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JPRS-CAG-86-026

25 JUNE 1986

China Report

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SICHUAN AGRICULTURAL GEOGRAPHY

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JPRS-CAG-86-026

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CHINA REPORT

AGRICULTURE

SICHUAN AGRICULTURAL GEOGRAPHY

Chengdu SICHUAN NONGYE DILI [SICHUAN AGRICULTURAL GEOGRAPHY] in Chinese Feb 81 pp 1-15, 44-53, 71-99, 100-112, and 256-262

[Selections from SICHUAN AGRICULTURAL GEOGRAPHY of the Chinese Agricultural Geography Series; edited by the Chengdu Institute of Geography, Chinese Academy of Sciences; published by Sichuan Renmin Chubanshe, 1981]

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Attached Photographs

Chapter 1. Assessment of Natural Conditions for Agriculture in Sichuan

Sichuan Province lies between 97°26' and 110°12' east longitude and between 26°01' and 34°21' north latitude, straddling more than 8 degrees of latitude from north to south and covering more than 1,200 km in width from east to west, making it a vast area. Mountain chains undulate within the region; there is great variation in elevation; the terrain is complex and diverse with extremely marked vertical changes. The tremendously swelling plateau in the west and the relatively low basin in the east, in particular, provide a marked contrast between east and west within the province. Under the influence of atmospheric circulation that follows different routes, the eastern part of Sichuan has produced a moist and hot subtropical southeastern monsoon climate; the southwest has formed an alternately dry and wet subtropical southwestern monsoon climate; and the northwest has formed a cold plateau continental climate. The features and differences in the aforementioned geographical location, terrain, and atmospheric currents has given rise to myriad differences in natural conditions throughout the province, north, south, east, and west, between the tops and bottoms of mountains and even on slopes that lie in different directions and landforms in different positions. They have had an extremely wideranging and profound influence on the patterns of agricultural production everywhere in the province.

First Section. Landforms

1. Major Types of Landforms

Within Sichuan Province there are both plains, gently sloping hills and flatlands, hills with a sharp incline, hills with a gradual incline, mesas, and low mountains, and mountain plains, medium low mountains, medium high mountains, high mountains, extremely high mountains, and plateaus (flat plateaus, tableland plateaus, and high mountain plateaus), plus canyons, broad valleys, mountain basins, and marshy lowlands, as well as alpine glaciers and karst topography, etc. The complexity of terrain types is unequaled by any other province or region in the entire country.

Generally speaking, the types of landforms throughout the province may be summarized as plains, hills, mountains, and plateaus, with mountains and plateaus being most extensive. Preliminary calculations show mountain areas amounting to approximately 49.8 percent of the total land area, and plateaus accounting for 29.02 percent of the total land area, the two totaling 78.82 percent. Hills and plains amount to 18.64 [as published] and 2.54 percent, respectively. (See Table 1)

The foregoing types of landforms differ in terms of elevation above sea level, relative height, and shape, and they give rise to a series of environmental changes in heat, moisture, plant cover, and soil, thereby profoundly affecting use of land for production. In general, among the various types of

landforms, the higher the elevation above sea level, the poorer the conditions for agriculture. Differences in agricultural conditions on those that are at nearly the same elevation above sea level are determined primarily by the slope of the land and the extent to which it is cut up.

The elevation above sea level of the plains is fairly low; heat is abundant; the land is flat and the soil thick; they are easily irrigated and drained; conditions for bringing them under cultivation are excellent; the reclamation index for agriculture stands at 60 percent or more; and an overwhelming majority of the cultivated land is paddyfields. The elevation above sea level of the hills is also low; heat is ample, and although the terrain undulates making for fairly poor conditions for the impounding or diversion of water, the gradient of slopes and relative heights are far smaller than in the mountainlands. The area suitable for cultivation is fairly large, the reclamation index amounting to approximately 40 percent. This includes gently sloping hills and flat land that is least deeply cut, and spacious flat land among the hills where conditions for reclamation for agriculture are second only to those on the plains. Hills with a sharp incline may have a relative height of 100 to 200 meters. Their slopes are fairly sharp and land among them very narrow, providing poor conditions for reclamation and the diversion of water. Conditions on hills with a gradual incline lie between those with a gentle slope and a sharp incline. It is for just this reason that even though plains and hills occupy a very small proportion of the province's total land area, they contain approximately 78 percent of the cultivated land area in the province and have become places for highly intensive farming while relatively little such land is used for forestry and animal husbandry.

Table 1. Main Types of Landforms and Their Structure in Sichuan*

Landform		Elevation above sea level (meters)	Relative elevation (meters)	Percent of total land area
Plains	Plains	<1,600	<20	2.54
Hills	Gently sloping hills and flat land	"	<50	4.00
	Gradually sloping hills	"	<100	9.89
	Sharply sloping hills	"	<200	1.75
Mountain- lands	Mesas	<1,500	<500	2.52
	Low Mountains		"	18.87
	Mountains among basins	1,500-3,000		0.29
	Mountain plains	1,500-3,000	"	2.00
	Medium mountains	1,500-3,000	>500	11.48
	Medium high mountains	3,000-4,200	"	9.00
	High mountains	4,200-5,200	"	4.87
	Extremely high mountains	>5,200	"	0.77

[continued]

[Table 1--continued]

Landform		Elevation above sea level (meters)	Relative elevation (meters)	Percent of total land area
High plateaus	Flat plateaus	>3,000	<100	3.22
	Hill-shaped plateaus	>3,000	<500	12.26
	Mountain plateaus	>3,000	>500	13.02
	High plateau broad valleys	>3,000		0.52

*Based on data from Topographical Unit, Chengdu Institute of Geography

Not only are there basins among the mountains in the mountainlands, but the soil on most hillsides is thin, the land rises and falls sharply, and since the elevation above sea level is fairly high, heat conditions are fairly poor and climatic changes are complex. The area that lends itself to reclamation for agriculture is limited. It includes mesas and the tops of mountain plains that are fairly flat and broad, thus better lending themselves to reclamation for agriculture than low mountains or medium high mountains. They stand relatively high (at approximately 20 percent) among mountainlands in terms of the degree to which they may be reclaimed for agriculture. Low mountains and medium mountains have only a very small amount of land suitable for farming; most of their area may be used for forestry. Medium high mountains are mostly suitable for forestlands, with a small amount useful for pasturing livestock. They contain virtually no farmland. When high mountains are at too high an elevation above sea level, there is insufficient heat for crops and trees to grow; however, they may be used as summer pasturelands. Extremely high mountains are virtually completely covered with ice and snow or bare rocks and are entirely without value for agricultural use. Because of the altitude and coldness of plateaus, only a few wide valleys on them may be reclaimed for agriculture; however, they make fine natural pasturelands.

The foregoing complex and varied types of landforms not only provide an advantageous environment for the development of farming, forestry, animal husbandry, and sideline occupations, but also impart to the agricultural production pattern of vast areas throughout the province a diversified, three-dimensional character. For example, in high and medium high mountains, going from bottom to top there are frequently marked subareas devoted to farming, forestry, and animal husbandry. In general, the following is found in low mountainlands going from the foothills to the tops of the mountains: Wetland agriculture-dryland agriculture-forestry in three zones. Even on hills, land use from top to bottom shows marked differentiation. In lowlying areas among the hills, the terrain is closed off making for poor drainage of water. Most of this land is winter wetlands (ravine fields) that collect water all year round. At the bottom, middle, and tops of hillsides are low, middle, and high banked fields (or first, second, and third terraces) including those at the low level where water and soil conditions are best.

Here wetlands are most numerous and can be both irrigated and drained. At the middle level where conditions are not as good, the amount of dryland fields increases gradually. Fields at the top have thin soil and lack water; drylands are more numerous here. This panorama of "three-dimensional agriculture" profoundly reflects the influence of variations in the pattern of landforms. It is extremely beneficial for all areas of the province to bring about overall development of numerous sectors of agriculture; however, it also increases complexity in directing agricultural production and makes for many difficulties in both the capital construction of farmland and the mechanization of agriculture.

Table 2. Differences in Land Use for Principal Kinds of Landforms in Sichuan

Landform	Agricultural reclamation index	Percent of province's cultivated land	Ratio of wetlands to cultivated land
Plains	More than 60 percent	15.4	80 percent or more
Hills	Average about 40 percent including: Gently sloping hills and flat land: 50 percent; gradual incline hills: 40 percent; and sharp incline hills: 30 percent	62.5	Average about 60 percent including: Gently sloping hills and flat land: about 70 percent; gradual incline hills: 60 to 70 percent; sharp incline hills: about 30 percent
Mountain-lands	Average 5 to 10 percent including: Tablelands and mountain plains: 20 percent; low mountains: 10 percent; medium mountains: 5 percent; high mountains and extremely high mountains: 0 percent	20.7	Average about 20 percent including: Tablelands: 50 to 60 percent; low mountains: 20 to 30 percent; other mountainlands: 10 to 20 percent
Plateaus	Less than 1 percent	1.4	0

2. Regional Landform Characteristics

Sichuan is made up of two main parts: The eastern part is a basin and the western part is a plateau and mountainlands. The two patterns differ sharply, with wide disparities in elevation above sea level and the extent

to which the surface of the land is cut up. Conditions for agricultural production are greatly different.

A. The Eastern Basin Region

The Sichuan basin in the east is one of China's four major basins. A continuous line drawn through the four points of Guangyuan, Ya'an, Xuyong, and Fengjie generally outline the bottom of the basin, which covers an area of approximately 160,000 square km at an elevation above sea level ranging from 250 to 700 meters. It is made up primarily of Mesozoic purplish red sand, shale, and mud stone, hence the name "red basin." In the southeastern part of the basin (east of Huaying Shan) lies the parallel mountain ranges and valleys areas, which derives its name from the numerous parallel-running mountain ranges and valleys. The valleys are broad and at an elevation above sea level of only about 300 meters. Hills intrude upon the flat land, and agriculture in the valleys is fairly well developed. The mountain ranges that line both sides of the valleys range from approximately 800 to 1,000 meters in height. Their tops are frequently eroded to form narrow trough-shaped valleys along the axis of the ranges. In the middle of the basin is a large expanse of low hills, most of which are at an elevation above sea level of 300 to 500 meters with a difference in height of between 50 and 200 meters. Individual ridge-shaped and rounded hills are widespread, and terraced fields rise in layers up them or else ridges have been built up the hillsides. This is the province's major production area for grain or cash crops; however, conditions for the diversion of water are rather poor and runoff of water and soil is serious so the level of production is not high. The western part of the basin (to the west of Longquan Shan) has a series of river-formed alluvial fans and alluvial plains adjacent to each other, which together form the largest plain in the southwestern part of the country--the plain at the western end of the basin. This plain covers an area of 8,000 square km; the land is flat, the soil layer is thick and fertile; the basin is crisscrossed by streams, and footpaths crisscross the fields. This is a renowned commodity grain and oil-bearing crop base that produces high yields consistently. In the northern part of the plain are large areas of table-shaped low mountains (that are also sprinkled in the eastern and southern parts of the basin). The underlying rock layer is close to the water table and after this rock has been cut by the flow of water, it forms free-standing ridge-shaped or table-shaped mountains the tops of which are fairly flat and broad, providing better conditions for farming than ordinary low mountains. Conditions for storing or diverting water are also poor, however.

The Sichuan basin is surrounded by intermediate and low mountains, and is made up mostly of pre-Paleozoic Era limestone and metamorphic rock, with some outcroppings of basalt and granite. Towering above the western edges of the basin is a series of mountains of intermediate height such as Jiuding Shan, Qionglai Shan, Erlang Shan, Daxiang Ling, and Xiaoliang Shan. The main range is more than 3,000 meters above sea level with a difference in elevation among peaks of 1,000 meters, protruding loftily as the highest mountain among the wall of mountains that surrounds the basin. Conditions for farming are rather poor; however, forestlands and land suitable for

forests is found widely. Longmen Shan, Milun Shan, and Data Shan meander along the western edges to the northwest and north of the basin, mostly at an elevation of 1,500 to 2,000 meters or higher. The rock mass of Longmen Shan is broken up and contemporary structural movement is active with earthquakes, landslides, and rock and mud slides occurring frequently. Outcroppings of limestone are widespread on Milun Shan and Daba Shan. These imposing mountains are fairly seriously eroded. The relative difference in altitude of peaks is between 500 and 1,000 meters, and conditions for farming are also poor. On the southeastern edge of the basin lie the Wu Shan, Qiyao Shan, and Wuling Shan mountainlands, most of which are at an altitude of 1,000 to 1,800 meters, with widely developed karsting, many sheer precipices and canyons. However, there are also some broad, flat, corroded lowlands and trough valleys, the largest of them covering several thousand mu or even nearly 10,000 mu. These are the best places for the local development of agriculture. The mountainlands on the southern fringes of the basin are a transitional area between the Yunnan-Guizhou Plateau and the Sichuan basin and are on the edge of the Dalou Mountain Range at an altitude above sea level of between 800 and 1,500 meters with little relative difference in elevation between individual mountains. Conditions for farming are fairly good. However, endless tunneling by falling water of the limestone mountains, and underground karsting has produced poor conditions for the storing of surface water and the threat of drought is great.

In summary, the landforms in the eastern region of hills, low mountains, and plains at a low elevation above sea level make extremely possible their development for agriculture and economic forests. Even though the land area amounts to less than half that for the whole province, the output of grain and cash crops from the area farmed accounts for more than 90 percent of the total for the province, and output of economic forests also accounts for an overwhelming part of the total for the province. This makes the bottom of the basin and the surrounding mountains, respectively, one of the country's major agricultural centers, and its economic forest and special products centers.

B. The Western Plateau Region

The western plateau region of Sichuan consists of the Aba Zang Autonomous Prefecture, Garze Zang Autonomous Prefecture, and Liangshan Yi Autonomous Prefecture as well as Xichang Prefecture and Dukou City. The landforms in Garze Zang Autonomous Prefecture and Aba Zang Autonomous Prefecture, which make up the main part of the region, are a part of the southeastern area of the Qinghai-Xizang Plateau and cover an area of 230,000 square km, more than 70 percent of which is at an altitude above sea level of more than 3,300 meters and has a frigid climate. The northwestern part of the plateau is not cut up very much. The surface of the plateau is broad; the valleys are vast and the soil is thick and fertile. Though its frigidity militates against the farming of grain crops, the plateau provides advantageous conditions for development of animal husbandry and for the growing of cold-tolerant cash crops. The surface of the eastern and southern parts

of the plateau is very much cut up, the mighty Min Shan, Qiong Shan, Daxue Shan, and Shaluli Shan mountain ranges stretching from north to south. The mountain ranges are more than 4,000 meters above sea level, and the Min Jiang, the Dadu He, the Yalong Jiang, and the Jinsha Jiang, large rivers all, follow along their valleys and have cut deeply into them to form a landscape of high mountains and gorge valleys. The bottoms of valleys lie at 1,500 to 2,400 meters above sea level and the difference in elevation between the tops of mountains and the valleys runs from 1,000 to 3,000 meters. Gongga Shan (7,590 meters above sea level) in the Daxue Shan, in particular, towers 6,000 meters above its nearby Dadu He Valley, making it a rarity in all of China. Inasmuch as the slopes on both sides of the gorge valleys rise precipitously and the edges of the valleys are at an excessively high altitude above sea level, conditions exist for the development of farming in only some stretches of the river valleys and are narrow in area. However, above the rim of the valleys there are many tracts of broad meadowlands with dense forests growing along the valley slopes that provide a vast area for the development of forestry and livestock raising.

The Xichang and Liangshan Yi area are a corner of the Yunnan-Guizhou Plateau. More than 80 percent of the area is at an elevation above sea level of between 1,000 and 2,400 meters, which is vastly lower than the Qinghai-Xizang Plateau. This area contains the Daliang Shan, Xiaoxiang Ling, Luoji Shan, and Maoniushan, which lay parallel to each other running from south to north, their myriad peaks rising and falling and the ranges stretching on and on. Within the Liangshan Yi Autonomous Prefecture lies a large tract of mountain plains at more than 2,000 meters above sea level where land suitable for forestry and animal husbandry is found in broad expanses. Within the same region also lie some fairly broad mountain basins and valleys including the Anning He valley plain at a relatively low elevation above sea level (1,200 to 1,600 meters) and covering 1,800 square km, making it the second largest flatland area in Sichuan as well as an agricultural center for western Sichuan.

Though the plateau and the high and intermediate mountains that dominate the entire western region limit general development of farming activities, they provide a broad space for development of forestry and animal husbandry and have become one of the country's major forestry and animal husbandry areas.

Second Section: Soil Resources

Sichuan has abundant soil resources, but the amount and makeup of various kinds of soil resources is very uneven. The proportion of land used for forestry and animal husbandry is greatest, the two accounting for a total of more than 470 million mu, which is 55.6 percent of the total land area. The proportion used for farming and wasteland suitable for farming is smallest (approximately 13 percent); however, this is a substantial amount in absolute terms. Water surfaces are relatively scarce, and water surfaces where aquatic products may be bred are particularly limited: less than the relative proportions and absolute amounts in most provinces and regions of the country. In addition, the proportion of inhabited sites, roads, land

used for industry and mining and for other activities of no direct value to agriculture is fairly large (approximately 30 percent). The area devoted to activities of no direct value to agriculture is alone in being nearly the cultivated land area of the whole province. This makes the utilization rate for land resources in Sichuan markedly lower than for other provinces and regions in the eastern area. (See Table 2)

Table 3. Structure of Sichuan's Land Resources*

Land resource	Area (10,000 mu)	Percent of total land area	Remarks
Cultivated land	10,029	11.78	Unfarmed land area was 99.82 million mu in 1978
Including: Wetlands	4,990		
Drylands	5,029		
Forestland	22,771	26.75	
Including: Dense forests	11,190		
Sparse forests	2,282		
Bushes	8,880		
Immature arrested area	410		
Meadowland and turfed slopes	24,564	28.85	Net amount suitable for pasturing is 169.5 million mu
Including land suitable for forests	7,614		
Wasteland suitable for farming	900	1.06	
Including: River flats	140		
Water surfaces	1,424	1.67	
Inhabited sides and land used for roads, industries, and mines	16,609	19.61	
Other	8,755	10.28	Land of virtually no value for agriculture (e.g., snowy moun- tains, alpine glaciers, rocky mountains, and precipices)
Total	85,140	100.0	Total land area is 567,600 square kms

*This table is based on the collection and compilation of data from many sources. Data on total land area uses numerical values figured by the Topography Section of the Chengdu Institute of Geography.

1. Farmland

A. Amount, Makeup and Distribution of Farmland

Sichuan Province has approximately 100 million mu of farmland (evenly divided equally between wetlands and drylands), the fourth largest amount for all provinces and regions. This includes the country's largest wetlands area. The amount of farmland is decreasing year by year through the takeover of land for cities, industrial plants and mines, transportation, water conservancy, and other construction in villages. Even with the addition of some land newly reclaimed for farming, the province's farmland area in 1977 was still 14.78 million mu (13 percent) less than in 1957. This, plus steady increase in the agricultural population, has meant a decline in the amount of farmland per capita from the 2 mu of 1949 to 1.17 mu (Footnote 1) ("Per capita" means per capita of rural population, and the same hereinafter) and an ever increasingly serious shortage of farmland. The climate, landforms, and soil vary from place to place, the density of farmland distribution is uneven. In the Sichuan basin, the farmland reclamation index is generally fairly high at approximately 30 to 40 percent, particularly in the area around the middle of the plain at the western end of the basin, (the Chengdu plain) where the reclamation index is as high as 60 percent. In the various counties in the mountains surrounding the basin, the reclamation index averages 10 to 20 percent. In Xichang Prefecture and in the Liangshan Yi Autonomous Prefecture, the farmland area amounts to only between 5 and 10 percent of the total land area. Farther westward and northward, the reclamation index further declines. In the southeastern part of Garze Zang Autonomous Prefecture and in the Aba Zang Autonomous Prefecture, where there are high mountains and deep valleys, the reclamation index is only 1 to 5 percent. In the northwestern plateau region, it is less than 1 percent. This includes Shiqu County where the reclamation index is zero.

There is a great difference in the ratio of wetlands to drylands as well. Eighty-five percent of the province's wetlands are concentrated at the bottom of the Sichuan basin, mostly on the plain at the western end of the basin and in the gradual-incline hill section at the southern end of the basin. In the former, the land is flat and laced with streams making for easy irrigation. Wetlands here account for between 80 and 90 percent of the farmland. In the latter, hills undulate and, historically, reliance has been placed on small dammed ponds for irrigation and for the impounding for local fields of autumn and winter precipitation to maintain plant growth. Here the proportion of wetlands averages around 70 percent. This is the area with the greatest distribution of winter wetlands in the province. In the middle reaches of the Tuo Jiang and the Fu Jiang, the percentage of wetlands is only approximately 30 percent, and the wetlands are concentrated mostly in low-lying trough areas among the hills. Since hillsides and mesas lack water sources, during winter and spring drought and when the climate is dry in summer, it is also difficult to store water for local fields, hence the large amount of drylands. The slope of the mountains surrounding the basin is fairly great and wetlands are fairly scarce there. Mostly they are found in river valleys and near streams. In the western area, the proportion of

wetlands is fairly high (approximately 70 percent) only in Xichang, Dechang, and Miyi Counties. In all other autonomous prefectures and counties, most of the farmland is dryland because of the elevation of the land and the relatively low temperatures. This is particularly true in the northwestern parts of Garze Zang and Aba Zang Autonomous Prefectures where there are virtually no wetlands.

B. Farmland Quality

Farmland quality is determined largely by soil, water, fertilizer, and gradient. Only farmland that is superior in all four of these ways is able to meet the high quality standards for flatness, soil, thickness, fertility, and ability to be irrigated and drained. Judged by these standards, only a very small portion of the farmland in Sichuan Province is of high quality.

(1) Farmland gradient and degree of certainty of water conservancy

A look at the gradient of farmland shows that virtually all wetlands meet the requirement of "flatness." However, approximately 70 percent of drylands are on hillsides from which water, soil, and fertilizer runs away; 63 percent of these drylands have a gradient of between 11 and 30 degrees, and 22 percent have a gradient of more than 30 degrees. In some mountain regions, in particular, the gradient of slopes is approximately 50 degrees as, for example, some that hang like a tapestry halfway up mountains that are termed "hanging fields." Hillside farmland accounts for approximately 35 percent of total farmland in the province amounting to more than 35 million mu. Approximately one-half of this is found in mountains surrounding the basin and in the western part of Sichuan. The other half is found on low mountains and hills within the basin.

The extent to which water conservancy may be guaranteed is low, making this one of the major weaknesses for farmland in Sichuan. The effectively irrigated area for the whole province is 42.3 million mu. The area from which a crop can be guaranteed despite drought or waterlogging is only 21.9 million mu, or less than 0.26 mu per capita. Furthermore, more than 40 percent of the wetland field area cannot be irrigated. This includes hill areas within the basin where the irrigated area averages only about 40 percent of the farmland and where the farmland from which a crop is assured despite drought or waterlogging is less than 20 percent. In mountain regions, the percentage is even less. Only on the plain at the western end of the basin can virtually all the farmland be irrigated, and most can assure a crop despite drought or waterlogging.

(2) Farmland soil structure and characteristics

More than 90 percent of the farmland soil in Sichuan is purple soil, alluvial soil, and red or yellow earth. Purple soils are found over a wide area within the basin and on the fringes of the basin in hill and low mountain areas at an elevation above sea level of between 600 to 800 meters or less, and covering approximately 50 million mu in area. It accounts for

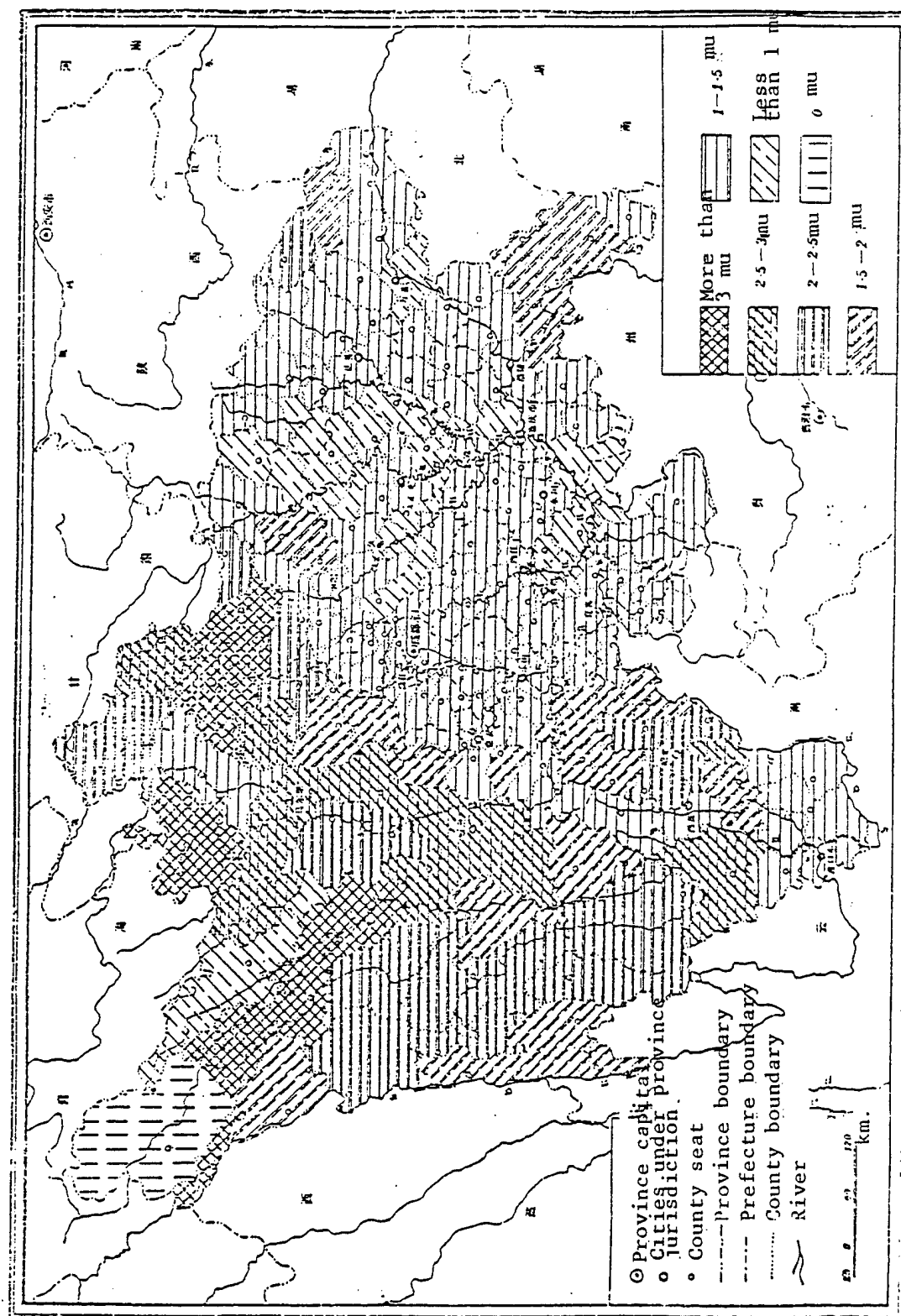


Figure 3. Map Showing Farmland Area Per Capita of Agricultural Population in Sichuan Province

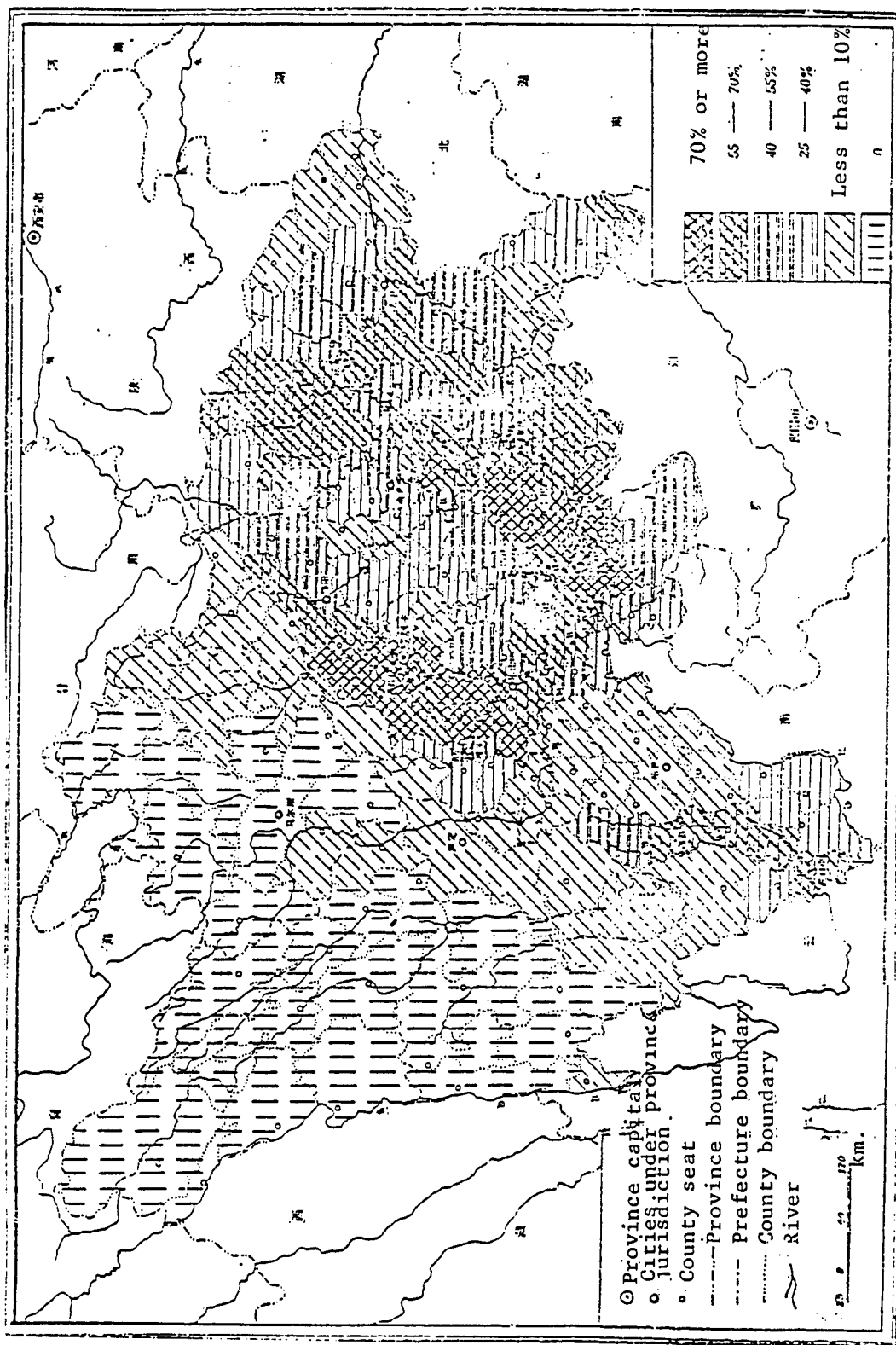


Figure 4. Map Showing Ratio of Wetlands To Farmland Area

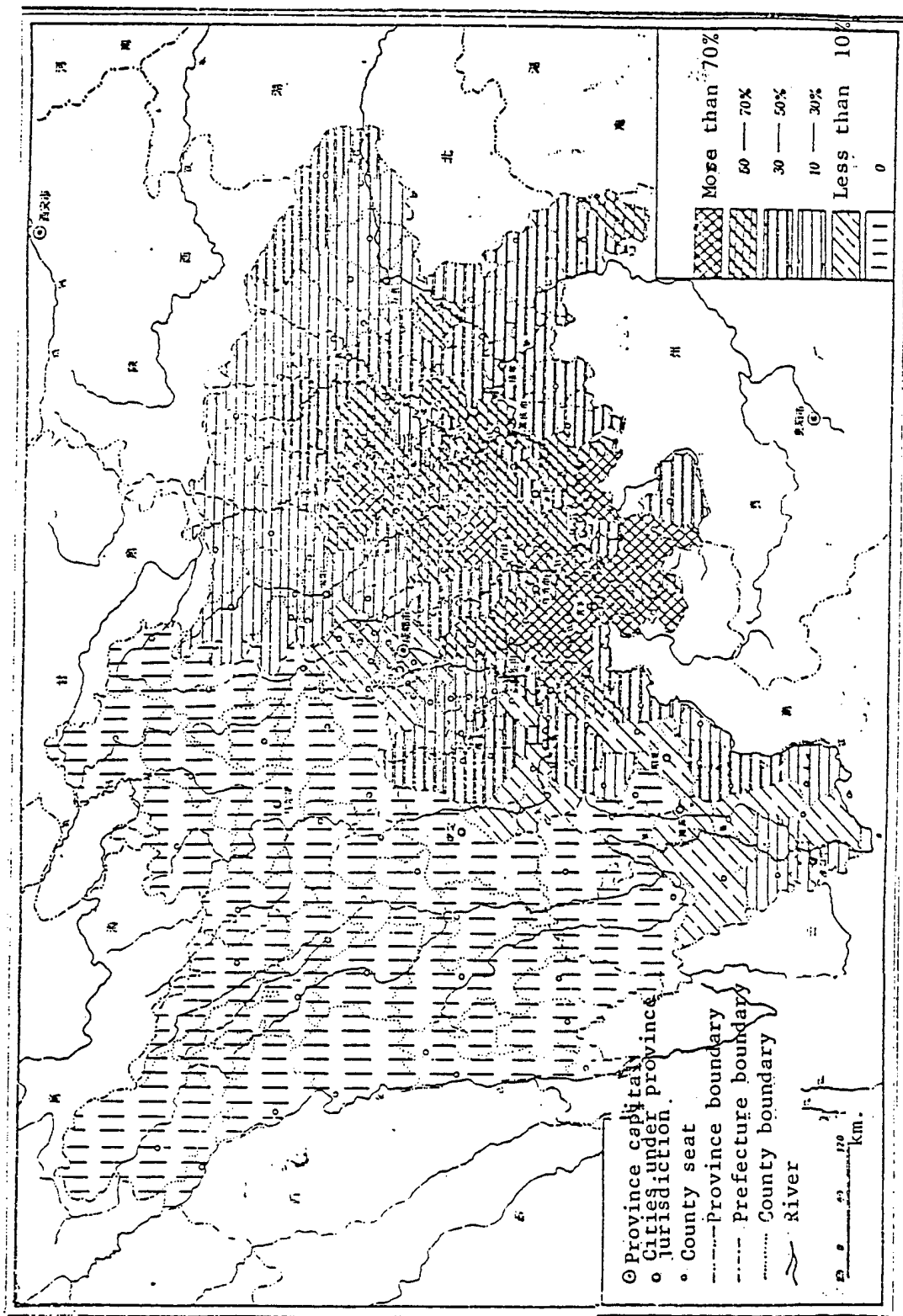


Figure 5. Map Showing Ratio of Winter Wetlands to Total Wetlands Area in Sichuan Province

one-half of the whole province's farmland and is made up mostly from sand and weathered shale. Most of it is neutral or calcareous purple soil with a fairly high mineral nutrient content. It is particularly rich in phosphate and potash. The quality of most of the soil is fair and it is porous for the passage of water and air, suiting it to the growing of grain and cash crops. Alluvial soil is found mostly on the plain at the western end of the basin and on both banks of streams over approximately 14 million mu in area. The source of its mother material is Quarternary Period river sediment. It tends to be medium to slightly coarse and generally nicely permeable, which suits it for farming. In addition, soil temperature is fairly high and nutrient content abundant. Red and yellow soils are found in different kinds of agricultural regions including flatlands, mesas, hills, and mountains over approximately 31 million mu in area. They are characteristically clayey, acidic, cold, infertile, and lacking in phosphate. Wetland soils are the aforementioned soils that have evolved through human use. Their content of organic matter is 86.45 percent higher than for dry-land soils; their pH value is neutral and their mineral content is generally relatively high. The area of other kinds of farmland soils is very small, amounting to less than 10 percent of the farmland in the whole province and found mostly in Sichuan's western mountainlands.

It is worth noting, in particular, that approximately 45 percent of the aforementioned farmland soils are low-yield soils (including nearly one-third of low yield wetland soils). Their yields are generally between 30 and 40 percent lower than ordinary soils and thus they have become a major element affecting farmland quality. Low-yield farmland soils may generally be divided into three kinds as follows: Heavy clayey soil, stony soil, and sandy soil. The clayey soil is mostly red and yellow type soil including baishan [4101 7668] soil, huangni soil, purple dead large soil [4793 5331 2984 1129 0960], gummy red mud, and gummy yellow mud covering a 30-million mu area. The baishan soil and the huangni soil are found mostly in the hills and mesas on both sides of the plain at the western end of the basin. The purple dead large soil is scatter in hill regions throughout the basin. The sticky red mud is concentrated in the Anning He valley in western Sichuan and on both banks of the Jinsha Jiang. The sticky yellow mud is found mostly in the mountains surrounding the basin. Their common characteristics are clayeyness, strong water-holding properties, "like a knife when dry and like paste when wet," infertility, phosphate deficiency, low soil temperature, poor aeration, slow reaction to fertilizer, and low yields. Stony soil is found largely in purple soils over approximately 10 million mu in area, most in the upper strata of hills in the middle and northern parts of the basin. Since this soil has a 50-percent or greater stone-particle content, its absorption properties are poor, it has poor resistance to abrasion, and the soil is less than 1 chi thick making it prone to drought. Its organic matter and nitrogen content is only 25 to 50 percent that of ordinary purple soils; thus crop yields are very low. Sandy soils are mostly alluvial soils (river sand soils), but some are other kinds of soil (such as red sandy soil and mountain sandy soil) which together cover approximately 5 million mu in area. River sand soils are found along rivers in a thin layer that is very sandy, is unable to retain water or

fertilizer, is unable to tolerate drought, is prone to damage from flooding, and produces low and inconsistent yields.

Though wetland low yield soils have been included among the foregoing low-yield soils, the effects of long-term drowning and of the terrain itself, in some cases have endowed them with certain unique characteristics which limit the utility of farmland of this kind. Trough fields, cold water-logged fields, yashini [7700 1452 3136] fields, blue mud fields and nitrate fields are all major kinds of low-yield fields in Sichuan that share the characteristics of being low-lying, shaded, having a high underground water table or not capable of being drained well. As a result of having been waterlogged for a long time, soil temperature is low; aeration is poor; microorganism activity is weak; breakdown of nutrients is slow; the soil has a poor structure or is lacking in structure; some have a thick layer of muck; tilling is difficult; paddy rice cannot put down roots easily; growth is slow and yields are very low. As a result of the overly large amount of ferrous salts derived either from the sources of water for irrigation or from the parent material from which the soil was formed, after being drowned for long periods of times, the nitrate fields are prone to produce a "multiplication of nitrate" that creates acidity and toxicity around rice roots leading to "sitting autumn" and producing yields that are low and inconsistent.

In short, in an overall sense, quality of Sichuan's farmland is not sufficiently high, the amount of farmland of poor quality amounting to a very large proportion of the total and requiring strenuous efforts to improve it.

2. Forestland (Footnote 2) (Includes brushwood mountainlands)

Table 3 shows that despite the very broad area covered by forestlands in Sichuan, the dense forest area amounts to only one-half of the total. The remainder consists of brushwoods, sparse forests and immature newly afforested land; hence, the forest-cover rate for the province as a whole is no more than approximately 13 percent, which is only slightly higher than the national average.

Sichuan's forestlands are distributed very unevenly. If a line drawn through Qingchuan, Ya'an, and Muchuan is taken as a boundary, the area to the west of it would contain from 70 to 75 percent of the forestland and the sparse forestland in the whole province, and approximately 90 percent of the brushwoods. To the east of the line in the Sichuan basin and in the mountainlands to its north, east, and south, the forestland area is miniscule, particularly in the hills and flatland areas within the basin where forest tracts are extremely scarce.

Forestland is land in which forest resources are concentrated. Forestlands include timber forestlands as well as tracts of economic forests and bamboo forests, both natural forests and forests grown by man. The percentage of timber forests and natural forests is greatest in the province, accounting for 95 percent and 90 percent of the total forestland area, respectively.

Moreover, among natural forests, primeval forests are an overwhelming majority. Consequently, forest reserves per unit of area in Sichuan's forestlands is very high, and the use value that can be generated is very great. However, they are concentrated in the high mountains and gorges of southeastern Garze Zang Autonomous Prefecture and Aba Zang Autonomous Prefecture where transportation is virtually nonexistent making the work of exploiting the resources difficult. (For details on dense forest resources and their development for use, please see Sections 2 and 3 of Chapter 5.)

The sparse forest area accounts for approximately 20 percent of the total forest area. Since forest trees are sparse, reserves are less than 6 percent of the total for forestlands; thus, their utility is fairly low. A considerable portion of this area is secondary growth or leftovers in forestland where sparse forests have grown following destruction of previous forests. On the other hand, they are found at fairly low elevations (along the middle and lower levels of hillsides). With better care and nurturing, plus introduction of some new varieties of trees for mixing in with the existing ones, further improvement could be made. In addition, since conditions are poor for the growth of forest stands in the high mountains or near the upper limits of dense forests in the west, frequently sparse forests have developed.

The area of brushwoods in Sichuan Province is very large amounting to approximately 89 million mu, which is approximately 40 percent of the total forestland area. Brushwoods are of three main kinds namely, scrub forests in the high or semihigh mountains where the bushes consist of many varieties of azaleas and rhododendrons, high mountain spirea japonica, jinlamei [6855 5198 2738], barberry [Barberis thunbergii], cotoneaster, high mountain willow [7559 1469 2692], and honeysuckle for the most part, most of which occur in Garze Zang Autonomous Prefecture and Aba Zang Prefecture from an altitude above sea level of 3,000 meters or more to above the limits where dense forests grow. Second is river valley dry scrub forests consisting primarily of cryptotaeneous cinquefoil [Potentilla cryptotaeniae], five-leaved chaste trees [Vitex negundo], Caragana sinica, tieganhao [6993 2616 5548], and members of the rose family, most of which occur in the valley of the Jinsha Jiang at below 3,000 meters above sea level, in the middle and lower reaches of the Yalong Jiang and the Dadu He at below 2,600 meters above sea level, and in the upper reaches of the Min Jiang at below 2,200 meters below sea level. Third is semitropical secondary scrub forests consisting predominantly of either Caragana sinica or aihuangu [4253 7806 5260], Corsiaria sinica, lily magnolia, shrub lespedeza [Lespedeza bicolor] and winter daphne [Daphne odora], and which are seen occasionally on relatively dry sunny slopes in semitropical mountainlands (at below 1,500 meters above sea level). Since brushwoods lack timber reserves, except for some that provide firewood or forage for goats, generally they are significant only in conserving water and soil. Thus, they should become future objects for improvement through afforestation (except for brushwoods in high mountains).

Immature afforested mountainlands are not numerous, amounting to only 1.8 percent of the total mountainland area. Afforested areas are found in just the opposite places from the aforementioned several kinds of mountainlands, two-thirds of them in the east and one-third in the west. This shows that the pace of new afforestation of places in Sichuan that formerly lacked forests is proceeding relatively rapidly.

3. Meadowlands and Turfed Slopes

Sichuan's area of meadowland and turfed slope is very widespread. Rough preliminary calculations show somewhat more than 240 million mu of usable area including approximately 76 million mu of meadowlands suitable for grazing, forestry (or farming) (such as hillsides below the dense forest line, grasslands along mountain ridges, grasslands among forests where dense forests have been cut, and grasslands in broad valleys on the plateau and in the basin that are suitable for bringing under cultivation to plant crops). There is an additional approximately 170 million mu of meadowlands purely suitable for grazing. This is vast land for development of animal husbandry in Sichuan.

A. High Mountain Scrub Forest Meadowlands

These are found largely on the Serxu and Sertar plateaus in the northern part of Garze Zang Autonomous Prefecture and in high mountain areas to the south at between 4,200 and 4,700 meters above sea level, i.e., above the limits of dense forests covering a usable area of 64 million mu. Varieties of pasture grasses are fairly few (and pulse pasture grasses are extremely scarce), sedges and weeds predominating. Frequently seen are grasses that tolerate grazing fairly well such as *artemesia* and *Dactylis glomerata*, yields of which are high, as well as vertical spike *jijian* grass [0987 4482 2126 4354 5430], *Roegneria kamoji*, and early maturing grasses that may be cut for hay, and a variety of grasses with a heavy fresh weight such as mountain knotweed, *artemesias*, and mountain leeks. Because of the high and cold topography, pasture grasses have only an approximately 100-day growing season, so most meadowlands can be grazed only during summer and fall. Winter meadows are limited to river valleys and to sunny slopes in the foothills of the mountains; thus there is a shortage of winter pasturage and there is overgrazing, with the result that quality of pasture grasses has regressed. In order to solve the problem of insufficient fodder during winter and spring, suitable areas in broad valleys and basins should be used for the active building of manmade fodder bases.

B. Semihigh Mountain Dense Forest Grassy Meadows

These are found in the northwestern part of Aba Zang Autonomous Prefecture and in the central part of Garze Zang Autonomous Prefecture (south of Serxu and Sertar, mostly at between 2,700 and 4,000 meters above sea level (Aba Zang Autonomous Prefecture) and at between 3,000 and 4,200 meters above sea level (Garze Zang Prefecture) on 85 million mu of usable area, making it the meadowland with the largest area and the greatest utility in the whole province. Mostly it is used for the pasturing of yaks, sheep, and horses.

Varieties of pasture grasses are very numerous, and wild growing pulse pasture grasses are also seen fairly frequently. Principal pasture grasses are xiao haocao [1420 5548 5430], xiao taicao [1420 5548 5430], zhuya liao [3796 5370 5578], xiao jidou [1420 2765 6258], xiao muxu [1420 5382 5581], xiangqing [7449 7230], and *Festuca ovina*. Since a large percentage of weeds is mixed into these pasture grasses (about 60 percent), and they are bad tasting, these grasses are not suitable for making hay. This reduces the quality of the meadowlands to a certain extent. Nevertheless, heat conditions for local meadowlands are better than for the previously mentioned kinds. The introduction of many varieties of fine pulse pasture grasses (such as alfalfa and sweet clover) could provide favorable conditions for building manmade meadowlands.

C. The Semihigh Mountain Marsh Grass Meadowlands

These are found mostly in Zoige and Hongyuan Counties in Aba Zang Autonomous Prefecture at between 3,200 and 3,700 meters above sea level on approximately 3.5 million mu of usable area. Pasture grass varieties lack diversification, consisting mostly of dahaocao [1129 5548 5430] and da heisui tai grass [1129 7815 4482 5377 5430], with a small amount of sedges and miscellaneous other grasses. Though the aforementioned grass varieties sprout earlier than others, they form spikes within a short period of time, making the grass so tough livestock do not like to eat it. Because the area is overcast and wet, insect pests (mostly parasites) pose a serious threat to livestock; thus such meadowlands may be used only in spring for grazing and their utilization rate is very low. Wet low-lying land that has become marshlike must be drained and improved before it can be used.

D. Dry River Valley Scrub Forest Meadowlands

These are found mostly in high mountain and gorge areas of western Sichuan in certain dry river valleys, such as below Batang on the Jinsha Jiang, below Xinlong on the Yalong Jiang, below Jinchuan on the Dadu He, and below Gunao on the Min Jiang. Since most of the land on gentle slopes has been cleared for farming, such meadowlands are found only on steep valley slopes where pasture grasses and scrub forests intermix. The usable area totals somewhat more than 6.2 million mu. Common pasture grasses are members of the artemesia family, *Eragrostis pilosa*, *Pennisetum alopecuroides*, and wild roses, all of which are thorny bushes, which makes them poor quality grasses on which only goats can pasture. Their average yield is also the lowest. Such meadowlands are also suited to being forestlands.

E. Meadowlands Among Mountainland Forests

Scattered here and there in Xichang, Liangshan, and in mountains surrounding the basin, these meadowlands are interspersed among dense forests, most of them having come into being following destruction of dense forest, or else occupying wasteland in mountain regions. Since heat conditions are fairly good, there is a large variety of pasture grasses and fine quality grasses. There is also a large amount of sedge grasses, miscellaneous

grasses, and pasture grasses that produce high yields. This is a range where agricultural region livestock can graze yearround. This type pastureland is also suitable for forests.

4. Wastelands Suitable for Agriculture

Wastelands suitable for agriculture as used in this context means land other than river flats that is actually grassland (or turfed slopes). Nevertheless, these grasslands differ from grasslands useful solely as pasturelands. They may be used not only for grazing but can also be opened to farming; thus they require separate listing.

No comprehensive survey of wastelands suitable for agriculture in Sichuan has been done for more than 20 years, so it is not clear just what resources are available. Rough statistics show approximately 9 million mu of wasteland (including 1.4 million mu of river flats) throughout the province as being suitable for agriculture. Of this wasteland, 42 percent is concentrated in the Aba Zang, Garze Zang, and Liangshan Yi Autonomous Prefectures and in the Xichang area, including upward of 1.5 million mu in Aba Zang Autonomous Prefecture alone; 23 percent is found in Daxian, Wanxian, and Fuling Prefectures in eastern Sichuan; 11 percent is found in Mianyang and Wenjiang Prefectures in the northwestern part of the basin. Very little is found in other prefectures or cities, only one-fourth the total for the whole province. (Footnote 3) (Based on figures reported by cities, prefectures, and autonomous prefectures themselves at the National Farmland Capital Construction Conference in July 1978)

In northwestern Sichuan (Aba Zang and Garze Autonomous Prefectures), an overwhelming majority of the wasteland is located on the plateau at between 3,000 and 3,700 meters above sea level where the terrain is flat and broad and the soil is thick, consisting mostly of meadow soil and meadow cinnamon soil that is rich in organic content. However, since the region is high and cold, with a very short frostfree period, most of this soil is not suitable for the growing of grain crops. It can be used only to grow cold-tolerant cash crops, such as sugarbeets and rape. Most of this wasteland lies in continuous tracts, almost 1 million mu of it in Hongyuan and Zoige Counties alone, making it most suitable for mechanized cultivation. Since it is a natural meadowland, it will be necessary to handle well the relationship between livestock raising and farming when it is brought under development, for a good mix of farming and animal husbandry.

The wasteland in southeastern Sichuan is located mostly in basins among mountains or in semimountainous areas at between 2,000 and 2,500 meters above sea level in fairly concentrated areas. There are several hundred thousand mu in the Yanyuan basin alone. Here heat conditions are sufficient for the growing of corn and winter wheat; however, precipitation is scant during winter and spring, so multiple cropping of crops sown in late autumn for winter growth is impossible without irrigation. The soils here are largely of the red and yellow kinds and are relatively lacking in fertility. Thus, in the process of development, major efforts must be made to improve water conservancy and soil; otherwise results will be miniscule.

In eastern Sichuan, northern Sichuan, and in the northwestern part of the basin are fairly large tracts of wasteland, most of which is at between 1,400 and 2,000 meters above sea level on broad mountain tops or ridges, where the climate is fairly cold, overcast, and wet making these places suitable only for the growing of a single crop of corn or potatoes. Other fairly small tracts of wasteland are scattered on hillsides and the tops of mountains everywhere, most of them under ownership of communes and brigades, and most of them interspersed among dense forests. Better management should be exercised over these wastelands, strictly guarding against bringing them under cultivation indiscriminately or destroying the forests to open up farmland.

Streams are numerous in hill and flatland areas where the terrain is fairly level. Though there is extremely little wasteland suitable for reclamation in these areas, there is a fairly large amount of river flats that can be developed. Since the layer of soil on river flats is too thin (or since they may have no soil at all), and since they are regularly inundated by flood waters, dikes will have to be built against flooding; fill dirt brought in from elsewhere, and increased fertilization given in a series of measures to improve the flats that entail a substantial amount of engineering. Nevertheless, since they are at a low elevation above sea level and the lay of the land is flat, since they are close to sources of water where water and heat conditions are good, and since there is an ample labor force in places where they are located, it should be easy to organize a mass campaign to reclaim farmland from the rivers. Once this farmland has gone into production, garden-style fields that produce high yields from multiple crops each year could be built within 2 or 3 years, producing fairly high utility from their development.

To summarize the foregoing, conditions for the reclamation of wastelands suitable for agriculture in Sichuan Province are generally poor. An overwhelming majority of places having wastelands are located in fairly remote plateau and mountain regions where population is scarce and transportation virtually nonexistent. In addition, some of these places are high and frigid, or cold, or arid and without water, or the soil is infertile, posing fairly severe hardships for their development. In particular, since the foregoing wastelands (river flats excepted) make fairly good pasturelands or lands suitable for forestry, competition between farming and forestry and between farming and livestock raising to use them poses pronounced conflicts. Therefore, before reclamation of most of these wastelands begins, how they will be developed must be thought out carefully. Ideally, clarification of the basic situation in them should be used as a basis for the preparation of tract-by-tract assessment and utilization plans, handling each tract by suiting general methods to specific circumstances.

Chapter 2. Historical Changes in Sichuan's Agricultural Production

Second Section: Magnificent Accomplishments on the Agricultural Front Since Liberation

The revolution emancipated productivity, and the revolution gave impetus to the development of productivity. Under leadership of the CPC and Chairman Mao, the Chinese people overthrew the evil rule of the "three big mountains" [imperialism, feudalism, and bureaucratism], Sichuan becoming liberated thereby. Next, the party led the broad masses in carrying out a mighty movement of land reform and the collectivization of agriculture, which brought the peasantry gradually to the broad road of socialism. Following the thoroughgoing smashing of the criminal plots of Lin Biao and the "gang of four" to restore capitalism, in particular, the position of socialism in rural villages was further consolidated and strengthened, thereby releasing large amounts of agricultural productivity, arousing enthusiasm for production among the broad masses of commune members, and advancing steadily the vigorous development of agricultural production.

1. Simultaneous Emphasis on the Five Occupations for All-Round Development

Since liberation, very great accomplishments have been scored in farming, forestry, animal husbandry, sideline occupations, and the fishing industry in Sichuan Province. The gross output value of agriculture and the output value of the individual sectors of farming, forestry, animal husbandry, sideline occupations, and the fishing industry increased between one- and several-fold between the eve of liberation in 1949 and 1977, and increased between 30 and more than 100 percent between 1964 and 1977. The increase in output value was fastest in the fishing industry, which formerly had had the weakest foundation. Comparison of 1977 with 1949 shows relative stability of the farming industry throughout the province in agriculture as a whole, a decline in the percentage of sideline occupations (but an increase in their output value), and a marked rise in the percentage of forestry, animal husbandry, and the fishing industry. However, there was virtually no change in the overall percentage of the farming industry to all other industries.

In 1973 and in 1975, Sichuan Province's gross output of grain went over 50 billion jin. In 1977, Sichuan's gross output of grain reached 56 billion jin (Footnote 1) (In 1978, gross output of grain throughout the province increased further to 61.2 billion jin, up 9.3 percent from 1977) in an increase of 87.4 percent and 43.6 percent over 1949 and 1965, respectively. With the rise in production, the number of cities and counties with grain yields surpassing "The National Program for Agricultural Development" rose from 16 in 1972 to 58 in 1977. (Footnote 2) (In the high and cold areas of Garze Zang, Aba Zang, and Liangshan Yi Autonomous Prefectures, grain production outstripped "National Program for Agricultural Development Standards" with yields of 400 jin per mu) This included Wenjiang Prefecture plus 13 counties and cities, namely Wenjiang, Xindu, Guanghan, Chengdu, Pixian, Shifang and Mianzhu Counties, Yibin City, Mingshan, Pengshan, Pengxian,

Table 13. Makeup and Changes in the Output Value of All Agricultural Sectors

Sector	1949		1977		1977 vs 1949
	Output value (100 million yuan)	Makeup (percent)	Output value (100 million yuan)	Makeup (percent)	Increase (Number of fold)
GVAO	36.19	100.00	109.41	100.00	2.02
Farming	26.33	72.80	80.77	73.82	2.10
Forestry	0.67	1.90	2.85	2.60	3.25
Animal husbandry	4.70	12.99	17.48	15.99	2.72
Sideline occupations	4.49	12.30	8.02	7.33	0.79
Fishing industry	0.004	0.01	0.29	0.26	79.55

Remarks: 1) 1949 output value based on constant 1952 prices.
 2) 1977 output value based on constant 1970 prices.
 3) GVAO in 1978 was 11,917,000,000 yuan including 8,762,000,000 yuan from the farming industry.

Shuangliu, and Hongya Counties, with yields of more than 1,000 jin per mu. Gross output of major grain crops including rice, wheat, and corn also broke the all-time high marks. Comparison of 1977 with 1949 showed a 52.1-percent increase in gross output of paddy, a more than doubling of the outputs of sweet potatoes and corn, and a 2.3-fold increase in the output of wheat. Yields per mu rose by between 60 and 140 percent. Simultaneous with the rise in grain production was development of cash crops at a greater speed. In 1977, 13.66 million mu was devoted to cash crops throughout the whole province, 62 percent more than in 1949. This included a 77-percent increase in cottonfields and a manifold increase in the growing areas for sugarcane, flue-cured tobacco, and jute. Outputs of the major cash crops of cotton, rape, sugarcane, and flue-cured tobacco increased tremendously. Cotton output increased 7.6-fold; rapeseed output doubled, and outputs of sugarcane and flue-cured tobacco increased 1.5- and 18-fold, respectively. Expansion of agricultural production not only improved the standard of living of the people throughout the province, but also gave powerful assistance to the building of socialism in the nation.

Since liberation, the people throughout the province have actively responded to Chairman Mao's mighty call to "make the motherland green," vigorously carrying out the task of planting trees for afforestation. As of the end of 1976, the province's afforested preserve area amounted to 33 million mu (including 1 million mu of economic forests), the replanting of 2.6 million mu of slash and the maintenance of 5 billion trees growing in the "four besides" [besides villages, streams, roads, and houses]. Simultaneous with the felling and replanting of trees in the high mountain forest areas of the west, emphasis has also been placed on the development in the Sichuan basin

region (and particularly in the forested mountain area around the basin) of fast-growing timber forests containing mostly Chinese juniper and pine, and economic forests primarily for the production of wood oils and tea oil, plus the corresponding building of a number of bases (or base counties). This has changed, to a certain extent, the imbalance in distribution of forest resources. Production of timber and most economic forest products has greatly expanded since the period immediately following liberation, particularly the output of tea, citrus fruits, apples, and walnuts, which in 1977 surpassed or were close to the all-time high levels. This included a fourfold increase over 1949 and a more than doubling over 1965 in the output of tea, with a manifold expansion in the new tea plantation area. State purchases of citrus fruits, apples, and walnuts were from several times to 90 times greater than during the period immediately following liberation. Development of forestry has succeeded in maintaining soil and water and protecting farmlands, while also providing large quantities of timber, fuel, fertilizer, animal fodder, and capital for promotion of the development of farm, animal husbandry, and sideline occupation production.

Simultaneous with the development of farming and forestry production has been fairly rapid development of animal husbandry production, very great increases having taken place since the period immediately following liberation in both the total number of livestock and in numbers of different breeds of livestock. Increase in hogs, sheep, and goats has been particularly rapid. As livestock have increased, there has also been a marked increase in state procurement of all kinds of livestock products. Comparison of 1977 with 1952, for example, shows an 89-percent rise in hog bristles, a 1.6-fold increase in hog casings, 2.8- and 6.4-fold increases in goat skins and cowhides, and a 19-fold increase in sheep's wool for a major contribution to the building of socialism in the nation.

Sichuan has traditionally had many sideline occupations. In addition to the processing of agricultural products, short-haul transportation, hand weaving, hunting, and trapping, it has had mostly the raising of silkworms, beekeeping, breeding of wax insects, the gathering and growing of medicinal herbs, plus the culturing of tremella and wood fungus, etc. The raising of silkworms has become the principal sideline occupation and the main source of income in some agricultural areas. In 1972, output of silkworm cocoons surpassed the all-time high year (1936 with 564,000 dan), and in 1977 output reached 878,000 dan (including 864,000 dan of mulberry silkworm cocoons), a nearly eightfold increase over 1949. (Footnote 3) (In 1978, the province's output of silkworm cocoons exceeded 1 million dan in one fell swoop for a new record) Purchases in recent years of honey, medicinal herbs, and tremella have surpassed record highs, increasing between one- and severalfold since before 1966.

Fishing industry production has also expanded very quickly. In 1977, the province reared fish of a water surface area of 2.2 million mu and output reached 982,000 dan (including 159,000 dan of catches from rivers), a 7.5-fold increase over 1952 and a 79-percent increase over 1965.

Table 14. Rate of Increase in Numbers of Livestock (1949 = 100)

Livestock	1949	1965	1977
Total number of livestock	100	210	313
Hogs	100	246	364
Cattle	100	135	163
Sheep and goats	100	270	363
Goats	100	310	395
Sheep	100	216	320
Horses	100	97	141

Flourishing production in farming, forestry, animal husbandry, sideline occupations, and the fishing industry has brought about a steady increase in rural villages' public accumulations and the incomes of commune members. In 1977, public accumulations of rural villages throughout the province reached 1,543,000,000 yuan for a 69-percent increase over 1973. Commune member per capita real income increased 43 percent over 1965, double the 1957 amount for a further strengthening of the collective economy and improvement in the standard of living for greater consolidation of the rural socialist front.

2. Steady Expansion in the Scale of Farmland Capital Construction

Good performance in farmland capital construction and improvement in agricultural production conditions are mighty undertakings in the rapid development of socialist agriculture. The broad masses of cadres and commune members in Sichuan have launched an all-out effort to subdue nature, starting with major efforts to tackle mountains, streams, fields, forests, roads, and marshes in a comprehensive way in order to bring water under control and improve the soil, and they have steadily changed the former condition of Sichuan's mountain streams.

In recent years, every winter and spring a mighty 10-million-strong army has struggled on the broad front of farmland capital construction throughout the province. This has included more than 50,000 farmland capital construction teams made up of more than 4 million people who work without letup all year round. During the past three winters and springs, in particular, a work force of more than 15 million, or approximately 45 percent of the total agricultural labor force has been fielded. This has greatly exceeded any previous year in terms of both momentum and scale.

Construction of water conservancy is a key measure for increasing agricultural production in Sichuan. The building of water conservancy projects has developed fairly greatly as a result of firm adherence to a program of "taking smallness in scale, complete equipping, and operation by communes

and brigades themselves as key links," plus following the principle of a combination of the large, the medium, and the small, a combination of storage and diversion of water, suiting general methods to local situations, self-reliance, and uniting to harness waters. As of the end of 1977, more than 10,000 mu of water diversion projects had been built at 89 locations, including 7 locations that had projects covering more than 300,000 mu, and 3 locations that had projects covering between 100,000 and 300,000 mu; 1,239 reservoirs covering an area of more than 1 million mu (including 2 large reservoirs and 78 medium-size reservoirs); 17,778 permanent electromechanical irrigation stations, and 2,552 water-wheel pumping stations; and small irrigation ditches, dams, ponds, dikes, well irrigation, and other irrigation projects at more than 900,000 different locations for the preliminary formation of large- and medium-size projects as the backbone of a water conservancy and irrigation system combining the large, the medium, and the small, and combining storage, diversion, and lifting of water. This has brought the irrigated area of the province to 42.32 million mu. This includes 32.73 million mu on which irrigation can be assured, a 5.2-fold increase over 1949 and a 47-percent increase since 1964. In recent years, spray irrigation has developed very rapidly in hill and mountain region drylands, with more than 2.6 million mu brought under control of spray irrigation. In 20 cities and counties throughout the province, the irrigated area covers more than 70 percent of the total cultivated area, and in 34 cities and counties, it covers between 50 and 70 percent. It is particularly noteworthy that the ancient Du Jiang Dam is also radiating youthfulness. Not only has its headwork been preliminarily transformed, but its old ditch system has refurbished to become a new project in the steady emergence of a new irrigation area. In recent years, after the people of Renshou County built the Heilongtan Reservoir in the Longquan Mountain region that is able to divert and store 300 million cubic meters of water from the Dujiang Dam, the people of Jianyang County dug a 6,200-meter-long water diversion tunnel through Longquan Shan, and the people of Deyang, Zhongjiang, and Shehong Counties victoriously completed a 183-km-long trunk canal (the seventh scheduled people's canal project). As a result of these projects, water from the Du Jiang Dam moves eastward over three routes, traverses a mountain and waters hills in the basin that have experienced drought 9 years out of 10. Today, the area served by the Du Jiang Dam irrigation area has expanded from the 12 cities and counties of the preliberation period to 27 cities and counties, and the irrigation area has expanded from 2 million mu to more than 8.5 million mu, an increase of more than 60 percent since 1965, bringing virtually all farmland in the irrigation area under irrigation.

Improvement of fields and improvement of the soil are important capital construction programs for agriculture. Soil-improvement projects in Sichuan Province got underway as far back as the period of cooperativization; however, only 3.9 million mu of fields and soil had been improved in the 15 years ending in 1970. This was an average field and soil improvement of only 260,000 mu per year. Since the 1970 North China Agricultural Region Conference, new movement has taken place in a mass campaign to improve fields and soil. Between 1971 and 1976, 14.29 million mu of fields

and soil were improved (including the improvement of 5.74 million mu of soil). This meant the improvement of 2.38 million mu of fields and soil per year, an 8.2-fold increase over the average for the previous 16 years. Following the smashing of the "gang of four," in particular, during 1977 (from October 1976 through April 1977), 4.39 million mu of fields and soil were improved, surpassing the total for the 15 years prior to 1970 and increasing by 36 percent over 1975. In addition, 5.5 million mu of soil was deeply plowed and turned over, 1.09 million mu of strip fields were built, and 140,000 mu of new fields were built. The size of the results and the speed of progress was greater than in any previous year. With the steady improvement in water and soil conditions, the winter paddyfield area has decreased from the 40 million mu of the period immediately following liberation to 32.7 million mu in 1965 and 19.24 million mu in 1977. Thanks to the strengthening of capabilities to withstand natural disasters, the area of the province from which consistently high yields may be obtained despite drought or waterlogging has reached 21.92 million mu, or more than one-fifth the total cultivated land area. (Footnote 4) (In 1978, the winter paddyfield area of the province was further reduced to 14.86 million MV, and the area from which consistently high yields may be harvested despite drought or waterlogging increased to 23.48 million MV).

The making of methane gas was begun in 1958 by the people of Zhongjiang and other counties; however, sustained development did not take place at that time. It was not until after 1973 that a mass movement in production of rural methane gas developed in Sichuan. As of the end of 1972, there were only 3,000-odd methane gas pits in the whole province. By 1973, the number had expanded to more than 30,000; in 1974 to 200,000, and each year during the past several years, approximately 1 million methane gas pits have gone into production. As of the end of 1977, 4.38 million methane gas pits had been built throughout the province, and in 14 cities and counties, rural villages use methane gas. Development of this undertaking has not only helped greatly to ameliorate the fuel shortage and further emancipate the work force, but it has also increased the amount of fertilizer and promoted consistently high yields in agriculture. It has also widened avenues for development of forestry production.

3. Emergence of a New Situation Through Reform of Farming System

Reform of the farming system is a strategic measure for giving impetus to going ahead quickly in a big way in agriculture. Practice has demonstrated that it is not only a way in which to make further use of light, heat, water and soil resources, to make use of the potential for increased yields that the soil holds and to raise the multiple-cropping index, but also allows full use of advantageous seasons and avoidance of disadvantageous times, and sets the stage as well for rational crop rotation and the realization of a combination of soil use and soil nurturing for extremely marked increases in yields.

For many years leaders at all levels and the broad masses of commune members plus agricultural scientific and technical personnel in Sichuan Province

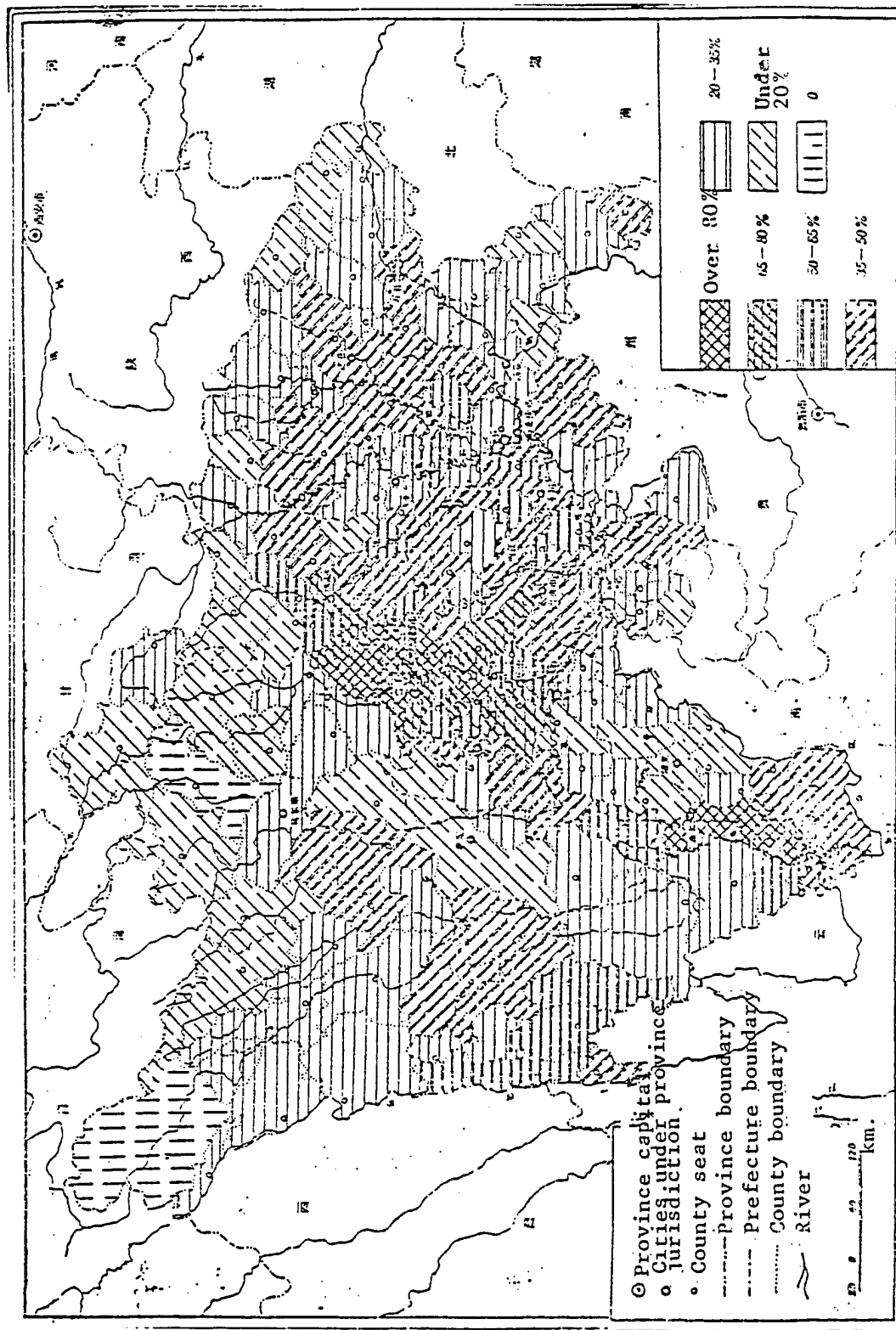


Figure 14. Effectively Irrigated Area as a Percentage of Total Farmland in Sichuan Province

have devoted very serious attention to reform of the farming system. As a result of practice in production and scientific experiments, new modes and new techniques have emerged in an endless stream. They have included quite a few that have already been or are in process of being promoted for use.

A. Reform of the Paddyfield System

(1) Where water conservancy within the basin permits, fields that now grow both dryland and wetland crops of paddy and wheat in a two-crop system should mostly grow one crop of winter wheat and two crops of paddy in a three-crop system.

(2) In order to solve problems of too short a season for the growing of two crops of paddy and the threat of spring drought in the northwestern part of the basin, active efforts should be made to promote the growing in wetlands of meat intercropped with corn followed by late paddy in a three-crop system.

(3) In hill regions within the basin where water cannot be assured on fields up the sides of hills with high embankments around them that depend on rainfall, where water conservancy is unavailable, a system of "taking the dry road when the wet road is not open" should be used for early plowing and cultivation to grow spring sown crops such as corn and sweet potatoes.

(4) In hill areas in the southeastern part of the basin, wherever water can be assured for winter wetlands, a change should be made from the growing of a single crop of intermediate rice to the growing of azolla and two crops of paddy. For winter wetlands where irrigation can be assured, the water should be drained from paddyfields and winter crops of green manure, rape or wheat grown, two crops of paddy or a single crop of intermediate paddy being grown in spring.

(5) In the eastern part of the basin, in fields for which sources of water are lacking, in order to avoid the threat of summer drought for intermediate paddy and in order to increase the multiple-cropping index, active efforts have been made in recent years to promote the growing of spring potatoes (or rape) or one crop of dryland rice and a fall crop of sweet potatoes (or fall potatoes) in a three-crop system.

(6) In fields that lie fallow during winter in mountain regions around the basin in which a supply of water can be assured, a change should be made from one crop of intermediate paddy to spring potatoes (or green manure) and one crop of intermediate paddy in a two-crop system.

B. Drylands Reform

(1) On the hill drylands within the basin, the two-crop system of wheat and corn (or sweet potatoes) should be changed to a three-crop system of crop rotation, growing wheat (intercropped with green manure) and the companion cropping of early corn and sweet potatoes in strips.

(2) On land in mountain regions that lies fallow during winter, a change should be made from the growing of a single crop of corn or potatoes each year to the companion cropping of spring potatoes with early corn in a two-crop system. Alternatively, there can be further use of a three-crop system in which spring potatoes are companion-cropped with corn followed by the growing of fall potatoes (or fall buckwheat).

(3) In recent years, active efforts have also been made on the plateau in the west from the growing of a single crop of spring wheat to the growing of Xizang feimai [5142 7796] [sown in winter]. Though this still amounts to only a single crop a year, feimai makes full use of light and heat resources, including those of the winter and spring seasons in a very long growing season for a huge increase in yields.

As a result of the various aforementioned reforms, the double-crop paddy area of the province increased from 540,000 mu in 1965 to 3.95 million mu in 1977 for a 6.3-fold increase. The area cropped to corn followed by late rice rose from less than 100,000 to 730,000 mu in 1978. As a result of the steady decrease in the area of the "three winter fields" (winter paddyfields, winter fallow fields, and winter idle fields) throughout the province, the area sown to wheat and potatoes has gradually increased. This has included an expansion of the wheat-growing area by 86 percent between 1949 and 1977, with a 57-percent expansion between 1965 and 1977. The three-crop area of intercropping in strips on drylands has expanded in recent years to more than 6 million mu. In mountain areas, very great expansion has also taken place in the growing of crops on land that has laid idle during winter heretofore.

With reform of the farming system, the average multiple-cropping index throughout the province has also risen from 153 percent in 1965 to 173 percent in 1977, (Footnote 5) (In 1978 the multiple cropping index reached 179 percent) and expansion of the multiple-cropping area has made a major contribution to development of agricultural production.

4. General Rise in Scientific Farming

In the process of the development of agriculture, all parts of Sichuan have bolstered leadership of their scientific research work in agriculture with the result that mass scientific experimentation has gained ground steadily, a scientific and technical agricultural corps made up of leaders, the masses, and technical people, and the old, the middle-aged, and the young has become increasingly vigorous. Today 80 percent of the province's cities and counties have set up agricultural science institutes; approximately 70 percent of communes and brigades have set up agricultural science stations, corps, or teams; and more than 1 million people are taking part in a campaign of scientific experiments in agriculture, experimental bases covering more than 2 million mu in area. In all the cities and counties of the Sichuan basin, a four-level agricultural science network has spread virtually everywhere.

Agricultural science organizations at all levels are in the process of actively developing a mass agricultural scientific experiment campaign that has as its main component the scientific farming of fields. Much successful experience has been gained in scientific farming as a result of arduous exploration and experimentation. This has given rise to no small amount of advanced scientific research results that has played a major role in giving impetus to the development of agricultural production.

Various places in Sichuan have developed fine varieties of paddy rice, wheat, cotton, rapeseed, and potatoes as part of their work with seeds. Paddy rice varieties "Aituogu" and "Fuxuan No 3"; wheat varieties "Fan 6" and "092"; and rape variety "Shengli No 4" have all been heartily welcomed by the broad masses and have spread quickly. Particularly noteworthy is the "62-200" cotton and the "disease-resistant Dongting cotton" bred in Shehong County that make it possible to control effectively the "incurable disease," wilt, and ranks as a fine variety of disease-resistant cotton that has been promoted throughout the country. In addition, hybrid rice and hybrid corn varieties have also gained preliminary promotion. The area growing hybrid corn has increased from 500,000 mu in 1971 to 7.6 million mu in 1977, and hybrid rice is now being grown where formerly nothing at all was grown. Beginning with test plantings in 1975, the growing of hybrid rice increased to 370,000 mu by 1977. New techniques have found steady application in farming. Examples include the breeding of "robust seedlings with many tillers" for paddy rice, the growing of corn, wheat, and cotton seedlings for transplanting, a variety of sweet potatoes the tips of whose tendrils overwinter and growing of sweet potatoes in "sun storing" hotbeds, growing of paddy rice hydroponically in hothouses, etc., all of which have produced markedly higher yields. In the scientific use of water, sensible fertilization, soil improvement, improved farming methods, prevention and control of diseases and insect pests, and the improvement of farm machinery and implements, agricultural science units at all levels have also played a model role and have made major contributions.

The widespread launching of a mass program of scientific experimentation has everywhere given impetus to a rise in the level of scientific farming, and yields per unit of area have risen steadily. Throughout the province, many high-figure bumper-yield plots have appeared, such as yields of 1,300 jin per mu of intermediate paddy, and nearly 1,000 jin per mu of single crops of early paddy, late paddy, wheat and gaoliang, plus yields of nearly 10,000 jin per mu of sweet potatoes and of 300 jin per mu of ginned cotton. Such high yields from small areas have already become commonplace. Deserving of special attention are grain yields averaging 2,121 jin per mu in 1975 that developed out of high yields over large areas year after year in Hongguang Production Brigade in Xiaogan Commune, Deyang County. This yield set an all-time high for wide-area grain yields per mu for the year in the province.

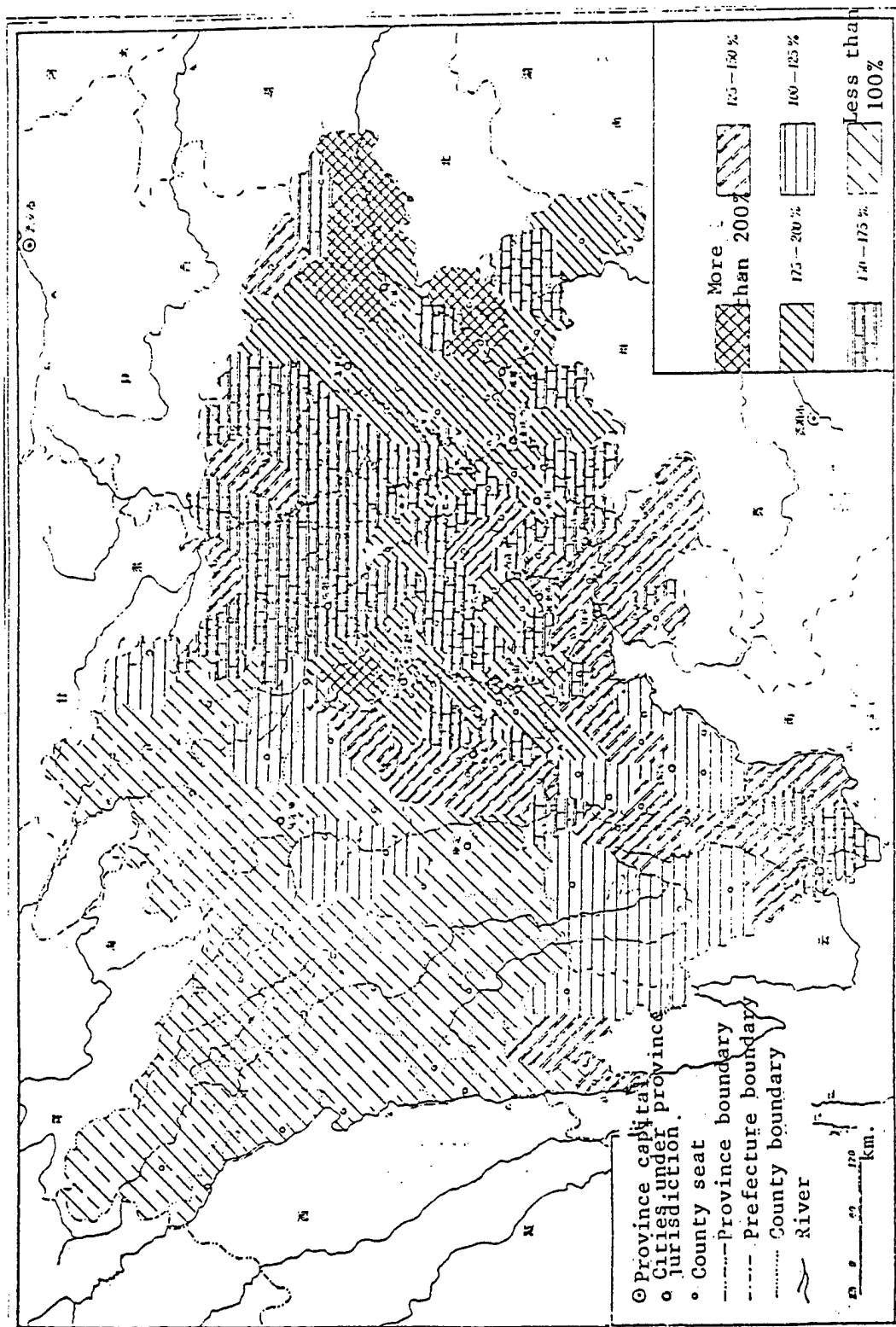


Figure 15. Map Showing Farmland Multiple-Cropping Index in Sichuan Province

5. Increasingly Solid Industrial Basis To Support Agriculture

Prior to liberation, the whole province was virtually completely lacking in farm machinery manufacturing industries and chemical fertilizer industries. Except for a few shops that made iron, woodworking shops, and small indigenous coal mines, the far-flung rural villages had no true "five small" industries, much less did they use farm machines, chemical fertilizers, and electricity. Following liberation, under leadership of the party, various industries to support agriculture and "five small" industries began to develop and grow rapidly. At the provincial, prefecture, and county levels, plants manufacturing farm machinery on various scales began to be built, and prefectures and communes have gradually built farm machinery repair and spare parts stations to form a fledgling farm machinery repair network.

Today the whole province is able to produce large numbers of tractors, diesel engines, locomotives, hydraulic turbines, and machines for drainage and irrigation, for farming, for hauling, for plant protection, for harvesting, for threshing, for processing, and for the feeding of livestock. Output of various kinds of tractors alone is 32-fold greater than in 1970. There are approximately 60,000 tractors in the province (including approximately 45,000 hand tractors) 46-fold the 1965 number. (Footnote 6) (In 1978, there were more than 80,000 tractors in the province, including more than 63,000 walking tractors)

Up until 1965, Sichuan had only 2 large nitrogenous fertilizer plants, 1 small nitrogenous fertilizer plant, and 10-odd phosphate fertilizer plants.

During the past 10-odd years more than 130 small chemical fertilizer plants have been built in the province (including 81 small nitrogenous fertilizer plants and 52 small phosphate fertilizer plants). Two large nitrogenous fertilizer plants have also been renovated and enlarged for a 5.4-fold expansion in the production capacity of the entire chemical fertilizer industry. Gross output of chemical fertilizer has increased 6.5-fold (including a 5.4-fold increase in the output of small commune- and brigade-operated chemical fertilizer plants). The varieties of chemical fertilizer have increased from 5 to 14 and the total amount of fertilizer used has increased threefold. Fertilizer use in the province averages 54 jin per mu of cultivated land (and reaches more than 100 jin per mu on the plain at the western end of the basin), thereby effectively promoting a rise in crop yields per unit of area.

Simultaneous with the burgeoning of small machinery and small chemical fertilizer plants has been the appearance in steady stream of small steel and iron plants, small coal mines, and small cement plants that use locally available resources and that closely serve the needs of agricultural production. All "five small" industries present a picture of prosperity. Comparison of 1977 with 1965 shows a 2.7-fold increase in the output of small iron and steel plants, which reached 353,000 tons. Output of small coal mines increased 316-fold to reach 24.43 million tons. Output of small cement

plants reached 1,849,000 tons in a 16.3-fold rise. Not only has development of the "five small" industries provided rural villages with large amounts of products to support agriculture that are needed locally, promoted agricultural production, and accelerated the modernization of agriculture, but it has also greatly bolstered the real economic strength of counties, communes, and production brigades to become an important material assurance that gives impetus to further development of people's communes.

Sichuan's electric power industry has also developed very rapidly. Comparison of 1977 with 1966 shows a 2.9-fold increase in electric power generation capacity and a more than threefold increase in the generation of electric power. There was a twofold increase in the length of high-voltage and super-high-voltage power-transmission lines erected. The entire province has virtually become a powerful electric power grid. At the same time, small hydroelectric power stations in rural villages have burst into bloom like hundreds of flowers dotting the landscape in farming areas, pastoral areas, the plains, and mountain regions. As of the end of 1977, 7,519 small hydroelectric power stations with 462,000 kw of electric power generating capacity had been built throughout the province, a more than 3.9-fold increase over 1965. High- and low-voltage power-transmission lines stretched for 158,000 km. Development of the electric power industry has powerfully spurred agricultural production. Rural power use reached 970 million kwh. Today 195 cities and counties throughout the province as well as 88 percent of communes and 36 percent of production brigades are served by electricity and in some counties every production brigade has electric power service.

In summary, profound changes have taken place in the far-flung rural villages of Sichuan Province since liberation, and achievements have been extremely remarkable. Since the smashing of the "gang of four," in particular, under leadership of the CPC Central Committee the people throughout the province have become fired with enthusiasm and their zeal has increased manifold. They are determined to exert maximum efforts to score even greater victories.

Chapter 4. Patterns of Production of All Sectors of Agriculture in Sichuan Province (Part 1)

First Section: Grain Crops

A. Numerous Varieties, Large Output, and a Prominent Position in the Country as a Whole

Sichuan is one of the most important grain-producing regions in China. It accounts for 8 percent of the nation's grain-growing area and produces approximately 10 percent of the nation's grain, first among all provinces and regions.

Sichuan grows a large variety of grain crops. Not only does it grow paddy rice, wheat, sweet potatoes, and corn, but also broad beans, peas, soybeans, potatoes, barley, highland barley, buckwheat, gaoliang, millet, oats, mung beans, and horse beans. Virtually every grain crop grown throughout the country is grown here. Furthermore, among the paddy rices grown are early paddy, intermediate paddy, late paddy, long-grain rice, short-grain rice, and glutinous rice. Sweet potatoes and corn include both spring and summer varieties. Wheat, broad beans, and highland barley include winter and spring varieties. The diversity and complexity of crops is unequalled in any other province or region.

Paddy rice, wheat, sweet potatoes, and corn are the four major grain crops of Sichuan Province, the area planted to them amounting to more than 80 percent of the total area sown and their output amounting to more than 90 percent of total grain output. This includes a paddy rice output of more than 28 billion jin or more than half of total grain output. Output of wheat, sweet potatoes, and corn is more than 6 million jin. (Footnote 1) (In 1978, Sichuan Province produced between 8.5 and 9 billion jin each of wheat, sweet potatoes, and corn and gross output of paddy was 28.6 billion jin. The extent of increase in output of the first three crops was very great; thus, the proportion of paddy rice to total grain declined to 46.7 percent.)

Up until the 1960's, Sichuan Province held first and second place in the country in area sown and gross output of paddy rice, sweet potatoes, and corn. However, its position declined gradually with the more rapid development of production in other provinces and regions. Today the province has slipped to second and third position, respectively, in area sown and gross output of paddy rice and sweet potatoes, and corn holds a commanding position only among provinces and regions in south China. Furthermore, Sichuan's wheat production has risen steadily to make the province one of the four major wheat-producing areas in the country.

B. Development Not Rapid and Production Insufficiently Consistent

Since liberation, despite the substantial achievements scored in Sichuan Province's grain production, the disparity with the speed of development in the country as a whole has been marked. During the past 28 years the rate of increase in gross output of grain in Sichuan has been about one-half the rate for the country as a whole. Over the years, grain output has risen and fallen, and fluctuations have been great with insufficient consistency in the development of production. During the period 1949-1958, for example, the province's grain output rose gradually, increasing at an average 5 percent per year. During the period 1959-1961, output nosedived. Gross output in 1961 was 44.2 percent less than in 1958. Between 1962 and 1966, output climbed again and then fell. After entering the 1970's, grain output gradually revived to the 1958 level; however, it then hovered at the same point for many years without advancing. It was only after the smashing of the "gang of four" in 1977 that grain output rose in one fell swoop to 56 billion jin for an all-time high.

Table 15. Crop Structure in Sichuan Province (1977)

Item		Grain crops total	Paddy	Wheat	Corn	Sweet potatoes	Other
Area sown	10,000 mu	14,870	4,975	2,808	2,151	1,890	3,046
	percent	100.0	33.4	18.8	14.4	12.7	19.7
Gross output	100 million jin	560	282.2	66.5	70.8	83.4	57.1
	percent	100.0	50.3	11.9	12.6	14.9	10.3

Development of paddy production has been markedly sluggish. Not only has the area sown not revived to the all-time high, but gross output in 1977 had increased by only slightly more than double the 1949 figure, much lower than the rate of increase (more than 150 percent) for paddy rice in the country as a whole, and much less than the rate of increase for grain in the province as a whole. Consequently, paddy rice output fell from 62 percent of grain output in 1949 to 50 percent in 1977 to become the weak link in grain production.

Though speed of increase for both sweet potatoes and corn was higher than for grain as a whole; nevertheless, output of sweet potatoes failed to reach the all-time post-liberation high (9.47 billion jin in 1958), and the area sown to corn did not reach the all-time high either (24.05 million mu in 1956).

Wheat production developed fastest by comparison, both area sown and gross output exceeding the all-time highs. As a result, the position of wheat as a percentage of the province's total grain output rose steadily to become a vital new force in increased grain output.

The area sown to other grains generally decreased (for example, the area sown to garden peas and broad beans in 1977 fell 35 and 42 percent, respectively, from 1949, and the area sown to soybeans and gaoliang shrank by 9 and 43 percent, respectively). Despite fairly high rises in yields per unit of area, gross outputs largely failed to reach all time highs.

Table 16. Changes in Grain Crop Structure in Sichuan

Year	Total grain		Paddy		Wheat		Sweet potatoes		Corn		Other	
	Area	Output	Area	Output	Area	Output	Area	Output	Area	Output	Area	Output
1952	100	100	36.4	62.3	10.9	5.3	12.0	12.0	15.0	8.8	25.7	11.6
1965	100	100	36.3	59.4	13.1	7.1	12.9	13.3	13.3	10.5	24.4	9.7
1977	100	100	33.4	50.3	18.8	11.9	12.7	14.9	14.4	12.6	19.7	10.3

C. Full Planting But Uneven Crop Patterns

Except for Serxu County in the northwestern corner of Garze Zang Autonomous Prefecture, all cities and counties in Sichuan produce grain; however, the crop pattern is very uneven. In the western part of the province (Garze Zang, Aba Zang, and Liangshan Yi Autonomous Prefectures and in Xichang Prefecture), which has more than half the land area in the whole province, both the area sown to grain crops and gross output is less than 10 percent of the total for the province. In the Sichuan basin, on the other hand (mountain areas on the fringes of the basin excepted), which has less than 30 percent of the province's land area, grain output is approximately 80 percent of the total for the whole province.

The crop pattern for the four major grain crops covers both a broad area and is concentrated at the same time. Except for the counties in the northwestern parts of Garze Zang and Aba Zang Autonomous Prefectures, 160 to 170 cities and counties in the province grow paddy and sweet potatoes; however, more than 85 percent of the growing area and the gross output is concentrated within the Sichuan basin. Wheat and corn are grown over a wider area in more than 95 percent of the province's cities and counties. A preponderant amount of wheat is also produced within the Sichuan basin, and corn is found mostly in all the counties in the mountains surrounding the basin and in Liangshan Yi Autonomous Prefecture and Xichang Prefecture.

Potatoes, peas, and broad beans are also found over a fairly wide area. Peas are grown mainly in the hill areas in the basin, particularly on dry, infertile hilltops and mesas where they usually are a winter crop. Fair amounts of broad beans are grown on fields that serve both as wetlands and drylands on the plain in the western part of the basin and on drylands on hills in the basin. They are a major local winter grain crop or green manure crop. The area in which highland barley, buckwheat, and gaoliang are found is fairly narrow, however. Highland barley is a dryland crop

that tolerates cold and is the principal grain of the people of Zang nationality; thus, it is grown mostly in Garze Zang and Aba Zang autonomous prefectures. Buckwheat has a short growing season, suiting it to planting in high and cold mountain regions such as Liangshan Yi Autonomous Prefecture and Xichang Prefecture, areas inhabited by the Yi nationality, where most of it is grown. The growing of gaoliang is pretty well concentrated in the area running from Luxian to Jiangjin, where it is the principal raw material used in the distillation of liquor.

D. Yields Not High; Disparities Between One Place and Another

Yields in Sichuan Province average 658 jin per mu of cultivated land, which is lower than in most provinces and regions in south China. Fewer than 30 percent of all cities and counties in the province have grain yields greater than those called for in "The Program for National Agricultural Development," and they are lower than the national average as well. Among principal crops, yields from intermediate rice stalled at 500 to 550 jin per mu for the past 20 years, finally breaking 600 jin only in 1977. Yields of late paddy have yet to increase beyond 300 jin per mu, placing Sichuan in last place among the provinces and regions of south China. Corn yields are also smaller than for the country as a whole. Wheat yields are only slightly higher than the national average.

There is an extreme disparity in the level of grain production from one place to another in the province. Today, the highest grain yield in a county (Wenjiang) is 1,400 per mu of cultivated land; in the lowest, the yield is less than 200 jin. In Wenjiang County, yields of intermediate paddy are greater than 800 jin per mu, while the yield in the lowest county is only 200-odd jin per mu. Cities and counties with the highest yields of wheat produce more than 450 jin per mu, while some places produce less than 100 jin per mu. There is also a manifold disparity between one county and another in corn yields. The difference between high-yield fields and low-yield fields is severalfold. This also demonstrates a huge potential for increased grain yields in Sichuan Province.

2. Status of Production and Course of Development of Major Grain Crops

A. Paddy Rice

Sichuan grows predominantly intermediate paddy, the growing area and gross output of which account, respectively, for 83 and more than 88 percent of all paddy grown. Intermediate paddy rice has historically been a mainstay in rice production. The plain in the western part of the basin, both banks of the Chang Jiang in the southern part of the basin, and the gradually sloping hills in the lower reaches of the Min, Tuo, and Jialing Rivers are the areas in which the growing of intermediate rice is most concentrated. In addition, a fairly large amount of intermediate rice is also grown on the hills in the northern and eastern parts of the basin and in the valley of the Anning He in Xichang Prefecture. Intermediate rice may be grown at between 1,400 and 1,500 meters in the mountains surrounding the basin, and

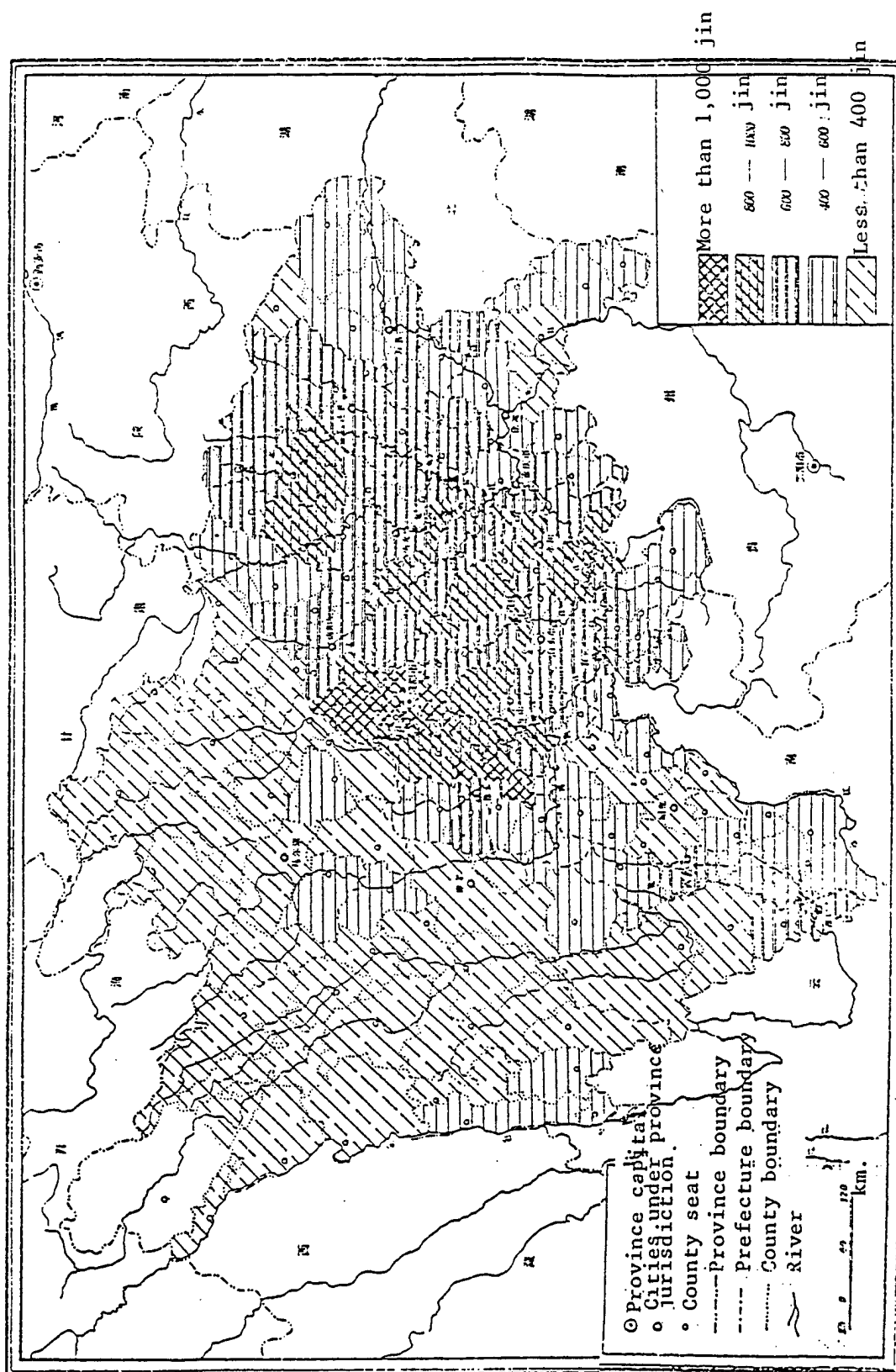


Figure 17. Grain Yields Per Mu of Farmland in Sichuan Province

at between 2,400 and 2,500 meters in Xichang Prefecture, making this the highest point in the whole province at which paddy rice is found. Though two crops of rice have been grown for 40 years, as of the eve of liberation the practice had virtually died out. Only in the area around Luxian did individual peasant households plant two crops. Following the liberation, despite ups and downs, the growing of two crops of paddy continued to expand until today when most of the double-crop area is concentrated in the hills in the southeastern part of the basin and on the plain in the western part of the basin in more than 20 cities and counties. It is grown only here and there, for the most part, in other places, while in some places planting is experimental. Consequently, the double-crop paddyfield area in Sichuan remains very low (8 percent), output of double-cropped paddy amounting to only 12 percent of total paddy output. This provides a striking contrast to the situation in provinces, regions (and cities) in south China that produce mostly two crops of paddy. (Footnote 2) (According to 1973 statistics, between 50 and more than 60 percent of all rice grown in south China (exclusive of the three southwestern provinces), in Hubei, Anhui, and Jiangsu was double-crop paddy. In other provinces, cities, and regions in south China, it accounted for between 80 and more than 90 percent.)

As has been said above, paddy yields are not high in Sichuan, and the speed of increase has been very slow. There are many reasons for this state of affairs. One is the poor water and soil situation in paddyfields. The percentage of winter wetlands and fields that depend on rainfall is large, and low-yield fields are numerous too. In fields that can be irrigated, there are no separate irrigation and drainage ditches in most cases, and fields are not level. Conditions do not exist for consistently high yields. Second, as the multiple-cropping index has risen, for the past more than 10 years the green manure area has gradually diminished, and other fertilizers have not increased greatly. In the growing of late paddy and of single-crop intermediate rice in winter wetlands, in particular, frequently there is no fertilizer to be applied. The growing of "seedlings on unfertilized soil" is pretty much the case everywhere. Third, numerous fundamental techniques for intensive farming have yet to become popular; seed-selection work has not kept pace; and mongrelization and regression is serious. In addition, short-stem fine varieties have not been promoted for growing in intermediate and late paddyfields, and both quality of farming and the level of care are also nonintensive. Fourth, there is a lack of general understanding about how to produce double crops of paddy, the proportion of late maturing early rice varieties planted being too large. This results in the late transplanting of large areas of late paddy and low yields, or else the overly early sowing of early paddy in order to clear the way for transplanting of late paddy causes seedling rot. Some places even require "arbitrary uniformity" in crop planning and practice blindness in the spread of techniques. Frequently, yields increase during the first year and rise greatly in the following year, creating needless losses. In order to bring about a rapid rise in paddy yields per unit of area, not only is improvement necessary in basic conditions such as water, soil, and fertilizer, but major efforts must be placed on scientific farming.

Intermediate rice production is concentrated from April through September when heat and water conditions are at their best. Yields are always fairly consistent, the growing area is large, potential is great, and the masses have experience in growing intermediate rice as well. A powerful attack should be launched on intermediate paddy to score great increases in yields. If consistent but not high yields are to be translated into consistently high yields, further promotion will have to be given to moist seedling fields. Also required will be sparse sowing of rice seeds, propagation of sturdy seedlings, frequent plowing and harrowing, thinning of dense plants and intensive care. A very great potential remains to be tapped in the selection of fine-variety seeds. A change must be made as quickly as possible to the growing of short-stem fine varieties to replace the tall-stem intermediate rice that is grown on 15 million mu in the province. Given similar water and fertilizer conditions, it is possible to increase yields of intermediate rice by between 50 and 100 jin per mu simply by a proper increase in density. Were strongly resistant, intermediate rice varieties (such as Keyu No 6) with a fairly long growing season selected for the 4 million mu of ankle-deep cold-waterlogged fields that produce low yields, and other measures applied, high yields could be produced. For the winter wetlands in the summer drought area of eastern Sichuan where water conservancy is not available, early maturing high-yield intermediate rice varieties (early ripening intermediate rice) should be selected for planting so that it would head and flower before the end of June, thereby avoiding the threat of summer drought. After harvesting, another late autumn crop could be planted. Particular attention should be given the promotion of hybrid rice and the propagation of "sturdy seedlings with many tillers." Hybrid rice shows marked heterosis in that its root system is strong; it grows vigorously; tassels are large and kernels numerous; it is widely adaptable; grain quality is good; and fine strains can increase yields by 20 to 30 percent or more as compared with ordinary fine varieties of rice. The propagation of "sturdy seedlings with many tillers" applies to both ordinary rice varieties and hybrid rice. Not only does this result in a great economy of seeds and seedling fields (it can save between 70 and 80 percent or more in seed per mu of fields), but this also increases yields by 40 percent or more over conventionally propagated seedlings. Thus, it is a revolutionary measure in paddy rice production. Pilot projects on these two propagation methods have scored very great results throughout the province, and as they find widespread application in production, great expansion will certainly occur in the production of paddy in Sichuan Province.

The double-crop rice production season extends from March and April until the end of October or even into November. During this period, most parts of the Sichuan basin have a growing period of 180 to 200 days from the time when early rice sprouts until late rice completely heads. Cumulative temperatures above 0°C range from 4,600°C to 5,000°C, enough to meet production needs. However, spring temperatures are not always stable, and when fall temperatures plummet, unless a body of scientific methods for growing rice exists, the seedlings of early rice are prone to rot and late rice will abort at low temperatures resulting in a serious decline in yields

or even no harvest at all. Similarly, unless sufficient water and fertilizer are provided and soil fertility is insufficient to insure normal growth of double crops of rice, even if there is a crop to be harvested, possibly "two crops will not amount to as much as one." Consequently, for double-cropped rice to produce greater results, serious attention must be devoted to improving the availability of water and fertilizer and good performance in scientific farming. Of particular importance is a good job in rational selection of early and late paddy varieties and in matching them with each other, plus strict understanding of the time when they should be sown and transplanted. Generally speaking, in the western part of the basin, the mix of early and late rice should be mostly the pairing of early (ripening) varieties with intermediate (ripening) varieties or matching intermediate to early varieties. In the middle and southeastern parts of the basin, intermediate-ripening should be matched to late-ripening varieties, and late-ripening paddy may be matched with some intermediate-ripening varieties. Cold waves should be guarded against when planting early rice, i.e., planting should be done at just the right time as the cold is leaving and warmth is arriving. (In the northwestern part of the basin, this is just before the vernal equinox, and in the southeastern part of the basin it is in the period between 5 March and the vernal equinox.) If hothouses and plastic mulch are used to propagate seedlings, so much the better. The time when late rice is transplanted has a very great effect on yields. Every effort should be made to transplant early, generally between 20 and 25 July, with transplanting being substantially completed by the end of July at the latest. If some late paddyfields just cannot be planted until early August, planned use should be made of the "two-stage seedling-propagation" method so that late becomes "early" to avoid losses resulting from the late transplanting of old seedlings. Simply by following the aforesaid measures, prospects are very good in most parts of the Sichuan basin for the development of double-cropped rice, and the potential is also very great. Individual places may create conditions and suit general methods to local circumstances for gradual development of the growing of two crops of rice as their particular situations permit.

B. Wheat

Sichuan Province grows both winter wheat and spring wheat. Most of the winter wheat is found within the Sichuan basin, the largest percentage being planted in the counties of the northern and western parts of the basin, where they are grown on 25 to 30 percent of the area sown to grain crops. The next largest percentage is found in the counties in the middle, and southern parts of the basin. Relatively little is grown in the eastern part of the basin, in the mountains surrounding the basin, or in Xichang Prefecture and Liangshan Yi Autonomous Prefecture. The area in which spring wheat is grown accounts for less than 1 percent of the total wheat-growing area. It is grown mostly in Garze Zang and Aba Zang Autonomous Prefectures at between 2,500 and 3,500 meters above sea level. In recent years the growing of spring wheat in some areas has been replaced by the autumn planting of high-yield "Xizang feimai."

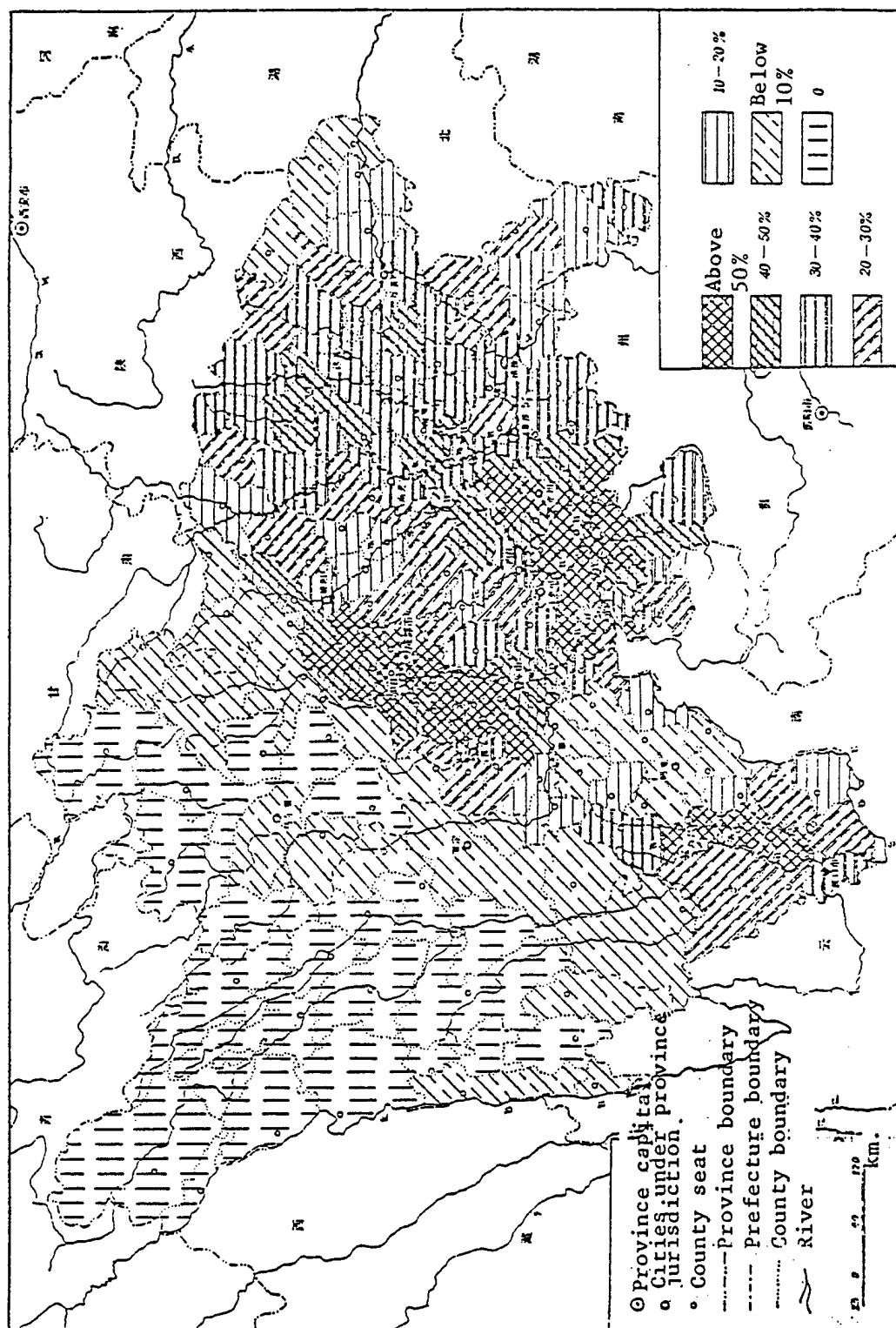


Figure 18. Rice as a Percentage of Grain Growing-Area in Sichuan

Sichuan has superb conditions for development of wheat production. Its winter temperatures are high; the frost period is short; temperature climbs rapidly in spring; and the entire winter and spring seasons are fairly dry. Not only can wheat grow fast and ripen early, but there is no, or little, "wetness damage." It is outstanding by comparison with other provinces and regions in south China. As a result, wheat has always produced fairly consistent yields in Sichuan. The reason that Sichuan's wheat-growing area did not amount to very much in the past was largely the result of soil and water limitations. However, with the improvement of fields and the improvement of soil (particularly improvement of winter wetlands), the wheat-growing area will gradually increase, particularly in the south-central part of the basin where the percentage of winter wetlands remains relatively high and where the amount of land that is allowed to lie fallow during winter is fairly large in mountainlands around the basin, in Xichang Prefecture and in Liangshan Yi Prefecture. It is such places that have spare land for increased growing of wheat.

In 1977, Sichuan Province harvested an unprecedented bumper wheat crop. In seven or eight counties in the southern parts of Garze Zang and Aba Zang Autonomous Prefectures, wheat yields averaged more than 400 jin per mu, and in cities and counties on the northern part of the Chengdu Plain yields also averaged between 350 and 400 jin or more per mu, making these areas one of the country's high-yield wheat areas. Nevertheless, another 60 wheat-growing counties averaged yields of less than 200 jin per mu, providing a marked contrast. Consequently, turning low yields into high yields and high yields into still higher yields is the main avenue for development of future wheat production.

At the present time, wheat fields have too few seedlings and the seedlings are not sturdy. This means too few spikes and small spikes containing few grains. This is a major reason for low wheat yields. In many places, each mu contains only 10,000-plus seedlings and sometimes fewer than 10,000; thus, more seeds must be planted. Experience with large-area production and the results of scientific experiments show that between 150,000 and 200,000 seedlings per mu should be planted in the fields used for the growing of both wetland and dryland crops in the eastern part of the basin where temperature and moisture are high. In other areas, the number may be as high as around 200,000 to 250,000.

Problems with wheat varieties in Sichuan are fairly prominent. For example, regression is a serious problem with fine hybrids; planning of the use of varieties is not done properly; fine methods are not used in conjunction with fine varieties; and certain varieties (such as "Abo") that have been promoted over wide areas have been generally infected with rust, which seriously impairs yields. Solution to these problems requires arousal of the masses to select critically, evaluate, and breed rust-resistant high-yield varieties. It also requires suiting of general methods to local circumstances to replace varieties. (For high yield flatland areas, varieties should be selected that tolerate fertilizer, resist lodging and have a large potential for increased yields. For terraced hillsides, varieties should be selected for their tolerance of drought and soil infertility.)

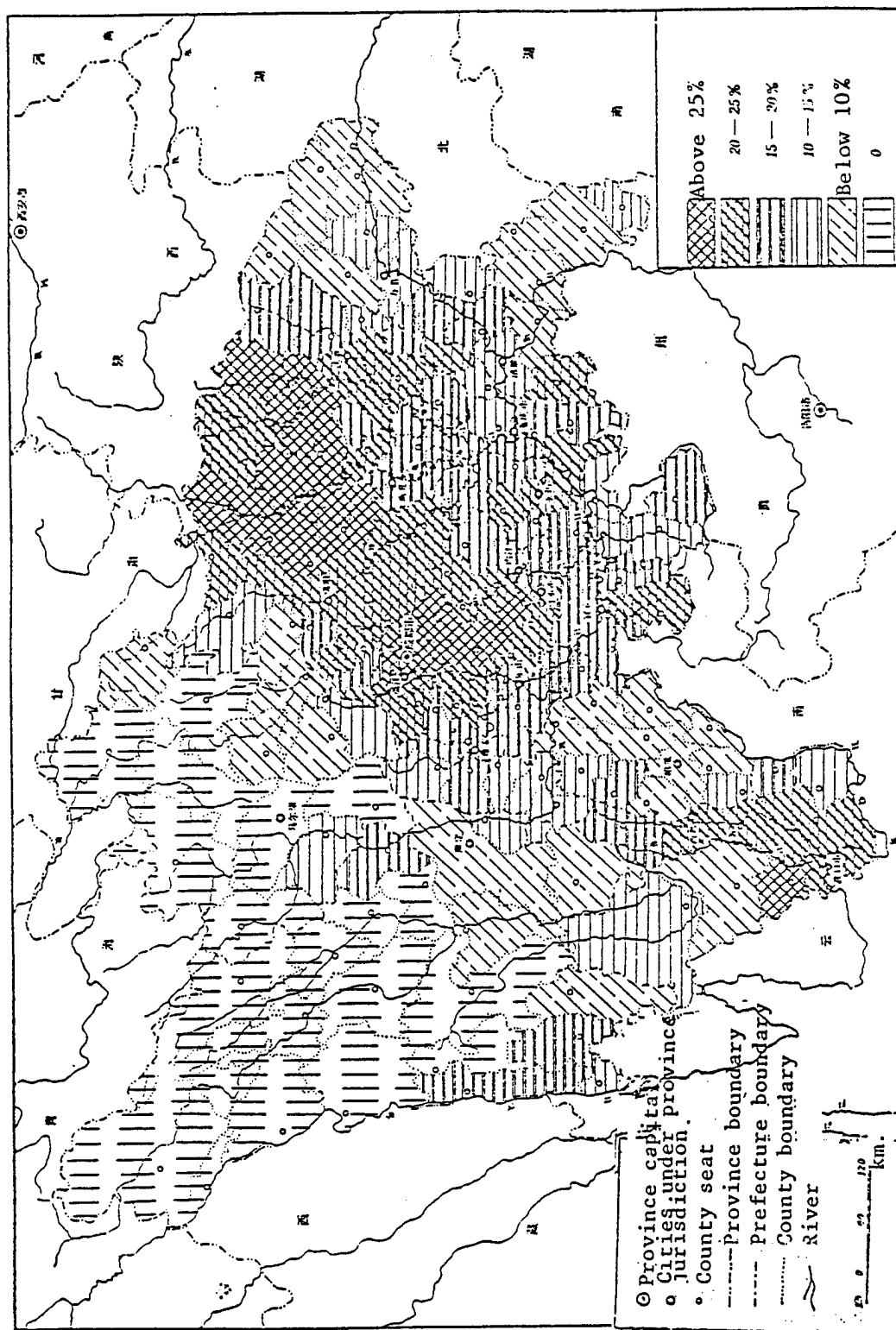


Figure 19. Wheat as a Percentage of Grain Crop Area in Sichuan Province

With the steady increase in the three-crop system, the area that is sown to wheat late in the season has also increased year by year (and already accounts for approximately 10 percent of the area sown to wheat). In the former two-crop system, wheat was generally sown before the arrival of frost. In the three-crop system, the period for sowing wheat will have to be postponed to the middle of November or even later; hence, yields will be generally somewhat lower. In order to solve this contradiction, the wheat that is selected for growing in the three-crop system should be a high-yield variety (such as "Fan 6," "A 2 Ai") that can be sown late and ripens early in spring. This is the key to winning high yields from wheat that has been sown late. This will have to be accompanied by measures such as the soaking of seeds to promote sprouting, intensive care, repeated application of base fertilizer, and early application of side dressings of fertilizer as a means of getting early results from late planting, early growth and rapid development and equally high yields. New methods of propagating seedlings for transplanting may also be promoted for wheat fields that are to be sown very late. Inasmuch as there has not been any postponement in the sowing season for wheat that is to be transplanted and since some damage to old roots in the transplantation process can be remedied through the rapid development of new roots and the vitality of the wheat increased, yields from wheat that has been transplanted may be markedly greater than from late-sown wheat through the propagation of sturdy seedlings, prompt planting, and planting at proper densities. Further solution will have to be found to problems in the mechanization of transplanting in order to increase work efficiency and set the stage for the transplanting of wheat over large areas.

C. Corn

Though in the category of "coarse grains," corn has more nutritional value than either rice or wheat and is of both better quality and stores better than sweet potatoes. Corn is diverse in its ecotypes; thus, it is widely adaptable. There are varieties that may be sown in spring or in summer, and it may be planted either as a single crop or intercropped. It will grow equally well on dryland hillsides or in fields that are used for both wetland and dryland crops. It is found on flatlands, on hills and in mountain areas. In mountain regions, in particular, it takes hold better than paddy, wheat, or sweet potatoes. Consequently, there is a lot of space for the growing of corn in Sichuan Province.

In Sichuan Province, corn is found mostly in the mountains surrounding the basin, and on the plain and in the mountains of western Sichuan where the area sown to corn is approximately 30 percent of the total area sown to grain crops. In places where the plain and mountains neighbor each other (as in Pingwu, Beichuan, Maowen, Wenchuan, Baoxing, Ebian, and Mabian Counties), between 50 and 60 percent or more of the area sown to grain crops is sown to corn. In addition, within the Sichuan basin, corn is widely grown, a fairly large amount of it is grown on the hills in the basin and in the parallel mountain valleys in the eastern part of the basin.

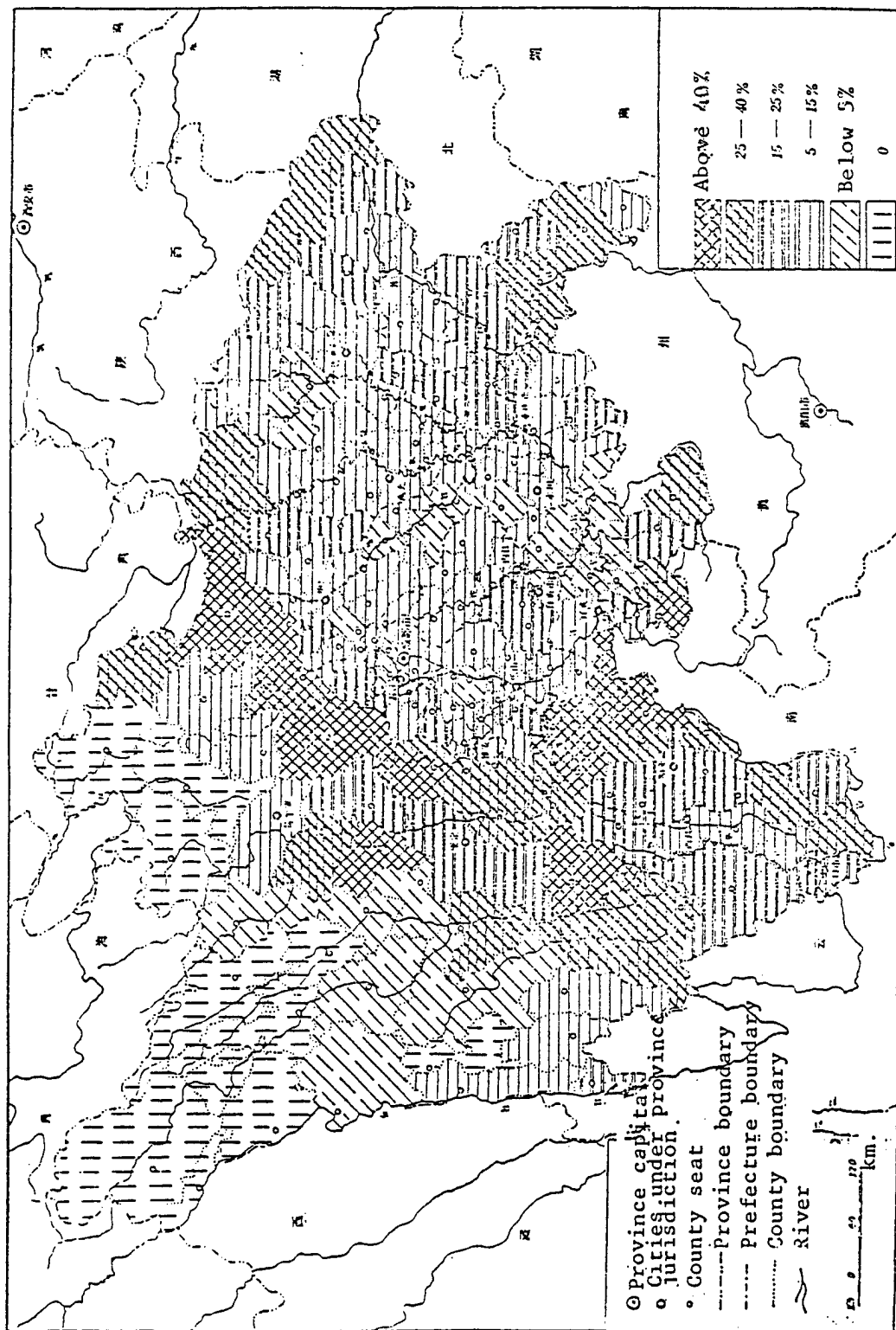


Figure 20. Corn as a Percentage of Grain Crop Area in Sichuan Province

More than 90 percent of all corn is grown on dryland hillsides from which yields are low because of erosion and the infertility of the soil. In mountain regions, in particular, corn yields average only 100 to 200 jin per mu in most counties. Thus, major efforts to improve the soil are needed. Most important at the moment are various measures including the deep digging of winter fallow land and reserve rows, bringing in of large amounts of soil, removal of soil (sand) from the surface, and increased fertilization in order to bring about increased yields.

Formerly corn was grown alone in Sichuan, mostly intermediate and late ripening varieties being planted. This both limited increase in multiple cropping of drylands and made the corn prone to damage from summer heat (particularly during the blossoming and in-the-milk periods). In recent years, some cornfields have been changed from the growing of corn alone to the intercropping of corn with other crops. Early corn has replaced intermediate corn and the growing of two crops has been changed to the intercropping of three. Not only is another crop grown (sweet potatoes or potatoes), but the corn avoids the hottest days of summer. This has made an important contribution to increased grain yields. Nevertheless, in more than two-thirds of the province, corn is still grown as an individual crop; thus the potential for improvement is very great. In the future, while continuing to promote the intercropping of corn with other crops, further stress should be placed on a change from the direct planting of corn to the growing of seedlings for transplanting. By so doing, corn can be made to ripen earlier by 10 days or more, and yields can be increased by approximately 20 percent.

The greatest potential for increased corn yields lies in the spread of hybrid varieties. First-generation hybrid corn has powerful heteroses. It grows vigorously, has sturdy stalks and large ears and is resistant to both diseases and to lodging. Under identical conditions, it produces 30 to 50 percent higher yields than conventional local corn varieties, and in some cases yields are double. Back in 1975, more than half the corn grown in China was hybrid, but in 1977 only one-third of the corn grown in Sichuan province was hybrid, the task of spreading the growing of hybrid lagging behind by several years. Because seed-production techniques were poor, hybrid parent stock not pure, and quality of hybrids that were produced not high, hybrids did not show strong heteroses. As a result, the role of hybrids in increasing corn yields have yet to show up to the full. Major efforts will have to be made in the future to improving seed-production work, to improving seed-production techniques, to increasing the quantities of seeds produced, and rigorous testing and demonstration used as a basis for spreading and popularizing hybrid corn as quickly as possible, good farming being used in conjunction with good techniques and superb seeds in close combination to bring about tremendous increases in corn yields during the next few years.

D. Sweet Potatoes

Sweet potatoes are a warmth-loving dryland crop, most of which are grown on the dryland hills in the Sichuan basin where they account for approximately

30 percent of local grain output. They are grown second most extensively in the southern part of the basin, with a substantial number being grown in the eastern part of the basin as well.

Sweet potatoes are grown in either spring or summer in Sichuan. Both spring and summer crops are grown either as separate crops or are intercropped. With the rise in the dryland multiple-cropping index in recent years, the area of intercropping has gradually increased while the separate growing areas has decreased.

Sweet potatoes are fairly tolerant of both drought and infertile soil, which is why they are grown on high terraced tablelands or on the tops of slopes where soil, water, and fertility conditions are worst. They are not fertilized, and in some places (such as eastern Sichuan), it is the habit to grow them on "hard slab ground" in a rather nonintensive way that seriously hurts yields. If higher yields of sweet potatoes are to be harvested, such backward farming habits will have to be completely changed, efforts made to thicken the soil layer and increased fertilization given. The focus of attention right now should be on bringing in soil to build up field plots, to develop the plots and put in upraised paths among them, to widen rows and areas between rows, to make high upraised paths and to plant, or alternatively make large-scale plantings of "piles" of sweet potatoes with gradual eradication of the practice of growing them on "hard slab ground" so that sweet potatoes will grow healthy and strong in a soil environment that is friable, fertile, and well aerated.

For many years, the mongrelization and degeneration of sweet potato varieties has been fairly serious as a result of which yields have fallen and quality has become poor. An effective way to surmount the degeneration lies in purification and rejuvenation. For example, the Sichuan Academy of Agricultural Sciences has selected seed stock for "Nanruitiao" for 3 consecutive years. Six of the finer strains selected have produced yields between 11.5 and 21.2 percent greater than the parent stock that was not selected for seed purposes.

In Sichuan Province, virtually every year 80 percent of the sweet potato crop is damaged by either summer or autumn drought. Therefore, planting as early as possible to enable the sweet potatoes to grow vines and produce tubers before the arrival of drought remains an important way in which to harvest high yields. However, because of backward techniques for growing seedlings in the past, early planting was not possible for production. Thanks to the promotion of advanced methods such as the overwintering of sweet potato vine tips for use in growing a new crop and "propagation in solar heat storage beds," this problem has been solved. Not only do the new techniques permit sprouting 30 to 50 days earlier, allowing the transplanting of sweet potatoes a month or more earlier, but between 70 and 80 percent fewer need be planted, which has very great significance for increased output.

Sweet potatoes rot easily. During the time they are in storage, between 30 and 50 percent of sweet potatoes rot as a result of blackspot or soft-rot disease. In worst cases, all of them rot. Unless this problem can be solved, increasing sweet potato yields will be rather meaningless. Currently, the use of "high-temperature large cellars" for storing sweet potatoes have been demonstrated to be extremely effective. Not only does this control the growth and proliferation of disease bacteria, but it also kills bacteria on the surface of the tubers, hastens the healing of wounds on the tubers, and increases their resistance to disease with the result that there is virtually no rot.

In recent years, the masses have summarized experiences with the aforementioned set of measures for increasing yields as "fighting calamities for high yields of sweet potatoes through a series of measures" (namely, "early planting, thick soil, heaps of sweet potatoes, fine seeds, fertilization, and high-temperature storage cellars"). Remarkable results have been achieved as the result of major efforts to promote these measures in production. As experience blossoms everywhere, Sichuan's sweet potato production will certainly increase substantially.

3. Commodity Grain Production and Distribution of Bases

Sichuan has been one of the country's most important commodity grain producing areas. During the First 5-Year Plan, the commodity grain rate averaged 22 percent for the championship among all of China's southern provinces and autonomous regions. Shipments of commodity grain outside the province averaged 3 billion jin per year, making Sichuan the country's largest shipper of rice and wheat among all provinces and autonomous regions in a very large contribution to the country. Nevertheless, because of the slow development of grain production and the very fast increase in agricultural population in Sichuan during the past 20 years, the amount of grain produced per capita of agricultural population in the province is presently 50-odd jin less than in 1957. The commodity rate for grain has dropped approximately 12 percent, so after supplying residents of cities and towns within the province, there is little commodity grain left over for shipment outside the province, and in some years, other provinces have to help provide grain to Sichuan. Counties providing 100 million jin or more of grain also declined from 27 in 1957 to 13. This situation has become less and less consistent with needs for developing the building of socialism.

Rapid expansion of commodity grain production and improvement in the commodity rate for grain requires the concentration of forces to operate a number of base counties that can be made into mainstays and principal forces for commodity grain production. The main task of commodity grain base counties should be the production of commodity grain, and they should be able to provide consistently large quantities of commodity grain to the country.

Generally speaking, commodity grain base counties should meet the following requirements at minimum: A fairly high per capita grain output, a fairly high

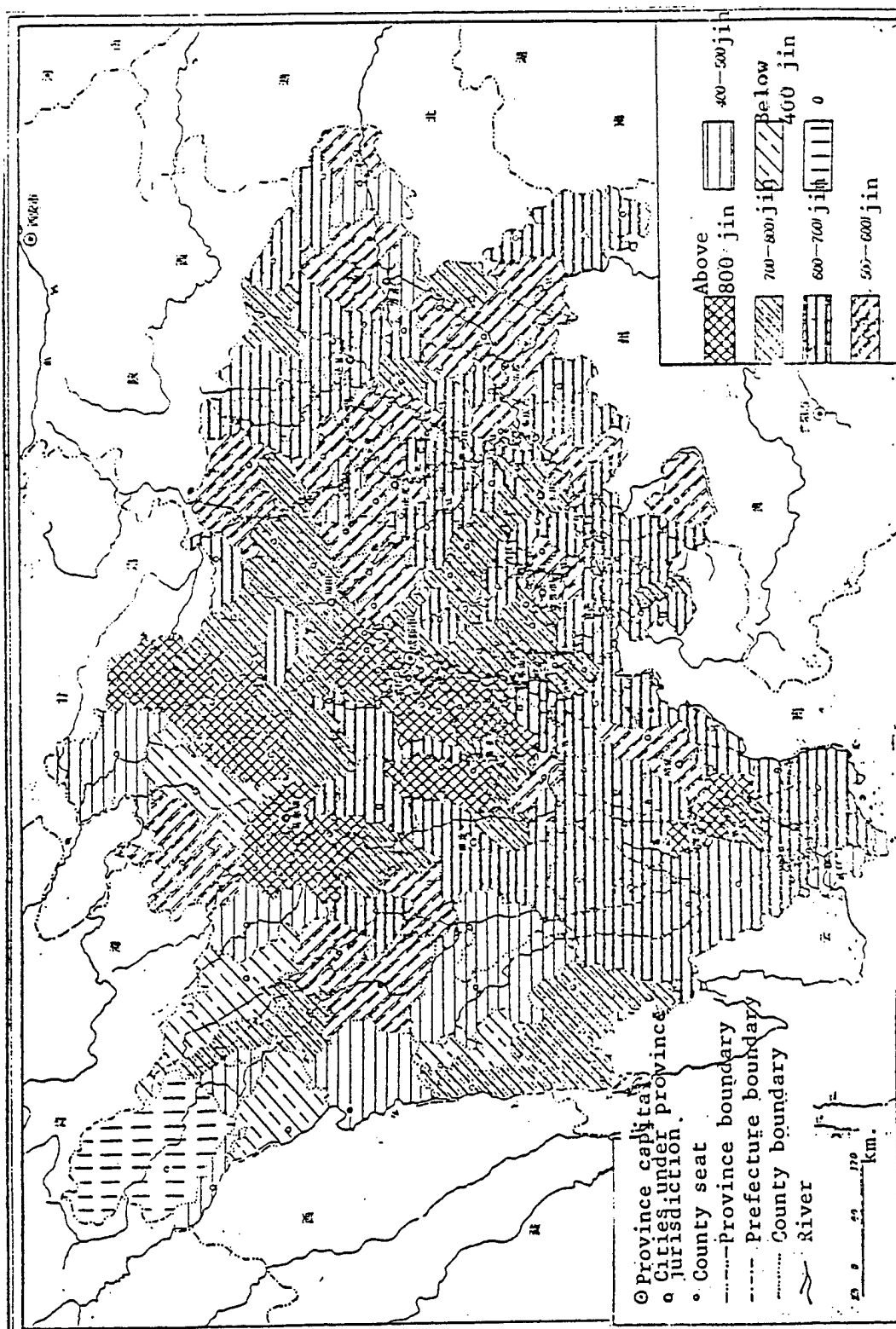


Figure 21. Grain Yields Per Capita of Agricultural Population in Sichuan

commodity grain rate (including the interarea commodity rate), or else a large area of wasteland that can be brought under cultivation, or a very great potential to increase output of commodity grain resulting from other reasons. The amount of grain output per capita reflects the grain surplus of rural villages within a county and shows the size of its potential for being able to provide commodity grain. The grain commodity rate is the ratio between the net amount of state grain purchases and gross output, while the interarea commodity rate is the ratio between the net amount of commodity grain sent outside a county and its gross output. The higher the ratios, the greater the real contribution and the more outstanding the role of the base.

It should be explained that the amount of commodity grain (the commodity amount) has not been the main basis considered here. This is because there is an extremely wide disparity between one county and another in the cultivated land area and in the amount of population. The population and the amount of cultivated land in some small counties is equivalent to that of just a single district of a large county, so naturally the amounts of the two cannot be discussed in the same terms. For example, Jianyang County is a cash-crop base county with more than 1.6 million mu of farmland and an agricultural population of 1.2 million. The commodity grain rate for the county as a whole is only 5.1 percent, and the amount of commodity grain per capita only 35 jin, making it the county in the Sichuan basin with the lowest commodity grain rate and the one that provides the smallest amount of commodity grain per capita. Its commodity grain production is scattered over a wide area, and its grain production is substantially for self-sufficiency. It is only because the county has a large amount of land that its annual amount of commodity grain, when taken together, amounts to more than 40 million jin. Conversely, Xinjin County is a small county that produces grain. It has only one-eighth the farmland of Jianyang County, but its commodity grain rate is 21 percent. Commodity grain production is 174 jin per capita, which is three- to fourfold that of Jianyang County. It is only because the county has such a small amount of farmland that its total commodity grain production is less than 40 million jin per year, less than for Jianyang. Were base counties to be selected solely on the basis of the amount of commodity grain they produce, that would lead inevitably to the erroneous conclusion that "large counties are superior to small counties." Thus, the absolute figures for commodity grain may only be used as a guide.

In view of the aforesaid needs and present realities, we believe that for the time being the province may designate one provincial commodity grain base and two "reserve bases." The amount of grain production in each county making up the provincial commodity grain base would have to be 750 jin or more per capita; the commodity grain rate would have to be 15 percent, and the interarea commodity rate would have to be no less than approximately 10 percent. "Reserve bases" would be those not currently having requisite conditions, but that could meet basic standards for becoming commodity grain bases within several years.

A. Commodity Grain Bases on the Flatlands in the Western Part of the Basin

The flatlands in the western part of the basin cover 23 counties including Wenjiang, Pixian, Chongqing, Xindu, Guanxian, Guanghan, Shifang, Pengxian, Deyang, Mianzhu, Anxian, Shuangliu, Xinjin, Dayi, Qongxia, Pujiang, Pengshan, Meishan, Hongya, Danleng, Jiajiang, Qingshen, and Mingshan. (Footnote 3) The area covered by this base and the provinces in it are entirely congruent with the "Western Sichuan Commodity Grain Base" planned by authorities concerned. The individual counties in the latter do not meet the three standards we have proposed, thus they have not been included.) Their connected tracts of land are found in the western part of the Sichuan basin, principally on the Chengdu plain where water and soil conditions are the best in the entire province and where farmland is predominantly paddyfields that can be both irrigated and drained and that produces consistently high yields. This is Sichuan's renowned granary for the production of rice and wheat. Grain yields for the entire base average more than 900 jin per capita, approximately 40 percent higher than for the province as a whole. The commodity rate averages 22 percent, and the interarea commodity rate is 14.6 percent, both far higher than in other parts of the province. Though this area has only between 10 and 12 percent of the province's farmland area and gross output of grain, it provides 22 percent of the province's total amount of commodity grain, and already plays the role of a commodity grain base for the whole province. Of course, there remains a substantial gap in both per capita grain output and the commodity grain rate between one county and another within a base, and the size of the role each plays varies. For example, in Wenjiang County grain yields are more than 1,100 jin per capita; and the commodity grain rate is more than 30 percent. In some counties, however, grain yields per mu and yields per capita are no more than 800 jin, and the commodity rate is only about 15 percent. Thus, a great potential remains to be tapped in commodity grain production.

B. Southeastern Hills of the Basin a Major Commodity Grain Producing Area

The southeastern hills of the basin include Qianwei, Jingyan, Rongxian, Anyue, Yibin, Nanxi, Changning, Jiang'an, Naxi, Hejiang, Huxian, Fushun, Longchang, Rongchang, Yongchuan, Dazhu, Tongliang, Tongnan, Bishan, Baxian, Changshou, Hechuan, Wusheng, Yuechi, Lingshui, Dianjiang, Dazhu, Daxian, Kaijiang, and Liangping for a total of 30 counties. The land in these counties lies in a continuous tract in the southeastern part of the Sichuan basin, principally in the hills (though a small number of counties are parallel mountain valley areas, they are also predominantly hills) where heat conditions are better than in other parts of the basin. Generally, there are many fields on little land and mostly paddy, sweet potatoes, and wheat are grown. The proportion of cash crops is fairly small. The commodity grain rate averages 15.9 percent (higher than the average for the province as a whole), and the region produces approximately 35.8 percent of the province's total commodity grain. This is the high commodity grain producing area of the province. Since water conservancy is lacking, however, and many fields remain covered with water during winter, increase in grain yields has been slow while increase in population has been fast. Grain yields average only slightly more than 602 jin per capita (or as high as 700 jin in a few counties), but lower than the average

for the province as a whole; hence, commune members' grain rations are fairly low and there is a shortage of grain for personal consumption. This area still lacks a stable foundation for development into a commodity grain base. Nevertheless, during the 1950's, this grain area increased its commodity grain rate by an overall 20 to 30 percent or more. Two-thirds of its counties annually provided 100 million jin or more of commodity grain (now only six counties do so), making a very great contribution to the nation. Consequently, if a good job can be done in the building of water conservancy and in transforming winter wetlands, a strong attack made on yields per unit of area, the multiple-cropping index increased, the mechanization of agriculture realized, and the labor productivity rate increased, this producing area could revive its historical role to become a commodity grain base, in fact as well as in name, that produces abundant grain.

C. The Southwestern Sichuan Broad Valley and Basin Commodity Grain Reserve Base

This region includes Xichang, Mianning, Dechang, Miyi, Yanbian, Huili, and Puge, a total of seven counties, the first five of which lie in the Anning River basin and in the lower reaches of the Yalong Jiang. Fields are concentrated in broad valleys where the land is flat and the soil thick, making for ready irrigation. Most fields are paddyfields and heat is plentiful making this one of Sichuan's granaries where grain yields average 650 to 800 jin per capita and the commodity grain rate ranges between 16 and 21 percent, making the region second only to the flatlands in the western part of the Sichuan basin. As the scale of future industrial construction expands further in the Dukou-Xichang industrial area, which is next door to these seven counties, the need for commodity grain will increase steadily, so it is essential that stable commodity grain production bases be built nearby. The multiple-cropping index and grain yields for these seven counties is currently fairly low. The amount of commodity grain they provide annually is limited (140 million jin), and far from satisfying needs. It will become necessary to do more with existing basic farmlands in these broad valley tracts (particularly the building of water conservancy, soil improvement, and greater fertilization), and to tackle the job of increasing yields and reforming the farming system. In another realm, the inventorying of available wastelands should be accelerated, should be developed, and planning improved to build the area into southwestern Sichuan's commodity grain production base as soon as possible.

The three aforementioned bases (or reverse bases) cover 60 counties, which is only 30 percent of the province's total number of cities and counties, yet they can produce 60 percent of the province's total grain. Firm attention to this 30 percent holds not only decisive significance for commodity grain production in Sichuan, but has a crucial influence on all grain production. For specific details on how to bolster the building of commodity grain bases, please see the "subregion" section below (chiefly chapters 6, 8, and 12).

Second Section: Cash Crops

1. Basic Characteristics of Cash Crop Production Patterns

A. Numerous Varieties of Cash Crops; Rapid Development; Important Position

Sichuan has numerous varieties of cash crops, not only all sorts of very warm-zone crops and semitropical ones as well (such as cotton, peanuts, sesame, sugarcane, flue-cured tobacco, sun-cured tobacco, ramie, jute, and ambari hemp), but also crops produced in temperate and cold zones such as sugar beets and flax as well as some special varieties of tropical cash crops (such as coffee and sisal hemp).

Since liberation, the growing of cash crops has advanced very rapidly in Sichuan. Increase in their growing area has been more than 10 times as fast as for grain crops, and the speed of increase in gross output has also been more than three times as great as for grain crops. They have made a very great contribution in supporting the building of socialism in the country and in improving the people's standard of living.

Sichuan's production of cash crops holds an important position in the country as a whole. This includes the area sown to rape and gross output of rapeseed, which stand first in the whole country. The area sown to ramie holds second place in the country as well; both the area sown and gross output of sugarcane hold fourth place; and both the area sown and gross output of cotton and peanuts account for a substantial portion of the national totals.

B. Both a Wide Area of Distribution and Relative Concentration

Every part of Sichuan Province grows cash crops with the exception of several counties in Garze Zang and Aba Zang Autonomous Prefectures in the northwestern part of the province. Ninety percent of the cities and counties that grow cash crops grow rape, and approximately 80 percent of them grow peanuts, sugarcane, and flue-cured tobacco; 40 percent grow cotton and sun-cured tobacco. At the same time, the pattern of cash crops in Sichuan Province is fairly concentrated, with virtually every variety of cash crop having its own concentrated area of production. Seventy-five percent of the cotton area and approximately 82 percent of the gross output of cotton in the whole province is concentrated in 17 counties in the hill region within the basin. This includes Jianyang and Renshou Counties, which have more than one-fifth of all the cottonfields in the province. Approximately 30 percent of rapeseed output and more than 80 percent of the hemp-growing area of the province are concentrated on the Chengdu plain; 80 percent of the province's ramie-growing area is concentrated in Daxian Prefecture; 30 percent of the sugarcane-growing area in the whole province is concentrated in the Tuo Jiang basin, more than one-fifth of it in Neijiang and Zizhong Counties; more than 68 percent of the flue-cured tobacco growing area is concentrated in Ziyang, Jianyang, Gulin, and Xuyong Counties; 30 percent of the sun-cured tobacco growing area is concentrated in Shifang and Mianzhu Counties. The same situation applies to the distribution of other cash crops.

It must be pointed out that inasmuch as cash crops are used as industrial raw materials, the end products from which are mostly shipped elsewhere, the pattern of most cash crops must be fairly concentrated and should not be dispersed in order to gain a fairly high commodity rate, a fairly high yield per unit of area and a stable supply of raw materials, as well as in order to be amenable to centralized management, procurement, and transportation. Were leaders not to devote serious attention to this matter and commune members not to act responsibly, no one taking charge at the top and no one managing at the bottom, it would be very difficult for production to move ahead. Judged from this standpoint, there is insufficient concentration of the growing of the aforementioned cash crops. In particular, the growing of cash crops in 101 different cities and counties shows, to a certain extent, the characteristics of a small agricultural economy of self-sufficiency that should be changed gradually.

C. More Room for Improvement of Yields and Commodity Rates

Cash-crop yields per unit of area are fairly low throughout Sichuan Province. Comparison of data for 1975, for example, shows yields for major cash crops such as cotton, sugarcane, flue-cured tobacco, and ramie to have been lower than the average for the country as a whole. (Footnote 4) (Data for the whole country for 1977 is lacking; hence, 1975 data have been used.) Yields for cotton, sugarcane, and ramie were among the lowest for the provinces and autonomous regions of south China, and yields of flue-cured tobacco stood in 10th place for the country as a whole. Only for oil-bearing crops (rapeseeds and peanuts) were yields fairly high. Yet another indication of low yields is that yields for major cash crops have not reached all-time highs; instead, for quite a few crops the extent of decline has been very great. In addition, there is an extremely great disparity among yields per unit of area from different places within the province. No matter the cash crop, the difference between counties with high and low yields has been severalfold to more than 10-fold. The disparity between high- and low-yield communes and brigades is even more conspicuous. Nevertheless, the foregoing circumstances show fully that there is an extremely huge potential for increase in cash crop yields in Sichuan Province.

Table 17. Comparison of Yields of Major Cash Crops in Sichuan Province

Crop	1977 yield (jin)	All-time year	High year yield	Percent of all-time high year
Cotton	65	1967	80	-19
Rapeseed	119	1971	147	-19
Sugarcane	3,665	1958	6,885	-47
Sun-cured tobacco	152	1953	214	-29
Flue-cured tobacco	183	1972	198	- 8
Ramie	72	1956	99	-27
Hemp	100	1956	113	-12

Generally speaking, the higher commodity rate for cash crops than for other crops is a function of their nature. However, as compared with other provinces and regions, and with the situation that has existed historically, commodity rates for cash crops in Sichuan today remain overly low. For example, in 1977 the commodity rate for rapeseed for the province as a whole averaged less than 50 percent, which was much lower than the all-time high. The commodity rate for peanuts was less than 40 percent, less than half the all-time high. The commodity rates for cotton and sugarcane were likewise far from reaching the all-time highs. Such a situation is obviously very inconsistent with requirements for development of the national economy.

D. Fairly Large Contradictions in Production Patterns Among Various Crops

Sichuan still does not produce an abundance of grain. In most villages, standards for commune members' grain rations are not high. Under these circumstances, as a result of the need "to take grain as the key link" and to achieve self-sufficiency in grain or even to provide commodity grain in areas in which the growing of cash crops is concentrated, in their planning of land use, their care of crops, investment of labor and application of fertilizer, many communes and brigades do everything possible to look after grain crops, placing cash crops in a subordinate position. In planning land use, in particular, cash crops (especially spring-sown cash crops) are frequently relegated to poor and infertile land and grain is intercropped among them as well. (It is estimated that in major cotton and sugarcane areas, approximately 60 percent of cottonfields and 80 percent of canefields are intercropped with grain, grain taking up approximately 20 percent of the space). This results in a serious inability to get the most out of the cash-crop area. The foregoing situation has an extremely adverse influence on the development of cash-crop production.

In addition, differences in "award sales" standards for the growing of cash crops also frequently give rise to contradictions that adversely affect both production and distribution. This happens mostly in production brigades that grow several different cash crops at the same time. When no "award sales" are given for the growing of certain cash crops, such crops are usually relegated to a mountain top or a forest floor. Conversely, those for which "award sales" are given or for which "award sales" standards are fairly high may elbow aside other cash crops, wreaking havoc in crop patterns. Consequently, formulation of equitable economic policies has a great deal to do with development of cash-crop production.

2. Present Situation and Avenues For Development of Major Cash Crops

A. Cotton

Cotton holds second place after rapeseed as a cash crop in Sichuan Province. For many years, its growing area has remained at around between 4 and 4.2 million mu for seventh place among the country's provinces and autonomous regions.

Cotton is a crop that likes plenty of warmth and sunlight, and it also requires a fairly large amount of moisture and a fairly hot environment. (Footnote 5) (Generally ideal conditions for the growing of intermediate ripening cotton are as follows: Cumulative temperatures of 4,300°C or more when the temperature is equal to or greater than 10°C, between 9 and 10 hours of sunlight daily, a relative humidity of approximately 50 percent, and 600 mm or more precipitation during the growing season.) A look at climatic conditions in the Sichuan basin shows sufficient heat and precipitation but insufficient sunlight (an average of 4 to 5 hours per day), an overly large number of rainy and overcast days (approximately 45 percent rainy days from July through October), and an overly high relative humidity (approximately 80 percent) that leads to an increase in the boll-rot rate and the flower-blighting rate that have a seriously adverse effect on the quantity and quality of cotton.

A weighing of all conditions shows that the cottonfields in Sichuan should not be expanded. However, in order to make the province self-sufficient in cotton yarn and cloth, an annual purchase of more than 5 million dan of ginned cotton is necessary. With no increase in the cottonfield area, this means that yields will have to be doubled from what they now are. Thus, the gap is a very great one that will require strong action.

Though the province's cottonfields are pretty well concentrated in the middle and northern parts of the Sichuan basin, in Renshou, Jianyang, Jintang, Anyue, Lezhi, Zhongjiang, Shehong, Santai, Suining, Lianxi, Xichong, Nanbu, Langzhong, Yilong, Bazhong, Pingchang, and Yihan Counties, 17 counties in all, in another approximately 50 counties planting of cotton is dispersed over nearly 500,000 mu (an average of fewer than 10,000 mu per county) in which yields and the commodity rate are 52 and 15 percent lower, respectively, than in the aforementioned concentrated growing areas. Were all of these cottonfields to be concentrated in one area, output of commodity cotton would increase by approximately 200,000 dan. In addition, even in the counties in which cotton production is concentrated, when cotton quotas are assigned, some counties have everybody share responsibility with every brigade growing cotton, which still makes for dispersed production. General methods have to be suited to local circumstances and the principle of appropriate centralization applied to this situation, quotas being further concentrated in communes and brigades where conditions are best and results optimum in order to make the most of their expertise and advantages for production and raise the degree of their specialization. Thus, a very great potential remains to be tapped in the readjustment of existing cottonfield patterns.

Most cottonfields in Sichuan are found on terraced hillsides. Only in Suining, Pengxi, Shehong and Santai counties in the middle reaches of the Fu Jiang are some cottonfields located on river valley flatlands. Thus, an overwhelming majority of cottonfields lack sources of water, the layer of soil is thin, fertility is low, and the soil cannot stand drought. Most cotton producing areas are also located in areas in which spring and summer drought are most severe. In still others (Bazhong, Pingchang, and Yihan Counties), the threat of drought during the dog days of summer is serious. Thus, the paradox of cottonfields being located in places where there is no irrigation is rather conspicuous. At the present time, water used on terraced hillside cottonfields is still mostly carried in buckets suspended from poles. This requires great exertion and is very inefficient. The building of water-storage ponds on slopes should be made one of the main components of cottonfield capital construction plans, one water-storage pond per 10 to 20 mu of hillside cottonfields being built as quickly as possible in order to increase the ability of cottonfields to withstand drought and obtain consistently high yields.

Cotton varieties in many cotton-producing communes today have become mongrelized and degenerate. Boll weight has decreased; fibers have become shorter, and ginning outturn had declined to around 35 percent. This is also one of the important reasons affecting output and quality. In recent years, the area affected by fusarium wilt has also increased steadily, posing a fairly serious threat to cotton production. The four-level agricultural science network should be relied upon in the future to do a good job of plant selection and propagation as well as purification and rejuvenation and improvement of quarantine work. Seriously infested areas should promote disease-resistant varieties.

Table 18. Per Unit Area Yield and Commodity Rate of Primary and Secondary Cotton-Producing Counties in Sichuan

Particulars	Number of counties	Area (10,000 mu)	Per unit area yield (jin)	Gross output (10,000 dan)	Centralized procurement (10,000 dan)	Commodity rate (percent)	Commodity cotton provided per mu
Total province	75	406.0	65.2	264.9	236.1	89.1	58.3
Main producing counties (100,000 mu or more)	17	303.1	72.0	217.9	197.3	90.5	65.2
Secondary producing counties (50,000 to 100,000 mu)	8	53.9	55.6	30.0	25.8	86.4	48.2
Counties with scattered production (less than 50,000 mu)	50	49.0	34.5	16.9	13.0	76.8	26.4

Note: In 1978, gross output of cotton for the whole province was 2,964,000 dan.

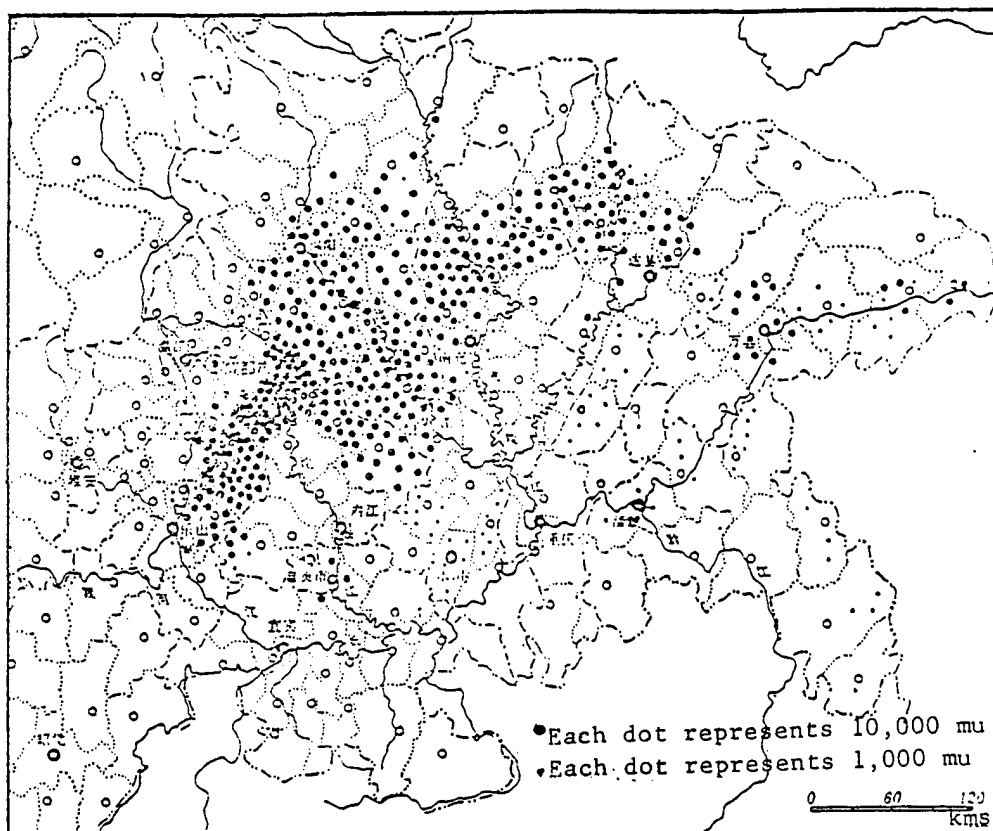


Figure 22. Cotton Distribution in Sichuan

In an overwhelming majority of cottonfields in Sichuan's cotton areas, a system is used whereby rows are reserved for the growing of winter crops in addition to which uncertain temperatures in spring and frequent spring drought mean that numerous gaps in seedlings will occur when cotton seeds are sown directly into the ground. The growing of seedlings for transplanting is a good way to get full stands from early sowing. Climatic conditions in Sichuan's cotton areas permit the growing of seedlings during late March in most cases (under plastic mulch or by applying warming agents to the surface of the soil). Transplanting can begin in early April and by the end of April a full stand should be growing. By contrast, direct sowing requires waiting until mid-April when the temperature is higher and there is sufficient moisture, with care being exercised in the sowing of seeds in order to insure a full stand from a single sowing. But this causes too much delay in the season; consequently, the growing of seedlings for transplanting should be vigorously promoted.

Inadequate fertilization and insufficient planting density is yet another major reason for poor yields. In the future, more fertilization will have to be done and the intercropping of green manure with cotton will have to be actively promoted. Where cottonfields are not well fertilized, density of plantings should be increased appropriately to make fullest use of increased

yields from plant colonies. This is the key to getting early maturing bumper yields from large areas.

"Thirty percent planting and 70 percent care" is particularly the case with regard to cotton production. Under influence of a psychology of emphasizing grain while slighting cotton, however, many places did not give timely care to cottonfields, did not take pains, and even did not designate people responsible for caring for the cottonfields. This seriously hurt output. In places where cottonfields are fairly concentrated, specialized cotton production teams have to be set up and careful attention given to all-round care before the transplanting of intermediate rice and following the harvest of early rice, and before the transplanting of late rice. In addition, effective actions have to be taken to do everything possible to reduce damage caused by autumn rains during the cotton harvest season.

Practice has demonstrated that though climatic conditions in Sichuan are not ideal for the growing of cotton; nevertheless, by taking a firm grip on the aforementioned matters, fairly high yields can be harvested. In the past some counties in Sichuan have produced yields of more than 100 jin per mu of ginned cotton from large areas. Today quite a few high-yield communes and brigades also produce more than 100 jin per mu. Their deeds show the very great potential for increasing cotton yields in Sichuan.

B. Rape

The rape-growing area in Sichuan accounts for 37.1 percent of the total area in cash crops and 77.4 percent of the area of oil-bearing crops. Rape is the primary cash crop in the whole province. During the period immediately following liberation, Sichuan had a rape-growing area of only 3.44 million mu. By 1955, this had expanded to more than 5.9 million mu and gross output of rape was 30 percent of the national total. Sichuan was also the champion among all provinces and regions in the amount shipped. In recent years, however, the rape-growing area has hovered around the 5 million mu mark and gross output has been approximately 6 million dan, declining to 21 percent of the national total. (Footnote 6) (Gross output of rapeseed in 1978 was 8,835,000 dan, a meteoric rise of 46.3 percent from the previous year.) With rapid development of the national economy and steady increase in the need for rapeseed in the daily lives of the people, there is an increasing sense of insufficient rapeseed production. Today even seven prefectures and autonomous prefectures are not entirely self-sufficient in edible oil. Consequently, vigorous expansion of rapeseed production is a major task in future agricultural production.

Eighty-seven percent of the rapeseed-growing area in Sichuan is found on the flatlands and in the hill areas of the Sichuan basin. Since it is the principal winter crop grown in paddyfields, most of it is grown in fields that are used for the growing of both wetland and dryland crops, with little being grown on drylands. It is found mostly in the same places where fields that grow both wetland and dryland crops are found. Within the Sichuan basin, for instance, the greatest concentration of fields used for the growing of both wetland and dryland crops is in Wenjiang Prefecture where the ratio of winter

farming of paddyfields is greatest and the most rape is also grown (occupying about 13.6 percent of the farmland area). Leshan Prefecture is second and Daxian Prefecture is third. The percentage of fields used for both wetland and dryland crops is very low in other prefectures, and the percentage of farmland occupied by rape is also very small. This includes Yibin Prefecture where, despite a high concentration of paddyfields, the percentage of farmland occupied by fields used for both wetland and dryland crops is very small (about 1 percent) because of the large number of winter paddyfields, and the rape-growing area amounts to only 3.2 percent of the farmland. Clearly expansion of the area on which both wetland and dryland crops are grown is an important avenue for expanding the production of rapeseed. As winter paddyfields undergo future transformation, the province's rape-growing area will increase from its present size. Thus, places having a fairly large number of winter paddyfields and fields allowed to lie fallow during winter for spring planting such as Yibin, Jiangjin, Nanchong, Neijiang, and Xichang Prefectures will be important places for future expansion of rape growing. In addition, tracts at more than 3,000 meters above sea level on the plateau in northwestern Sichuan offer definite prospects for the growing of ramie, since the growing of grain crops there risks damage from frost and freezing while spring-sown ramie, which has a shorter growing season, produces consistently high yields.

Vigorous increase in yields is the main way to expand production of rapeseed in Sichuan. Rapeseed yields averaged 147 jin per mu in Wenjiang Prefecture in 1977, 24 percent higher than the average for the province as a whole (119 jin). Twelve of the remaining 14 prefectures or autonomous prefectures had yields lower than the average for the province as a whole, most of them producing less than 100 jin per mu. Thus, general increase in their yields is of crucial importance in expanding rape production for the province as a whole.

Experience with high yields year after year in Shifang County shows the need to devote serious attention to improvement of varieties and matching them rationally in order to change the low rapeseed yields. Cabbage-type rapeseed varieties that tolerate fertilizer, resist lodging, are only lightly damaged by diseases and insect pests and that produce consistently high yields should be completely substituted for the bok choy-type yellow rape (yields from the former being about 40 percent higher than for the latter). In a two crop system high-yield intermediate-maturing late varieties should be mostly planted. In a three-crop system, because of the shortened rape-growing season and the delay in sowing it, intermediate-maturing early varieties and early-maturing high-yield varieties should be grown. This is a prerequisite for harvesting high yields from rapeseed that has been transplanted late. In order to maintain and improve the characteristics of fine varieties, seed selection, purification, and rejuvenation must be maintained year after year. Experiments have shown that early transplanted and late transplanted high-yield varieties alike should be fairly densely planted (7,000 to 8,000 plants per mu.) Early-maturing late transplanted varieties in particular should be planted fairly close since their plant height is fairly low. In addition, the different fertilizer needs at different stages of development of rape should

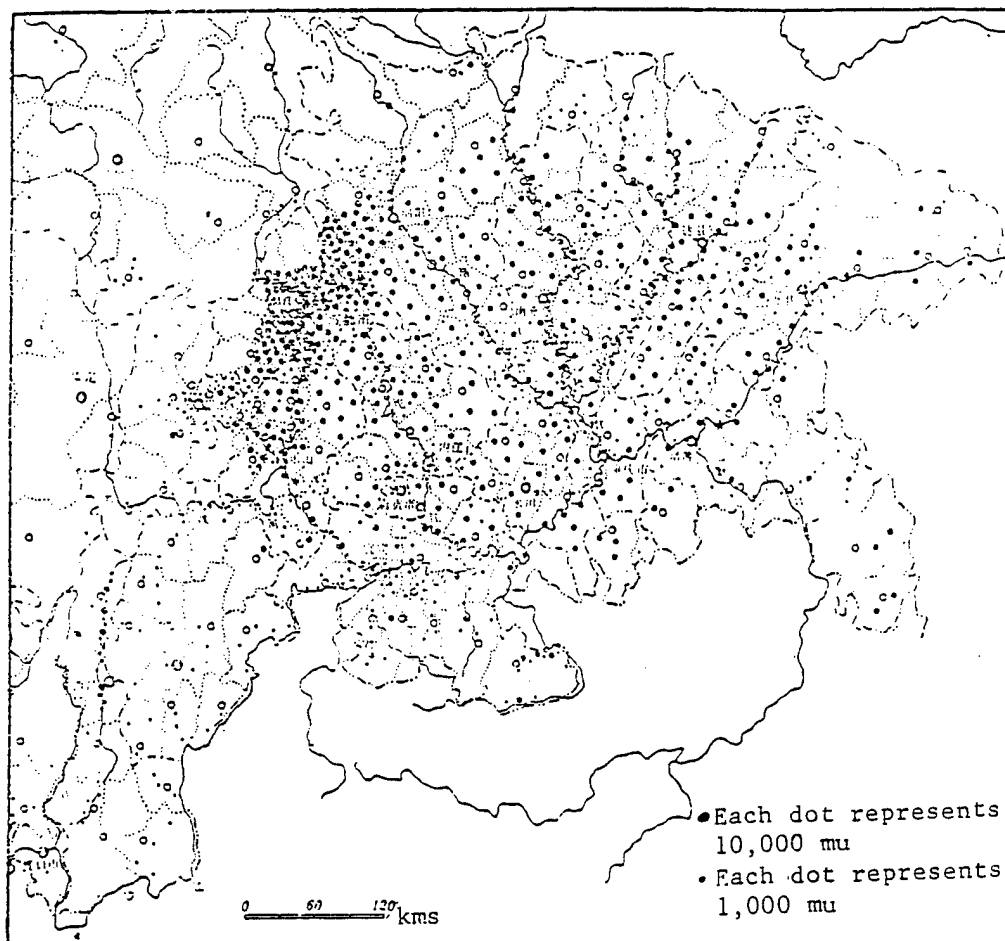


Figure 23. Tea Oil Distribution in Sichuan

be kept in mind and sufficient base fertilizer should be put down, fertilizer given to seedlings, mature plants heavily fertilized, and care exercised in fertilizing during flowering, mostly farmyard manure used with the addition of some phosphate plus a suitable amount of chemical fertilizer. The foregoing body of experience is of major significance for guiding increased rape yields throughout the province and merit general promotion.

C. Sugarcane

Sichuan has a long history of sugarcane production; however, on the eve of liberation the province's sugarcane-growing area totaled only slightly more than 300,000 mu and gross output was 11 million dan. After liberation, sugarcane production grew very quickly and by 1977 the growing area had reached 760,000 mu with a gross output of 27.63 million dan. (Footnote 7) (By 1978, gross output of sugarcane had reached 37.06 million dan in a more than

one-third net increase over the previous year.) This was still far from meeting needs and large quantities of sugar had to be shipped into Sichuan from other provinces every year. Consequently, vigorous expansion of the growing of sugarcane has become an urgent task in agricultural production in Sichuan.

The Sichuan basin gets plentiful heat and copious rainfall. The area suited to the growing of sugarcane is a vast one and conditions for growing sugarcane are better here than in the various provinces along the middle and lower reaches of the Chang Jiang. On both banks of large- and medium-size rivers in the southern and central parts of the basin, in particular, not only are heat conditions superb, but there is a large area of river flats and sandy soil suitable for the growing of sugarcane. Water transportation is also extremely convenient; thus, most of the sugarcane-growing area in the province is concentrated here. It is most concentrated in the middle and lower reaches of the Tuo Jiang centering around Neijiang and Zizhong Counties. In the southern part of Xichang Prefecture, heat conditions are even finer. When irrigation can be assured, this area is even better than the aforementioned ones for the growing of sugarcane.

During the early 1950's, average per unit area sugarcane yields in Sichuan Province held steady at slightly more than 5,500 jin for many years (reaching a maximum of more than 6,800 jin) for first place in the whole country. In recent years, however, per unit area yields have fallen to between 2,000 and 3,000 jin with Sichuan retreating to 11th place in the country. Very clearly, vigorous increase in yields remains the main way to expand sugarcane production in Sichuan Province. Were yields to revive everywhere to the all-time highs, output of sugarcane for the province would increase by more than 80 percent. Readjustments and improvements in crop patterns, the farming system and methods of care will have to be made in order to achieve this.

Though the growing of sugarcane is relatively concentrated in an overall sense today; nevertheless, the growing area for a considerable portion of sugarcane is not sufficiently rational. The sugarcane-growing area in 38 percent of the province's sugarcane-growing counties is less than 1,000 mu. Only 15 percent of all counties have more than 10,000 mu. Even in the latter instance, some use the method of "a sprinkling here and there," each brigade growing only 1 or 2, or 3 to 5 mu. Both yields and commodity rates are low. In some cases, the relegation of sugarcane growing to hillsides, poor or infertile land, and to the tops of hills is an even more general practice. Thus, readjustment of crop patterns is extremely necessary. Jiangjin County combined readjustment of state purchases with the institution of grain ration policies. Acting in accordance with the principles of suiting general methods to local situations and suitable concentration of growing areas, the original 1,373 sugarcane-growing brigades throughout the province were condensed to 934 (in a one-third reduction) and the growing area increased 50 percent in a general revival to the all-time high of the scale of production. Since sugarcane output is high, requires a large amount of transportation, and cannot be stored for long, it has to be hauled away and processed at once. Thus, insofar as possible, sugarcane fields should be laid out along rivers and highways in places requiring hauling no more than 5 km. The best sites are alluvial soil along both banks of rivers and the first and second levels of terraced fields.

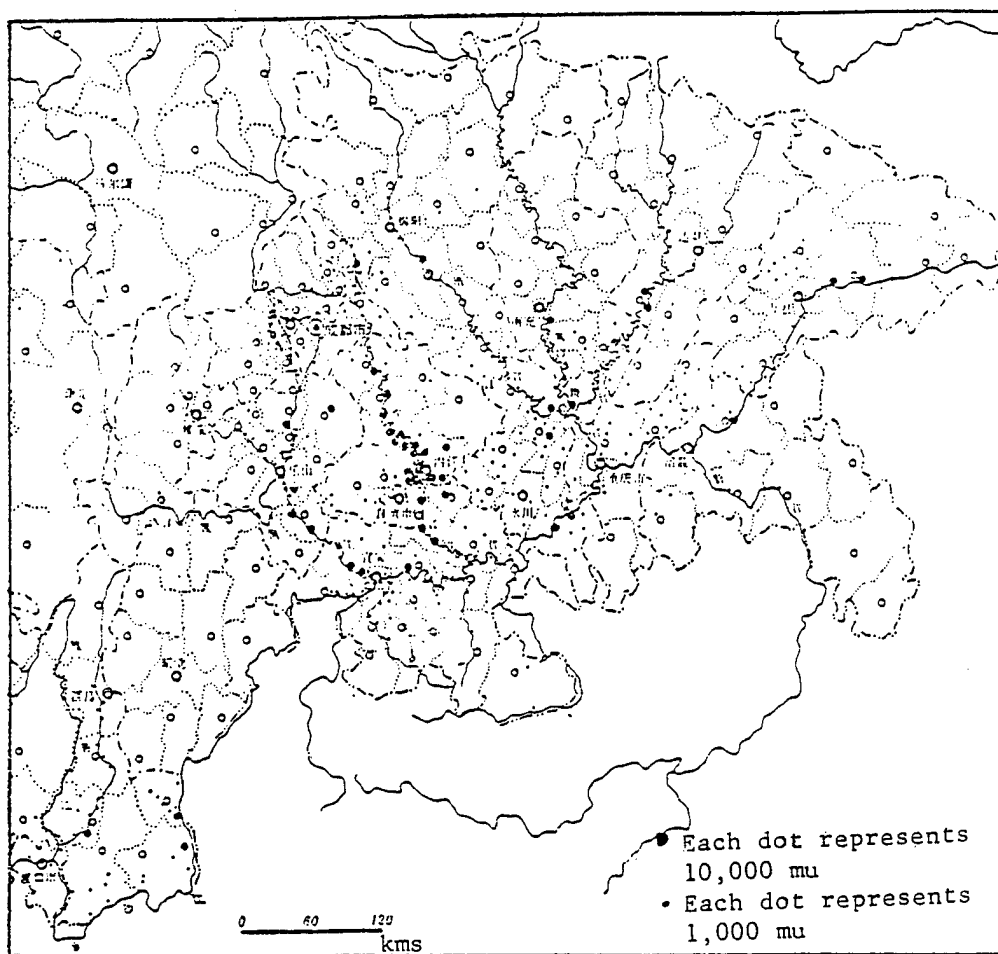


Figure 24. Distribution of Sugarcane in Sichuan

Formerly sugarcane was generally planted in the spring in Sichuan Province, but since spring planted sugarcane had a growing season of only 8 to 9 months, neither cane nor sugar yields were very high. Sugarcane planted in the fall or winter, on the other hand, can be planted early and matures early (between 3 and 4 months and more than 1 month, respectively, as compared with spring planted sugarcane). Sugar accumulates in it rapidly, yields are large and the sugar content is high. (Footnote 8) (Results of experiments conducted at the Neijiang sugarcane planted in the fall as compared with sugarcane planted in the spring, and a 5.78 percent higher sugar content. Sugar content per mu was 23.87 percent higher.) For this reason, the suiting of general methods to local situations to change from spring to fall and winter planting hold very great significance for increasing yields. In the southern and eastern parts of the Sichuan basin, as well as in the southern river valleys of Xichang Prefecture, where winters usually have no temperatures below 0°C, this kind of planting is suitable for promotion and popularization.

The basic element in obtaining high yields from sugarcane is to insure a sufficient number of basic seedlings and an increase in the weight of individual stalks. Thus, it is necessary to increase density appropriately so that there are between 6,000 and 8,000 basic seedlings per mu. In addition, it is necessary to be sure to fertilize properly (heavy base fertilization and followup side dressings from time to time), providing water and fertilizer in combination so that throughout its vegetative growth period the sugarcane has a steady supply of water and fertilizer to promote an increase in the weight of individual stalks. It must be noted that under present circumstances, the planting of sugarcane fields at the proper density is often prevented by the companion cropping of grain, particularly the companion cropping of corn. Not only does this reduce the number of sugarcane stalks per mu, but the two crops shade each other, resulting in a 15- to 20-percent or greater decline in sugarcane yield (depending on the density of the corn). For this reason, in line with the premise of correct handling of the relationship between grain and sugarcane, prohibition of the growing of grain in sugarcane fields is of major significance for increasing yields of sugarcane.

A look at the situation as it exists in Sichuan shows that appropriate expansion of the sugarcane-growing area is also necessary. The best way to expand the area lies in the development of river flats. Not only does this cause no conflict with grain for land, but the soil on river flats is suited to the growing of sugarcane; moisture is plentiful; and the flood season also deposits fertile mud on the flats. If varieties that withstand drowning are selected, sugarcane yields would be markedly higher than from most terraced hillsides. In recent years many counties have taken this road for rapid development of sugarcane production.

D. Flue-Cured Tobacco

Sichuan has several decades of experience in the growing of flue-cured tobacco; however, as of the eve of liberation, the flue-cured tobacco area for the whole province totaled no more than 30,000 mu and tobacco leaf output was only approximately 30,000 dan. After liberation flue-cured tobacco production developed extremely rapidly, and by 1977 the flue-cured tobacco area reached 310,000 mu and gross output was 570,000 dan.

Flue-cured tobacco grows best when the temperature is between 18 and 25°C. It requires rather ample sunlight (a sunshine rate of higher than 50 percent is best). If sunlight is insufficient, thin leaves, loose tissue, poor flavor, and a low oil content will result. Fairly large difference between daytime and nighttime temperatures helps the accumulation of sugar in flue-cured tobacco. It also requires an ample supply of moisture. If temperatures climb higher than 28°C during the ripening period, the tobacco's alkali content may become overly high, adversely affecting quality. The foregoing requirements show that though flue-cured tobacco is grown in the Sichuan basin, climatic conditions there are not entirely ideal for it. For example, sunlight is insufficient (during April, May, June, and December, the sunshine rate usually averages only 20 to 40 percent); the difference between daytime and nighttime temperatures is slight; and damage from summer and dog days drought is serious. August and September frequently have temperatures above

28°C, and during harvest time the autumn rains go on and on. This has a substantially adverse effect on both flue-cured tobacco quantity and quality. Furthermore, some places in Sichuan that are territorially contiguous with the Yunnan-Guizhou plateau (such as Huili and Huidong Counties, Shuyong County, and the southern part of Gulin County) have terrain and climate that differs greatly from that of the Sichuan basin and they are close to Yunnan and Guizhou where the aforementioned unfavorable conditions do not exist; therefore flue-cured tobacco quality is higher there, and these are relatively ideal places for the growing of flue-cured tobacco. For this reason, in any future expansion of the tobacco-growing area, these counties should be considered first. Meanwhile, the old tobacco-growing areas in the Sichuan basin (Ziyang County in particular) should mostly run existing tobacco fields well and go on to take effective action to improve yields and quality.

Flue-cured tobacco is a cash crop that requires a fair amount of skill. To a very large extent, both output and quality are determined by how well it is planted and taken care of and skill in curing it. Practical experience has shown that fine varieties and sturdy seedlings are requisites for high yields; early planting avoids or reduces adverse effects from summer drought and continuous heavy autumn rains. Thus, mastery of these three skills is very important for flue-cured tobacco production. Flue-cured tobacco also requires very close attention to fertilization. Not only does it require heavy fertilization and early applications of side dressings, but it requires mostly farmyard manure (best is withered stems of oil-bearing crops and livestock manure), and a suitable amount of nitrate fertilizer. Unless it receives it, the color and luster of the leaves, and the full taste and aroma of the tobacco cannot be assured. This is one of the reasons why the quality of tobacco from some tobacco-growing places is so poor. In order to assure a supply of withered stems of oil-bearing crops, a system of rotational cropping of rape and tobacco should be actively promoted, the rape helping the tobacco. Sichuan's tobacco-growing areas have not given sufficiently serious attention to the curing of tobacco in the past, and this adversely affected the quality of flue-cured tobacco. In recent years, some progress has been made. Nevertheless, the advance experiences of fraternal provinces should be studied as a basis for vigorous effort to improve curing techniques.

3. Pattern of Major Cash-Crop Bases

Many years of practical experience everywhere has shown there to be numerous advantages from the establishment of production bases for cash crops. It helps strengthen leadership and unify the planning of production; it helps accumulate experience and raise both output and quality; it helps raise commodity rates and stabilize the supply of raw materials for industry; it helps with the rational distribution and building of processing enterprises; and it hastens the mechanization of agriculture. For these reasons, the building of bases is a major step for development of cash-crop production.

Selection of sites for bases should be done largely on the basis of natural conditions, historical farming habits, existing production bases, and availability of transportation and following the principles of suiting general

methods to local situations and suitable concentration. Most bases consist of a county, a commune, or a production brigade. The "bases" listed below have been formed by the grouping together in accordance with the foregoing principles of cities and towns possessing conditions that apply to individual counties. Some of these large "bases" are already carrying a major share of the load for the whole province in the production of cash crops, while others will carry such a heavy load. Serious attention to these several large tracts is of crucial importance to cash-crop production for the whole province.

A. Cotton Production Bases

As was said previously, more than 74 percent of Sichuan's cottonfields are concentrated in 17 cotton-producing counties in the hill region of the basin where the cottonfield area totals more than 3 million mu and is responsible for supplying the province with more than 83 percent of its cotton. These 17 counties are linked into a continuous tract that stretches along the hills in the western and northern parts of the basin to form a complete and fairly large cotton-production base.

All of the counties that make up this base have a frost-free period of 280 to 320 days; cumulative temperatures for days when the temperature is 10°C or higher range from 5,200 to 5,700°C, and precipitation is approximately 1,000 mu annually. Both the amount of heat and precipitation are better than in most large bases throughout the country. However, this base gets only between 1,300 and 1,500 hours of sunlight annually for a 30- to 35-percent sunshine rate, which is far less than for other bases in the country. But this is still relatively better than in most other parts of the Sichuan basin. Each of the counties in the bases face the threat of spring, summer, and late summer drought, but there is too much rain during the fall when dreary and rainy days go on and on with bad effect on cotton production.

For details on development of this base, please see Section 4 of Chapter 7.

B. Rapeseed Production Bases

(1) The Rapeseed Base on the Basin's Western Plain

This base includes most of Wenjiang and Leshan Prefectures as well as the western part of Mianyang Prefecture, accounting for one-third of the rapeseed-growing area of the whole province and nearly 40 percent of the province's gross output. It includes several counties in which the rapeseed-growing area already accounts for more than 20 percent of the area planted to winter crops and more than 15 percent of the farmland area. Clearly production is fairly concentrated.

This place is located on a flatland and monadnock area where water, soil, and fertilizer conditions are fairly good. Historically this has been a major rapeseed production base in the province and in the country as well. Since it covers a large area where growing is concentrated, both leaders at all levels

and the masses in general devote fairly serious attention to rapeseed production. Cultivation and care is also fairly meticulous and yields are higher than the average for the province as a whole, making it a large-area, high-output, concentrated rapeseed-growing area renowned throughout the country.

Development of the individual counties that make up the base is currently very uneven. On the one hand, per unit area yields are not uniform. For example, rapeseed yields in Shifang County are more than 200 jin per mu, while they are less than 150-odd jin in most other counties. On the other hand, a substantial number of counties grow a fairly low percentage of rape (less than 15 percent of the winter crop growing area and less than 10 percent of the farmland area). Thus, the consolidation and development of this base will require, first of all, an all-round spread of experiences in the production of high yields in an effort to obtain balanced high yields everywhere. Second, some counties should use equitable readjustment of the percentage of winter crops grown as a basis for appropriate expansion of their rape-growing area so that they occupy between 20 and 25 percent of the winter-crop area.

(2) The Hills Rapeseed Base in the Southern Part of the Basin

This base mostly includes both banks of the Chang Jiang in the southern part of the Sichuan basin as well as the counties in the southern reaches of the Min, Tuo, and Jialing Rivers. The area planted to rape is currently not great here and there are some places where no rape is grown at all; nevertheless, the potential is greatest here for future expansion of rape growing.

The average annual temperature in this area is more than 18°C, permitting the growing of three crops. Temperatures during the period when rape is sown are around 17°C, and during the overwintering period, the temperature is 8°C or above, so there is no freeze damage. During the flowering period, temperatures reach 15°C or higher. Relative humidity is approximately 77 percent, which is very favorable for flowering and the setting of seed pods. Heat conditions are the best to be found. The soil is mostly coarse and semisandy and of fairly high fertility suiting it to the growing of crops such as rape. Most of the farmland is paddyfields (approximately 70 percent); however, the percentage of winter paddyfields is overly high (at 60 percent); thus, there is little area of fields that grow both wetland and dryland crops for the growing of rape. This definitely limits rape production. Currently rape is grown on less than 5 percent of the farmland area, a lower percentage than elsewhere in the basin. However, with the further extension of water conservancy, the area of fields used for the growing of both wetland and dryland crops will increase greatly, and there will be room for an expansion of the growing of rape. Thus, from a long-range standpoint, this is a rape-production base with very great prospects for development. (Please see Chapter 8)

C. Sugarcane Production Bases

(1) The Neijiang-Zizhong Sugarcane Base

This base includes five counties (and cities) along the Tuo Jiang in Neijiang Prefecture, namely Neijiang City and Neijiang, Zizhong, Ziyang, and Jianyang Counties where the sugarcane-growing area totals approximately 200,000 mu or more than one-fourth the total for the whole province. This is Sichuan's oldest, largest, and most concentrated sugarcane-production base.

Climatic conditions for the growing of sugarcane range from middling to good and the basis for production is excellent by comparison with other places. Yields were also fairly high at one time; however, today's yields are lower than the provincial average (in 1977), and protection potential is a long way from being used to the full. In addition, the percentage of farmland occupied by spring-sown cash crops is fairly large (averaging approximately 10 to 15 percent) higher than the percentage for drylands, and river flats are also pretty much used to the full, so room for further expansion of the sugarcane-growing area is not large. Thus, the future program of development should be to stabilize the existing area and mount an attack on increasing yields.

(2) The Southern Basin Sugarcane Base

This includes Fushun, Yibin, Longchang, Nanxi, Gaoxian, Jiang'an, Luxian, and Hejiang Counties in Yibin Prefecture, Jiangjin in Jiangjin Prefecture, and Qianwei County in Leshan Prefecture for a total of 10 counties. Most of these counties have 10,000 mu or more of sugarcane fields, their sugarcane-growing area totaling 130,000 mu or 17 percent of the total for the province, making this the second large sugarcane-growing area in the province. The counties comprising this base lie along the Chang Jiang in the southern part of the basin or else in the lower reaches of the Min and Two Rivers where heat resources are the best in the basin and where rainfall is also greater than at the Neijiang-Zizhong base. Thus, climatic conditions are most favorable for the growing of sugarcane.

This base differs from the Neijiang-Zizhong base in that it is primarily a grain-growing area where few spring-sown cash crops are grown and the competition for land between grain and sugarcane is relatively slight. However, since the percentage of paddyfields is very high (more than 70 percent of the cultivated land), and the dryland area is limited, most of the sugarcane-growing area is located at the tops of hills or on high slopes where the soil is thin, water is lacking and conditions are poor. The amount of sugarcane that can be grown on such land is naturally very limited. Consequently, in addition to other measures that should be adopted, improvement of the soil to grow sugarcane holds major significance for increasing yields.

Along the rivers or in the middle of rivers, there are quite a few river flats and sand bars where results in the growing of sugarcane have been extremely good, yields being at least 20 percent higher than from terraced hillsides. Therefore, it is necessary both to consolidate the existing growing areas on

river flats and to halt the supplanting of sugarcane by the growing of paddy rice. In addition, potential should be tapped to develop new flats that have not been exploited to expand the growing of sugarcane. (Please see Chapter 8.)

(3) The Southwest Sichuan Sugarcane Base

This includes Miyi, Dechang, Yanbian, Ningnan, Huidong, and Huli Counties with 60,000 mu of sugarcane-growing area, or 8 percent of the total for the whole province, and a gross output of less than 13 percent, making it the third largest sugarcane-producing area in Sichuan and another high-yield cane-growing area.

In the river valleys of the aforementioned six counties at less than 1,500 meters above sea level, heat resources are the very best in the whole province; sunlight is ample, and daily temperature variation is great, which greatly benefits the accumulation of sugar; hence climatic conditions are "richly endowed by nature." This is also a very important reason for the very high sugarcane yields here. However, because of the very pronounced dry season, sugarcane must be irrigated. This area also has rich soil resources. Along the banks of the Anning He lie large tracts of river flats, and Ningnan, Huidong, and Huili Counties have quite a bit of wasteland that is suitable for the growing of sugarcane. Potential here is very great for expansion of sugarcane growing provided water conservancy projects are built. In addition, improvement of the soil on a small portion of existing farmland for the growing of sugarcane also holds great prospects. However, attention must be paid to the improvement of transportation. In short, this base has vast prospects for development and it can become a major sugarcane-growing area that rivals the Neijiang-Zizhong base.

D. Flue-Cured Tobacco Bases

Though 30 counties (and cities) in Sichuan grow tobacco, more than 90 percent of production is centered in 10 counties namely Ziyang, Jianyang, Gulin, Xuyong, Meishan, Danleng, Qianjiang, Xiushan, Huili, and Huidong, that have been formed into five concentrated production areas.

The Ziyang-Jianyang tobacco growing area is currently the province's largest base for growing flue-cured tobacco with a tobacco area totaling 120,000 mu that produces 44 percent of the province's tobacco. Natural conditions here favor the growing of flue-cured tobacco, which has a long history and a fairly good foundation. Nevertheless, the quality of flue-cured tobacco is fairly poor here. It will be necessary to stabilize the growing area, pay attention to increasing base fertilization (bean cake fertilizer is best) and improving curing techniques in order to promote improvement in both quality and yields.

The Gulin-Shuyong tobacco growing area is a new one that has come into being only in recent years. Its size has grown to the present 93,000 mu (30 percent of the province's tobacco-growing area), vaulting it into the position of second largest (base for flue-cured tobacco in the province. Its production of flue-cured tobacco is centered in the county's towering mountainlands

at more than 800 meters above sea level where the climate is temperate, the summers are without scorching heat, sunshine is ample, and daily temperature variation is great, making it more suitable for the growing of flue-cured tobacco than any other base. As a result, the quality of its flue-cured tobacco is good and nearly as good as Guizhou tobacco. Nevertheless, since its foundation for production is relatively poor, yields tend to be low. A major future attack should be directed at increasing yields.

The Meishan Danleng, the Qianjiang-Xiushan, and the Juili-Huidong tobacco-growing areas are relatively small, amounting, respectively, to only 34,000, 30,000, and 17,000 mu. The Meishan-Danleng tobacco area has been in existence for a fairly long time, but the other two have achieved a certain amount of production only in recent years. Natural conditions in the Juili-Huidong area resemble those in Yunnan Province and quality of this area's flue-cured tobacco is the finest in the province, with the flavor of Yunnan tobacco. Climatic conditions in the Qianjiang-Xishan area resemble those in western Hunan and Hubei Provinces, so the flue-cured tobacco produced here is different.

The aforementioned five tobacco-growing areas are better in some ways than others and their products are distinctive. They provide extremely advantageous conditions for providing raw materials that can be blended by tobacco plants in the province.

Chapter 5. Production Patterns of All Agricultural Sectors in Sichuan (Part 2)

First Section: Animal Husbandry

1. Basic Characteristics of the Pattern of Animal Husbandry Production

A. Numerous Kinds of Livestock, Large Numbers, and Very Uneven Distribution; Important Position of Livestock Raising in Farming Regions and of Animal Husbandry in Pastoral Regions

Animal husbandry holds an important position in Sichuan Province's national economy, its output value amounting to one-seventh of the GVAO. The animal power required in the farming industry and for transportation, and the meat and hides needed in the daily life of the people are all provided by animal husbandry. Much of the fertilizer needed for farm crops is also supplied by animal husbandry, and hogs, hog bristles, intestine casings, hides, and wool are all important products shipped out of Sichuan. In the eastern part of the basin, income from animal husbandry averages less than 10 percent of total earnings from agriculture. In the high mountains and plateau in the west, however, income from animal husbandry accounts for between 15 and 35 percent of total income and between 50 and 80 percent in some counties, making it a major source of livelihood for the local people.

There are many kinds of livestock in the province. Not only are there camels, but also all sorts of livestock in very large numbers, for an important position nationally. The province stands first in the country in the number of hogs and water buffalo and second in the number of goats. It stands in the forefront among south China's provinces in the number of sheep, oxen, and horses.

Livestock in the province total 51.57 million head, 16.4 percent of them large livestock animals, and 83.6 percent small livestock animals. Among large livestock animals, water buffalo and oxen total 65.1 percent; yaks and pien niu [the offspring of a bull and a female yak] total 31.2 percent, and horses, donkeys, and mules are very few, totaling only 3.7 percent. Small livestock animals consist of hogs for the most part, which account for 79.8 percent of the total, and goats and sheep together total 20.2 percent. More than 80 percent of hogs and water buffalo are concentrated in the eastern part of the Sichuan basin, while more than 80 percent of sheep, horses, mules, and donkeys are found in the Garze Zang, Aba Zang, and Liangshan Yi Autonomous Prefectures in the west. Virtually all of the yaks and pien niu are found in Garze Zang and Aba Zang Autonomous Prefectures. Most of the oxen are found in the mountains surrounding the basin and in the hill region of the basin. Goats are found mostly in the mountains surrounding the basin, in Xichang Prefecture, and in the southeastern parts of Garze Zang and Aba Zang Autonomous Prefectures.

Differences in the main areas of occurrence of the various kinds of livestock animals has brought about a very great diversity in the structure of animal husbandry in individual areas. In the Sichuan basin, hogs hold a predominant position in animal husbandry (accounting for more than 85 percent of all livestock). Next come water buffalo and oxen, with very few other kinds of livestock. Hogs predominate in the mountains surrounding the basin, followed by oxen and goats. In Liangshan Prefecture, sheep and hogs are equally important. In Xichang Prefecture, on the other hand, goats and hogs are of equal importance. In southeastern Garze Zang and Aba Zang Autonomous Prefectures, goats and sheep, and yaks and pien niu predominate. In northwestern Garze Zang and Aba Zang Prefectures, on the other hand, yaks, pien niu, and sheep predominate overwhelmingly.

B. Diverse Livestock Feeding Methods and Generally Poor Operating Methods

In pastoral regions, grazing is the main way of feeding livestock, mostly moving from one grazing area to another with the seasons. Since the climate is cold, the land vast, the population sparse, and the numbers of livestock large, the burden on the work force is fairly great, particularly during July, August, and September during the busy season in livestock production when there are usually very great conflicts in the use and placement of the work force. Animal husbandry operations are nonintensive; capital construction of the grasslands is very poor with the emphasis on use to the neglect of care, all grazing and no nurture, which has led to a regression of meadowlands, one-third of all meadowlands having become either infested with insect pests and rodents or having become swampy, and 70 or 80 percent of livestock having no shelter. During winter and spring when the grass is withered, no supplementary fodder is given the livestock and ability to withstand disaster is very weak. A general situation exists of "plenty to eat in summer, fat in the fall, skinny in the winter, and dead in the spring." Basically, livestock are raised by living off the land.

In farming regions, hogs are generally fed in pens while cattle both graze and are fed in sheds. Sheep and goats depend mostly on grazing. The level of care is generally higher than in pastoral regions. Almost every livestock animal has a permanent pen and sources of fodder are also more diversified.

In places where farming and animal husbandry intermingle, feeding and care methods are generally between those of farming regions and pastoral regions. They are transitional in nature either being closer to those of farming regions or pastoral regions, animal husbandry being determined by location and the status of local grassland fodder.

C. Further Improvement Needed in Quantity and Quality of Livestock Products

The speed of livestock development in Sichuan is still not fast enough. Statistics for the period 1949-1974 show an average annual rate of increase of 4.9 percent for hogs, 5.7 percent for goats, 4.6 percent for sheep, and 2.1 percent for large livestock animals (including only 1.1 percent for water buffalo and oxen), which is far below the national average 6.1 percent speed of growth for all livestock.

Despite the various fine breeds of livestock available in the eastern part of the basin and in the mountains surrounding the basin, breeding has not been done well so the percentage of fine breeds is not high. The body weight and meat output of some livestock has even declined. Most of the livestock on the western plateau are stock breeds well suited to the nonintensive feeding and care conditions, but production capacity is low.

Despite year by year increases in the numbers of hogs in Sichuan since liberation, the slaughter rate for fattened hogs has hovered around 55 percent during the past 10-odd years (61.2 percent in 1965). In most years, the average gross weight of hogs purchased has been 140 to 150 jin, and it fell as low as approximately 130 jin in some years. As a result both slaughter rate and gross procurement weight are lower in Sichuan than the average for the country as a whole, so shipments outside the province of pork and volume of exports have both been greatly affected. Sichuan's Tibetan-strain sheep produce between 0.5 and 2 jin of wool per sheep per year, which is only one-half the national average. Improved varieties of sheep total 14 percent of the total number, while the national average is 21 percent. The wool produced can satisfy only 25 percent of the raw materials needs of woollen textile industries in the province; there is an extreme discrepancy between supply and demand. The number of goats in the province exceeded the all-time high for the first time only in 1972, while goatskin procurement was only 55 percent of the all-time high. Since 1962, more plow oxen have been shipped out of the province than into it; nevertheless, approximately 30,000 head are annually transferred between one region and another within the province at a great cost in manpower, material, and financial resources. Both milk and meat output from pien niu and yaks is very low, only a miniscule amount being provided over and above consumption by herdsmen themselves. The province has to bring in more than 100,000 jin of milk powder and approximately 1 million jin of beef annually.

As the standard of living gradually rises, and with the rapid development of both production and foreign trade, Sichuan's animal husbandry must develop more rapidly in order to be able to provide livestock products in larger quantities and of better quality to satisfy the needs of all.

2. Current Status of Production and Avenues for Development of Major Livestock Animals

A. Hogs

Hogs are Sichuan Province's most important livestock animal, account for two-thirds of all livestock animals. In converted figures, they account for one-half of all livestock animals. (Footnote 1) (One large livestock animal is equivalent to five sheep or goats and to 3.3 hogs.) In Sichuan Province, every peasant household raises an average of 1.7 hogs or 0.43 hogs per capita and 0.37 hogs per mu of land (figured in terms of the yearend number in inventory), all of which are higher than the national average. In the plains regions at the western end of the basin, in particular, where the number raised is higher than elsewhere, are located 18 of the 20 counties in which there is either 1 hog per capita or 1 hog per mu (figured in terms of numbers

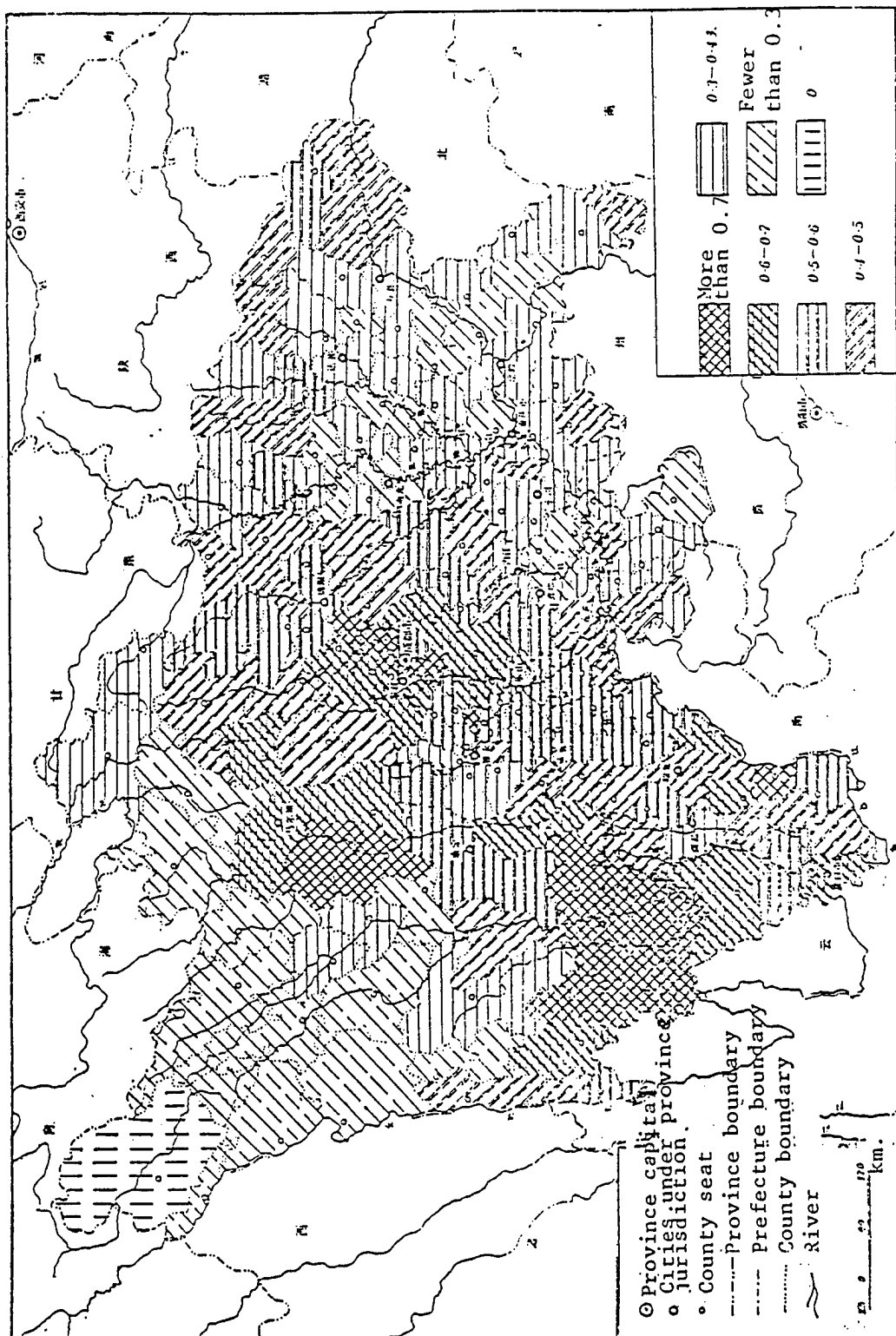


Figure 26. Number of Hogs Per Capita of Agricultural Population in Sichuan Province

raised). However, Sichuan's hog-raising industry is still a long way from being able to meet the needs for its national economic development and a great gap exists between hog production in Sichuan Province and that of advanced provinces and municipalities.

Currently, collectively-raised hogs account for only approximately 15 percent of the total number of hogs in the province, and collectively-raised sows account for approximately 35 percent of all sows. In some counties, the ratio of collectively-raised hogs is less than 5 percent or even only 1 to 2 percent. Even in counties that are advanced in the raising of hogs, the percentage of collectively raised hogs in communes and brigades is very low. Experience has shown that increased collective hog raising helps control sources of supply, stabilizes market prices for shoats, and gives priority to satisfying the needs of needy households; it helps collectives maintain control over sources of fertilizer, lowers agricultural production costs, makes the collective economy robust, and increases commune members' earnings; it helps provide the country with more commodity hogs, assists in the building of socialism and in the planning of city and countryside market supply; and it helps promote fine breeds and popularize advanced experiences in scientific hog raising. Consequently, all jurisdictions should resolutely carry out the Central Committee's policy of "actively develop collective hog raising and continue to encourage commune members to raise hogs." They should strive to run collective hog farms well, increase in a planned way the percentage of collectively-raised hogs, and give particular attention to the raising of sows by collectives so that collectives can breed hogs to raise themselves, brigades can reproduce hogs for brigades to raise, and brigades can reproduce hogs for raising by households. In suburban areas, mechanized hog farms of a certain size should be operated in a planned way.

Fodder is the foundation for consolidation and development of the hog-raising industry. A shortage of fodder has been a main reason for the downturn in the numbers of hogs and the decline in quality during the past several years. The ways that the small-scale agricultural economy formerly used to solve the fodder problem are completely unsuited to today's needs in the large-scale raising of hogs. Thus, fodder production should be made a part of socialist agricultural plans. In order to insure a steady supply of fodder, every commune and brigade should figure out its total needs for fodder based on the number of hogs it plans to raise, concentrating mostly on green feed appropriately augmented by concentrated and coarse feeds. They should do this in conjunction with overall planning, starting with dedicating land to the growing of needed fodder but also making fullest use of agricultural sideline products and wild-growing fodder and actively promoting carbohydrate feed, expanding the area of green feed crops such as Chinese trumpet creeper, Chinese milk vetch, broad bean stalks, and radishes through increased plantings, companion cropping, and intercropping. They should particularly advocate use of pits, ponds, and dammed sites and paddy fields for the growing of fodder that grows in water such as water cabbage, water peanuts [*Alternanthera philoxeroides*], water hyacinths, and red azolla. This is an important way in which to solve the competition between grain and fodder crops for land. As a result of having taken the above-mentioned actions, some

counties, communes, and brigades advanced in the raising of hogs have not only made fodder for collectively owned hogs a part of their agricultural plans, but they have additionally been able to supply part of the need of private commune members for fodder to raise hogs. In addition, in order to meet needs for mechanized hog raising, gradual development of a feed industry and establishment of feed companies is necessary.

During the past several years, four contagious diseases, namely, hog cholera, swine herpes, swine erysipelas, and swine plague, have spread widely throughout the province causing severe damage and posing a very great threat to development of the hog-raising industry. Thus, a firm grip must be taken on the establishment and improvement of livestock veterinary medicine organizations at all levels to form a network for the prevention and control of infectious livestock diseases and for the promotion of a cooperation effort to prevent and control livestock diseases, steadfast efforts being devoted to comprehensive measures, with mass prevention and mass treatment being emphasized, and efforts being made to bring down the hog death rate to 5 percent below the all-time low.

Hog breeding and feeding techniques in the province today remain fairly low. In order to meet needs for development of the hog-raising industry, efforts must be made to use local sows and fine breed boars for breeding, to cross-breed fat hogs in one generation, and to use artificial insemination in breeding.

B. Water Buffalo and Oxen

Water buffalo and oxen are important draft animals in the Sichuan agricultural region accounting for more than 98 percent of all draft animals. Water buffalo are found largely on the Chengdu plain and in the paddy-growing areas of the Chang Jiang, Min Jiang, Fu Jiang, Tuo Jiang, and Jialing Jiang basins. Oxen are found largely in the mountains surrounding the basin, in the hill region of the basin, and in Xichang and Liangshan Prefectures.

There are approximately 3 million head each of water buffalo and oxen. The fine breeds of water buffalo are the "Fuling water buffalo," the "Qijiang water buffalo," and the "Dechang water buffalo." All are characterized by large bodies, rapid growth and development, strong pulling power, and ability to tolerate hard labor. The fine breeds of oxen are "xuanhan oxen" and "Rongjing oxen," which have the common characteristic of strong pulling power and ability to stand hard work for a long time.

Today, each draft animal in the province is responsible for plowing an average of 26.7 mu of land and for sowing 46.3 mu, but the amounts vary greatly from one place to another. In some counties, communes, and brigades, the animals carry a heavy load, such as in Jintang, Jianyang, and Ziyang Counties where they plow between 60 and 70 mu and are responsible for sowing more than 100 mu. The overall situation in surplus and shortage of draft animals in the more than 150 counties in the province's eastern agricultural region was as follows: Approximately 60 counties had a surplus of buffalo and oxen, and

approximately 50 counties had a shortage. Counties self-sufficient in supply numbered 40. In view of this situation, plus the inability to mechanize across the board very quickly because of limiting factors, conscious efforts must be made to surmount the mistaken notion that "development of plow oxen and water buffalo is useless." It will remain necessary to use draft water buffalo and oxen for a long time to come, and to devote equal attention to the raising of beef cattle and draft cattle. All jurisdictions should diligently implement a program of "self-breeding and self-raising," institute a policy that provides rewards, and spread experiences in "equal care and use" or combining care and use. Counties, communes, and brigades that lack water buffalo and oxen should do all possible to breed plow animals, to raise the self-sufficiency rate, to generally use fine breeds in breeding, and to try to improve quality. Ideally, each production brigade should have one stud water buffalo or ox, and each production team should have a minimum of two female animals that are able to reproduce. Counties with surplus animals having the conditions should breed more plow animals (particularly fine breeds) in order to supply shortage counties.

Worth noting is that during the past more than 10 years the quality of Sichuan's plow buffalo and oxen has gradually declined. Statistics from a general survey conducted during August 1974 at Mingyu Commune in Fuling County, one of the areas producing "Fuling water buffalo," show that mature bulls and cows 6 years old or older were, respectively, 1.8 and 4.6 centimeters shorter than in 1959. Equal attention will have to be devoted in the future to a policy of improvements through selective breeding and through crossbreeding. Simultaneous with the revival and improvement of existing fine-breed cattle should be major efforts on crossbreeding. Experiences in Anyue and Tongnan Counties show that hybrid water buffalo produced through the crossbreeding of imported Murrah water buffalo (the work king of water buffalo) and local water buffalo resulted in animals that were tall, well proportioned, grew and developed fast, were very adaptable, and had strong pulling power for marked improvement of the quality of local water buffalo.

C. Goats and Sheep

Sichuan has 5.92 million goats or 63 percent of all goats and sheep combined. Goats are distributed over a wide area, most of them in Xichang Prefecture, in the eastern part of the basin, and in the mountain area at the northern end of the basin. Hill regions also have a substantial number. More than 11 counties have 100,000 or more goats each for a total of 1.73 million, or 27.3 percent, of the province's total goat population. Clearly, they are fairly concentrated.

Goats are rather strongly adaptable. They withstand cold and heat well, are adept at climbing on craggy terrain, eat a wide range of food, and may be fed with a wide variety of weeds and wild fodder (including small shrubs). They do not require concentrated feeds as a supplement in their diets. They mature and breed rapidly, and require little labor to care for them. The masses use them mostly for their meat. Sichuan goatskin has been a traditional export commodity that enjoys a very high reputation internationally

and earns very high foreign exchange. Supply has been unable to meet demand for many years. Thus, vigorous efforts will have to be made, as circumstances in individual places permit, to produce more.

A fine breed of Sichuan goat is the "Tongyang" (also known as the Chengdu Mayang) that is valuable for its meat, its milk, and its skin. Quality of its meat is quite good. It does not have a goat smell; it produces a substantial amount of milk; its skin is fine and tightly textured, has high tensile strength, and is highly regarded in international markets. More of these goats should be produced. After more than 20 years of efforts, the Yuandingzi livestock farm in Nanjiang County has scored initial success in the breeding of "Nanjiang oxen" that are useful for their meat, their milk, and their hides. They are tall animals with tasty flesh and fine, supple hide having high tensile strength. Efforts should be made to popularize this breed. In addition, mayang goats from Fengjie and "banjiao goats" from Wanyuan are also rather fine breeds.

Future efforts should center around active development of goat herds both among collectives and communes. The operation of collective goat farms is an important way to increase goat production. In mountain regions, in particular, potential is very great for development of commune, brigade, or jointly operated goat farms. Places having requisite conditions should select relatively inaccessible cols where fodder is abundant for the establishment of permanent grazing bases for goats, placing them under collective care in order to reduce or avoid damage to forest trees. It is difficult to control random grazing of goats raised by individual commune members; thus tethering or raising in pens is preferable. In hill regions lacking large tracts of grassy hillsides where conditions do not permit grazing in herds, even collectively-raised goats should be raised in pens.

Sichuan has 3.52 million sheep, most of them on the western plateau and in high and cold areas at 2,500 meters or more above sea level in Liangshan Yi Autonomous Prefecture and in Xichang County. This includes 1.1 million or more in Zoige and Serxu Counties, and more than 100,000 in each of the five counties of Hongyuan, Aba, Zhaojue, Sertar, and Yanyuan for a total of 1,805,000 in the seven counties or 51.4 percent of all sheep in the province. They are found in a more restricted area than goats.

Sichuan has two types of sheep: grassland sheep and mountain valley sheep, both of which are Tibetan sheep breeds. The grassland sheep are found on the northern part of the plateau. They tolerate coarse fodder, hunger, fatten easily, are strongly resistant to disease, have a strong herd instinct, and adapt to a high and cold environment. Mature sheep are shorn once each year, producing between 1 and 2 jin of wool. Wool quality is fairly coarse; most wool-producing parts of their body grow wool fibers measuring from 8 to 15 cm in length in a mixture for the most part. Each ram weighs about 65 kg and each ewe about 55 kg. Slaughter rate is approximately 40 percent. Valley sheep are found in the southern part of the plateau and in Liangshan Yi and Xichang Prefectures. They are smaller than the grassland sheep and their wool is fine and short. Most of their hair is 4 to 8 cm long. They are

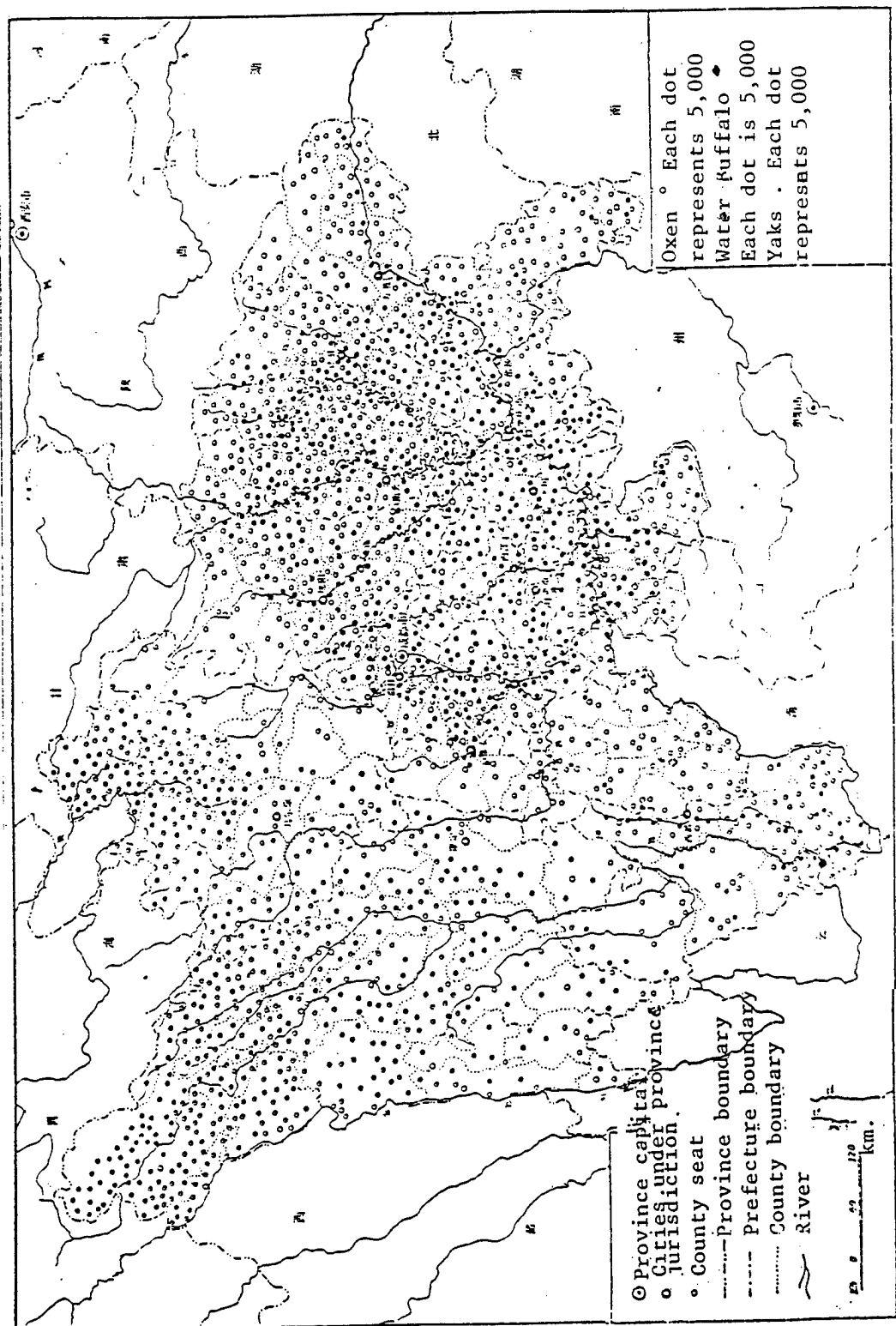


Figure 27. Distribution of Oxen, Water Buffalo, and Yaks in Sichuan Province

shorn between one and three times annually producing between 0.5 and 1.5 jin of wool annually. Mature sheep put on weight fast. Slaughter rate is higher than for grassland sheep at approximately 50 percent.

Since liberation, Sichuan Province has introduced different kinds of fine-wool and semifine wool breeds from elsewhere that have gone far to improve the Tibetan sheep breeds. Nevertheless, they have not been able to satisfy the needs of the wool textile industry in terms of either quantity or quality. A decision has been made on the basis of national needs and conditions in the province to move toward improving sheep to produce 48 to 50 count (coarse) semifine wool. For the future, strong attention will have to be given to increasing the numbers of sheep while simultaneously devoting efforts to improving breeds and building up the grasslands. This will be of extremely great importance in advanced industrial and agricultural production, in consolidating the alliance between industry and agriculture, in strengthening bonds among nationalities, in developing the economy of nationalities, and in increasing exports. (Please see Chapter 14 for details.)

3. Pattern of Bases for Livestock Breeding and Livestock Product Commodities

C. Hog-Raising Bases

"Neijiang hogs" and "Rongchang hogs" hold first and second position among the country's nine fine-breed hogs. "Chenghua hogs" are also a fine local breed in Sichuan. "Neijiang hogs" have large bodies, tolerate coarse fodder, are strongly adaptable, grow rapidly, have high fecundity, and are readily bred with other hog varieties. "Rongchang hogs" have medium-size bodies, tolerate coarse fodder, have high fecundity, are slaughtered in large numbers, and have outstanding quality fibers. "Chenghua hogs" have small bodies, tolerate coarse fodder, and highly adaptable, fatten and mature readily, and have a delicate flesh.

Sichuan has the job of providing the whole country with "Neijiang hog" and "Rongchang hog" breeding stock. At the same time, it also has to satisfy as best it can the whole province's needs for "Neijiang hog" and "Rongchang hog" breeding stock, as well as the western Sichuan basin's needs for "Chenghua hog" breeding stock. However, there are only approximately 100,000 head of "Neijiang breeding hogs" and "Rongchang breeding hogs" in the province, and only 70,000 head of "Chenghua breeding hogs," which is far from being able to satisfy demand from inside and outside the province. By way of making greater use of the role of these fine breeds, not only should efforts be made to increase their numbers, but also to improve their quality, and to increase the slaughter rate and the weight of fattened hogs through shortening the time it takes to fatten them.

In view of the hog-raising bases already in existence and convenience in shipping breeding hogs elsewhere, Neijiang Prefecture should be made into a base for "Neijiang breeding hogs." Its eight prefectural and county (or city) hog stud farms and hog farms, Neijiang City, Neijiang County and the Yinshan, Shuinan and Guide districts of Zizhong County, plus the Wuhuang District of Ziyang County should be the center of the base. The southwestern part of

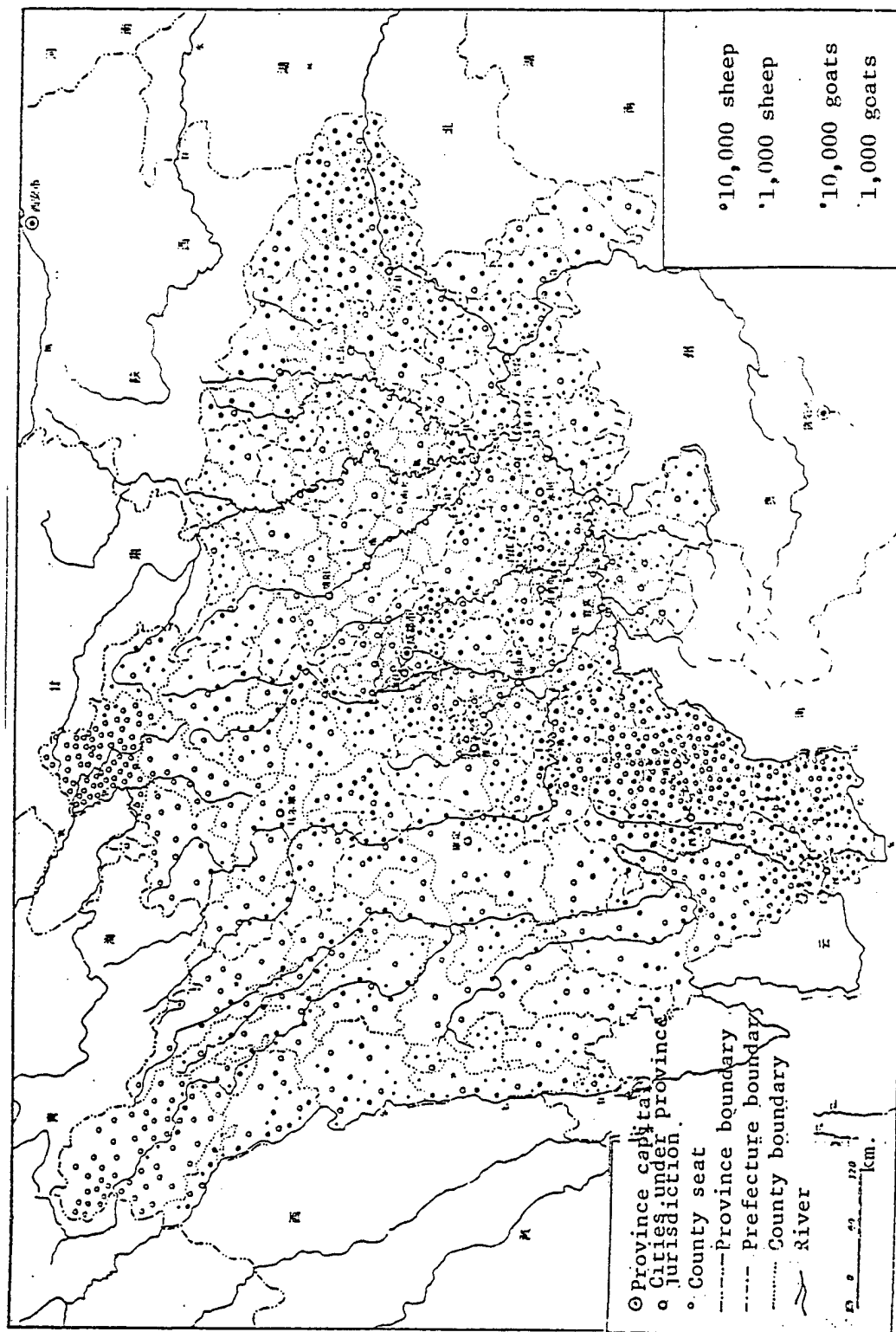


Figure 28. Map Showing Distribution of Sheep and Goats in Sichuan Province

Jiangjin Prefecture and the southeastern part of Yibin Prefecture should be a "Rongchang hog" breeding base centering around Rongchang, Longchang, Yongchuan, and Luxian Counties. The suburbs of Chengdu City and the southeastern part of Wenjiang Prefecture should be a breeding base for "Chenghua hogs." This base should center around Chengdu, Wenjiang, Pixian, Shuangliu, and Xindu Counties.

In the process of building hog-breeding bases, emphasis should be placed on increasing the proportion of state farm and collective breeding, on improving the availability of fodder, on changing the stage-by-stage feeding method (fattening of mature hogs), changing the tendency to emphasize the raising of sows rather than boars, overemphasis on the numbers of hogs, active development of artificial insemination, good selective breeding of reserve hogs and getting rid of substandard hogs in a planned effort to build up a nucleus of hog herds.

B. Commodity Hog Bases

As the building of socialism progresses and the standard of living rises, the amount of demand for pork increases daily. In order to meet this situation, it is necessary to build a number of mechanized and semimechanized large hog-raising enterprises in large and medium-size cities and at meat-processing plants. In addition, it is necessary to select a few counties that have ample fodder and a fairly good foundation for hog raising to act as commodity hog base counties and key points.

Some units concerned have already done preliminary planning to make 28 counties in the province into commodity hog base counties for the whole province. The counties are: Luxian, Jiangjin, Hechuan, Tongnan, Bazhong, Pingchang, Guang'an, Nanbu, Suining, Shehong, Pengxi, Ziyang, Jianyang, Anyue, Renshou, Meishan, Leshan, Pengxian, Guanghan, Xindu, Shifang, Chongqing, Pixian, Qionglai, Guanxian, Deyang, Mianzhu, and Mianyang. In 1977, these counties raised 15.7 million hogs and had 10.47 million head in inventory at the end of the year, or more than 28 percent of the total for the whole province. They had a 50-percent slaughter rate and provided the country with 248 million jin of commodity pork for a fairly substantial contribution.

The aforementioned 28 counties may be divided into three categories. Category 1 are high-yield grain counties (numbering 13 in all), all of them located on the plain in the western part of the basin and virtually forming a single tract. Not only do these counties have an ample grain ration, but they also plant the most winter green manure and livestock fodder crops. Both the green feed and the enriched feed required to raise hogs are fairly abundant. Hogs number 0.65 head per capita for first place in the whole province. (Footnote 2) (Figured on the number of head in inventory at year's end. The same applies hereinafter.) In the second category are counties that grow grain and spring-planted cash crops (numbering 10 in all). They are located virtually in a continuous tract in the hill region of the basin, and they grow mostly cotton as a cash crop. A very large percentage of dryland crops, such as sweet potatoes, corn, and broad beans, are intercropped with grain. After the stalks and stems from these crops have been chopped up, they make fine coarse fodder.

Thus conditions for hog raising are fairly good and the number raised is fairly high at 0.52 head per capita. In the third category are hill region counties in which the growing of grain in paddyfields (mostly winter paddyfields) predominates, but where grain rations are short and neither concentrated nor coarse feeds are as plentiful as in the foregoing two categories. Hog raising is at a fairly low level of 0.33 head per capita, which is lower than the average for the province as a whole. It is only because they are all large counties that the number of hogs in inventory is higher than in smaller counties.. It will be necessary to use the large numbers of winter paddyfields for the large-scale growing of red azolla as a basis for rapid improvement in the amount of fodder available to improve the level of hog raising.

C. Commodity Beef Bases

Nearly half of the oxen in Sichuan are concentrated in the 33 counties of the northern and eastern part of the province (Daxian, Xuanhan, Wanyuan, Tongjiang, Nanjiang, Bazhong, Pingchang, Quxian, Wanxian, Yunyang, Fengjie, Wushan, Zhongxian, Fengdu, Shizhu, Wulong, Pengshui, Qianjiang, Youyang, Xiushan, Yilong, Yingshan, Langzhong, Cangxi, Mianyang, Santai, Jiangyou, Zitong, Jiange, Wangcang, Guangyuan, Qingchuan, and Pingwu Counties). Most are mountain region counties and the remainder are counties with low mountains or high hills in which the terrain is relatively high where the climate is agreeable, being neither severely cold nor scorching hot (except for the river valleys in a few counties), where the turfed slope area is fairly large, and the basis for livestock raising is also good. Beef-processing plants have been built in Daxian, Nanjiang, Tongjiang, and Wuxian, thus conditions there are better than elsewhere for development of commodity beef, and plans call for making them into one of the country's 14 beef bases. First, it will be necessary to stress the work being done in 10 pilot project counties, namely, Daxian, Xuanhan, Wanyuan, Tongjiang, Nanjiang, Bazhong, Guangyuan, Jiange, Santai, Xintong, and Qianjiang and gradually import, little by little, Charolais, Simmental, and Holstein cattle for crossbreeding with local oxen to improve the breed the better to meet demand for beef.

D. Plow Animal Bases

Since mechanization of wetlands is more difficult than mechanization of drylands, particularly on small terraced fields in hill regions, full mechanization of plowing will require a process. Consequently, for some time to come, serious attention will have to be given to the reproduction of water buffalo.

The authorities concerned have already designated Hongya, Qijiang, Yibin, Shuyong, Dianjiang, Dechang, Daxian, Pingchang, Mingshan, Anyue, Muchuan, and Bazhong counties as plow oxen (or water buffalo) reproduction bases. Though these 12 counties have only 16 percent of the total number of water buffalo in the province, they all have a surplus of water buffalo, and they bear the main responsibility for providing the whole province with plow animals. Breeding

and feeding conditions in these counties is better than elsewhere, and they should be further consolidated and improved. Qijiang, Dechang and Dianjiang counties should breed mostly local breeds of "Qijiang oxen" "Dechang water buffalo" and "Fuling water buffalo," introducing outside blood in a planned way. The other counties should crossbreed Murrah water buffalo and niliruifei [1441 6849 3843 5481] buffalo with local breeds, developing in the direction of animals that can be used to plow, provide milk, and be used for meat.

In the process of building bases, old, weak, and crippled animals that have lost their ability to plow and to reproduce should be culled in a planned way. At the same time, the breeding and care of cows and bulls should be given main emphasis to build up and maintain a reserve of a certain number of cows of proper age and selection of a number of bulls consistent with needs for breeding. Efforts should be directed to full breeding so that all eligible cows are kept pregnant and bulls and cows should be cared for separately to prevent too early breeding, random couplings, and unplanned breeding.

E. Animal Husbandry Bases for All-Round Production of Hair, Wool, Hides, Meat, and Milk

Garze Zang, Aba Zang and Liangshan Yi Autonomous Prefectures as well as Xichang Prefecture in western Sichuan have virtually all the sheep, yaks, and pien niu in the province. They also have approximately 160 million mu of meadowlands suitable for grazing, making them a vast land for development of animal husbandry. As a result of the primitive livestock breeds and poor maintenance of the grasslands, output and quality of livestock products today is not very high, and far from satisfying the province's needs for hair, wool, hides, meat, and milk. In order to change this situation as rapidly as possible, the job of building bases will have to be done.

(1) The Aba semi-fine-wool base

This base includes Zoige, Hongyuan and Aba counties in Aba Zang Autonomous Prefecture where sheep number more than 91,000, or 26 percent of the total for the whole province. This is the place of greatest sheep concentration in Sichuan. Today most of them are still Tibetan-breed grassland sheep, where wool is not suitable for use by woolen textile industries. Since liberation, this area has imported some fine-wool and semi-fine-wool sheep for crossbreeding with the Tibetan sheep. Now it appears that the Tibetan sheep that have been improved by fine wool sheep (Xinjiang Merino sheep X Tibetan sheep) have virtually the identical quality of wool with a certain amount of coarse-wool sheep (border region Leicester sheep) blood lines mixed in. Additional breeding steps will be necessary and then within a certain period of time there will be the prospect of breeding a new semi-fine-wool breed sheep that provides both wool and meat. (Please see Chapter 14 for details.)

(2) The southwest Sichuan fine-wool sheep base

This base includes all of Liangshan Yi Autonomous Prefecture plus Huidong and Yanyuan counties in Xichang Prefecture, which has a grassland area of more

than 10 million mu and 27 percent of all the sheep in the province, 10 percent of which are improved-breed sheep, the largest number in the province at the present time. This is the region in which greatest results have been obtained from improved sheep; nevertheless the Tibetan-breed valley type sheep remain an overwhelming majority. In the future, mostly now available fine-wool rams and semi-fine-wool Romney rams should be crossbred and re-crossbred with local breed ewes to develop semi-fine-wool sheep that provide both wool and meat. (For details, please see Chapter 12.)

(3) The northwestern Sichuan sheep and yak base

Tibetan-breed grassland sheep are fitted for high and cold environments. Their wool is coarse and long, and though it does not meet the requirements of the woolen textile industry, it is a first-rate material for the manufacture of rugs and enjoys a very high reputation in foreign markets. The flesh of grassland sheep is tender and without a mutton taste. It is much enjoyed by the masses. Yaks are also very suited to high and cold environments, and they find wide use not only as draft animals, but also in providing milk, meat, and hair. Yak hair is fine for the most part. It is tough and tensile, has luster and may be use in making rugs and tents. As the national economy develops, the need for cattle and sheep that produce fiber for rugs increases steadily, so these two kinds of livestock breeds must be retailed. However, the quantity of the fiber and milk they produce, and their slaughter rates are low. They will have to be selectively improved steadily in the future.

In the northern and central part of Garze Zang Autonomous Prefecture (in Serxu, Sertar, Dengke, Dege, Baiyu, Garze, Luhuo, Xinlong, and Litang counties), the topography is high and cold; the climate is rather awful; supplemental fodder for livestock is difficult to obtain during winter and spring; the area is cut off from transportation; and conditions for improving sheep are poor. There are also large number of grassland sheep and yaks here (24 and 51 percent, respectively, of all the sheep and yaks in the whole province) and a lot of wool and hair are produced, which suits the area to be a sheep and yak base primarily for the production of fiber for use in making blankets.

F. Goat bases

The whole body of a goat is a treasure. Goat meat is in short supply in markets, and goat intestine casings and goatskins are important export items. Goat milk is a very good nutritional food. For these reasons, vigorous efforts to raise goats continues to be a requirement for development of the national economy. Furthermore, establishment of corresponding bases is an indispensably important method for raising goats.

The country is currently extremely attentive to the building of goat bases, and particularly to the collective raising of goats, to which major material and financial support has been given so that the percentage of collectively raised goats will steadily rise. This is of major significance in the

consolidation of the collective economy, in gaining control over the sources of supply of goats, in protecting does, and in propagating fine breeds to provide more commodity goats to the country.

The following several bases have been preliminarily decided on the basis of the existing foundation for raising goats in various places, the availability of fodder, and the availability of transportation:

(1) The eastern Sichuan goat base

This includes Wanxian, Yunyang, Fengjie, Wushan, Wuxi, Kaixian, Fengdu, Wulong, Pengshui, Xiyang, Xuanhan, Tongjiang, and Nanjiang for a total of 13 counties in all with a total of more than 1.16 million goats, or 20 percent of the total number in the province. These are all mountain region counties that virtually form a single contiguous area in which the turfed slope and brush area is fairly large, fodder grasses ample, and the foundation for goat raising good as well. "Fengjie ma goats," "Nanjiang yellow goats," and "Wanyuan banjiao goats" are all local breeds from which the masses have selectively bred fine breeds over a long period of time. In addition, water and land transportation is readily available in this area. Thus, it has fairly good conditions to make it a base.

The southwestern Sichuan goat base

This area includes Huili, Huidong, Ningnan, Miyi, Xichang, Dechang, Yanbian, Yanyuan, Zhaojue, Leibo, Xide, and Meigu for a total of 12 counties that have a total of 1.24 million goats, or 21 percent of the total for the province, or slightly more than the base next above. This is the region of Sichuan with the highest concentration of goats. The grasslands here are vast, natural fodder abundant, and the foundation for raising goats fairly good. In most counties, transportation is readily available, and commodity rates for both goat meat and goatskins are fairly high.

In addition, production bases for milk goat dairy products can be established in Maowen, Wenchuan, Dayi, Qionglai, Jianyang, Ya'an, Hongya, Yuexi, Nanjiang, and Luxian Counties. These would include the "tong goat" ("Chengdu mayang") production areas of Maowen and Wenchuan Counties plus the counties near Chengdu, which should mostly purify and rejuvenate native breeds, placing the emphasis on development of breeds that produce milk, meat, and hides. The other counties should concentrate on planned introduction of fine-breed milk goats (such as Saanen and Toggenburg), emphasizing increase in milk output.

Attached Tables

Master Table 1. Natural Survey of All Agricultural Regions in Sichuan

Particular item		Zone I	Zone II	Zone III	Zone IV	Zone V	Zone VI	Zone VII	Zone VIII	Zone IX
Number of counties and cities		29	30	26	19	32	14	10	19	16
Square Kilometers		2,81	5,33	3,83	4,02	9,18	3,13	3,43	11,55	13,48
Percentage of Province		4,95	9,39	6,75	7,03	16,17	5,52	6,01	20,35	23,75
Average height above sea level (meters)		400-750	400-700	300-700	300-900	600-2,000	800-3,000	1,000-3,000	2,000-4,000	3,300-4,500
Terrain characteristics		Mostly flatland next to mountains some hills	Mostly hills. Some mountains & flatland	Mostly low hills Some mountains Little flatland	Mostly low hills & Little hills Flatland	Mostly low mts plus hills & mts	Mostly medium plains Some low mts	Mostly low plains Some hills & mts	Mostly low plains Some hills & mts	Mostly low plains Some hills & mts
Average temperature (°C)		16-17.5	17-18	17.5-18.5	17-18.5	15-17	10-15	15-20	7-14	0-6
Cumulative temperatures (°C) when temperature is 10° C or above		1,800-5,200	5,300-5,700	5,300-6,000	5,000-5,800	4,500-5,500	3,000-5,000	1,500-6,000	2,000-4,000	400-1,500
Frost-free period		230-390	290-320	300-310	270-330	250-280	200-300	250-300	180-240	<120
Annual precipitation (mm)		650-1,200	900-1,000	1,000-1,200	1,000-1,200	1,100-1,500	800-1,100	800-1,100	500-800	500-700
Percent of annual precipitation between May through September		40-83	70-77	66-70	60-70	70-74	70-80	80-89	80-90	80-85

Note: Temperatures and precipitation in zones I through IX apply to basal areas

Master Table 2. Basic Situation in All Agricultural Regions of Sichuan Province

	Whole Province	Zone I	Zone II	Zone III	Zone IV	Zone V	Zone VI	Zone VII	Zone VIII	Zone IX
Population Density (persons per square kilometer)	159	474	455	482	415	136	55	67	8	3
Reclamation Index (%)	11.78	33.69	33.00	33.55	26.47	12.49	7.00	6.30	1.03	0.48
Cultivated land per capita (mu)	1.17	1.22	1.09	1.00	1.07	1.39	1.28	1.51	2.29	2.30
Cultivated land per capita of workforce (mu)	2.95	2.96	2.68	2.52	2.75	3.85	4.57	3.81	5.14	4.73
Cultivated land per draft animal (mu)	26.72	33.67	29.59	29.55	27.86	23.45	27.81	19.24	11.02	6.95
Paddyfields as a percentage of cultivated land	49.76	74.49	40.93	69.78	53.65	35.25	11.12	42.83	0.50	/
Winter paddyfields as a percentage of paddyfields	38.56	9.10	46.43	59.57	40.25	38.34	21.65	9.38	10.58	/
Mechanical horsepower per mu of farmland	0.05	0.07	0.05	0.05	0.05	0.03	0.03	0.05	0.05	0.07
Percentage of land machine farmed	14.68	32.46	15.53	14.22	7.94	7.63	7.27	10.55	7.89	25.65
Percentage of total area irrigated	42.20	75.99	40.47	44.39	37.92	24.27	20.37	48.34	25.13	20.89
Percentage of farmland from which a crop can be guaranteed despite drought or waterlogging	21.85	53.86	21.41	13.90	12.51	8.95	13.77	23.96	11.56	5.71
Amount of fertilization per mu (kgs)	53.73	98.08	55.85	59.22	44.27	34.76	16.29	27.88	20.57	5.40
Grain yields per capita (jin)	653	851	638	633	578	620	633	661	737	420
Grain yields per mu of farmland (jin)	641	903	718	696	593	476	362	483	333	194
Number of hogs per capita	0.43	0.64	0.47	0.35	0.32	0.38	0.51	0.52	0.60	0.19
Number of hogs per mu	0.37	0.53	0.43	0.36	0.30	0.28	0.27	0.34	0.26	0.03

Note: Except for the additional explanations provided on master tables 2 through 7, all statistical data has been taken from "National Economic Statistical Data for 1977" published by the Sichuan Provincial Statistical Bureau

Master Table 3. Status of Farming, Forestry, and Animal Husbandry in All
Agricultural Regions of Sichuan Province Units: (percent)
Whole province 100

Particulars	Zone I	Zone II	Zone III	Zone IV	Zone V	Zone VI	Zone VII	Zone VIII	Zone IX
Total population	14.70	26.31	20.38	18.19	13.77	1.89	2.57	0.99	0.19
Total agricultural popul.	13.55	23.32	20.56	17.43	11.43	2.04	2.28	0.90	0.49
Agricultural workforce	14.17	29.12	20.51	17.12	13.17	2.07	2.27	1.00	0.53
Total cultivated land	14.16	26.30	17.50	15.99	17.15	3.13	2.95	1.77	0.96
Area sown to farm crops	15.79	25.72	16.73	17.95	17.13	2.49	2.38	1.13	0.43
Grain sown area	13.72	24.37	17.57	18.77	18.58	2.71	2.48	1.27	0.53
Grain output	17.67	27.66	19.91	13.43	13.69	1.99	2.31	1.02	0.32
Paddy sown area	21.58	20.40	25.33	17.83	11.78	0.68	2.38	0.03	/
Paddy output	24.09	22.71	23.23	16.17	10.59	0.71	2.46	0.02	/
Wheat sown area	16.21	31.62	16.97	16.48	14.42	1.32	2.45	0.52	/
Wheat output	21.22	34.74	17.24	13.63	9.07	1.24	2.18	0.68	/
Corn sown area	9.44	17.28	9.48	18.64	32.51	6.27	3.45	2.92	0.01
Corn output	11.81	23.79	10.53	15.26	26.11	6.09	3.32	3.09	0.01
sown area	5.60	38.99	18.23	21.48	14.90	0.51	0.26	0.03	/
Sweet potatoes output	4.78	44.41	22.87	15.15	12.25	0.32	0.22	0.01	/
Potatoes sown area	6.72	2.85	2.51	24.22	46.68	9.53	4.57	2.78	0.14
Potatoes output	8.18	3.29	1.88	19.19	44.24	12.85	5.54	4.67	0.18
Highland barley ¹ sown area	/	/	/	/	/	/	/	23.79	76.21
Highland barley ¹ output	/	/	/	/	/	/	/	28.91	71.09
Cash crops sown area	10.62	43.33	11.27	12.48	10.17	0.66	2.11	0.27	0.09
Cash crops output	6.51	79.83	3.02	6.22	4.42	/	/	/	/
Cotton sown area	6.72	85.35	1.47	3.89	2.57	/	/	/	/
Cotton output	33.61	24.66	13.07	14.74	10.59	0.98	1.79	0.46	0.20
Rapeseed sown area	39.29	30.25	11.81	11.12	5.92	0.43	0.69	0.32	0.17
Sugarcane sown area	9.69	34.50	32.27	9.56	4.78	0.83	8.36	/	/
Sugarcane output	11.86	33.44	30.96	6.63	3.15	1.14	13.82	/	/
Timber forest area	3.26	5.29	2.31	5.71	19.83	9.42	17.26	24.71	12.21
sown area	1.59	1.24	0.97	0.91	9.86	11.39	10.37	39.05	21.62
Wasteland & mts suitable for forests	2.03	6.91	3.01	6.01	33.56	18.01	16.95	9.64	4.73
Mulberry silkworm cocoon output	4.55	47.45	30.60	12.79	4.19	0.24	0.17	0.01	/
Tea output	10.96	2.08	14.50	14.61	52.91	4.44	0.03	1.37	/
Raw lacquer output	5.91	/	/	2.20	74.50	3.75	3.01	10.57	/
Tung seed output	1.43	17.12	17.56	20.14	42.17	1.09	0.19	/	/
Tea oil output	8.80	3.63	39.51	1.75	45.65	0.15	0.49	/	/
Tallow tree output	8.46	13.52	8.38	1.87	62.34	3.46	1.97	/	/
Walnut output	1.89	12.14	0.92	2.15	44.43	17.38	8.21	12.87	0.01
Fruits: Citrus output	3.80	25.74	31.68	25.89	12.03	0.52	0.27	0.07	/
Apple output	20.47	23.54	0.92	5.07	14.89	12.81	2.04	19.92	0.32
Pear output	11.21	25.97	10.40	6.77	6.21	11.81	16.99	10.62	0.02
Livestock: Hogs	20.15	30.54	16.86	13.05	12.81	2.39	2.73	1.25	0.22
Oxen	4.63	17.14	1.17	11.87	34.57	8.72	8.44	8.37	5.09
Water buffalo	13.91	25.09	23.40	17.04	13.98	1.31	5.25	0.02	/
Yaks & pien niu (incl. ajiao yaks)	/	/	/	/	0.04	0.05	0.20	19.43	50.28
Horses, donkeys & mules	2.47	0.64	1.99	2.33	3.31	7.78	13.90	18.87	43.83
Goats	2.53	7.48	5.47	9.49	20.89	9.85	19.82	15.53	8.94
Sheep	0.03	0.08	/	/	0.50	22.46	11.15	12.49	53.28
Total	14.74	23.44	13.21	11.27	13.32	4.63	5.46	4.81	9.12
Figured as converted units ²	12.19	21.62	12.27	11.01	13.93	3.86	4.85	5.70	13.95

Note: 1. 1973 statistics for highland barley. 2. Method for converting livestock units: 1 large livestock animal equals 5 sheep or goats, or 3.3 hogs.

Master Table 4. Structure of Crops Sown in All Agricultural Regions of Sichuan

Units: (percent)

Particulars	Province									Zone			
	Whole	Zone I	Zone II	Zone III	Zone IV	Zone V	Zone VI	Zone VII	Zone VIII	Zone IX	Zone X	Zone XI	Zone XII
Grain-sown area as percentage of total sown area	85.59	74.35	80.47	89.90	89.53	92.86	93.24	89.06	96.05	94.04			
Winter grain-sown area as percentage of sown area	31.36	30.09	39.74	25.96	30.87	31.89	14.91	28.05	13.96	/			
Spring grain-sown area as percentage of sown area	68.64	69.91	60.26	74.04	69.13	68.11	85.09	71.95	86.94	100.00			
Paddy-sown area as percentage of total grain area	33.47	52.63	28.01	48.21	31.79	21.21	8.42	32.10	0.74	/			
Double-crop paddy area as percentage of field area	1.91	11.51	3.49	12.19	8.49	1.71	0.14	2.31	/	/			
Winter wheat area as percentage of grain-sown area	18.88	22.32	24.53	18.23	16.58	14.66	9.18	18.69	7.76	26.07			
Potato-growing area as percentage of grain area	4.19	2.35	0.56	0.69	6.13	12.04	16.81	8.86	10.47	1.32			
Sweet potato area as percentage of grain area	12.71	5.19	20.33	13.19	14.54	10.19	2.37	1.35	0.29	/			
Corn-growing area as percentage of grain area	14.17	9.96	10.26	7.81	14.36	25.31	33.45	20.14	33.24	0.25			
Highland barley area as percentage of grain area	0.46	/	/	/	/	/	/	/	8.29	63.93			
Other grain-growing area as percentage of grain area	16.12	7.55	16.34	11.84	16.55	16.59	29.74	18.86	39.21	34.50			
Cash-crop area as percentage of grain-growing area	13.61	18.86	22.43	8.76	10.67	8.07	2.72	9.75	2.09	1.33			
Cash-crop area as percentage of total area sown	7.86	9.76	13.14	5.30	5.46	4.67	2.07	6.97	1.89	1.54			
Cotton area as percentage of cash-crop-growing area	29.66	9.85	54.65	7.95	14.78	12.88	/	/	/	/			
Rape area as percentage of cash-crop-growing area	37.15	63.63	21.15	43.08	43.88	38.32	55.52	31.51	62.34	79.68			
Sugarcane area as percentage of cash-crop area	5.52	2.73	4.40	15.81	4.23	2.60	6.99	21.87	/	/			

Master Table 5. Structure of Grain Crop Output in All Agricultural Regions of Sichuan

Particulars	Whole Province	Zone I	Zone II	Zone III	Zone IV	Zone V	Zone VI	Zone VII	Zone VIII	Zone IX
Winter-sown grain as percentage of total	17.59	17.68	22.25	13.53	15.39	18.69	10.34	14.97	13.09	/
Spring-sown grain as percentage of total	82.41	82.32	77.75	86.47	84.61	81.31	89.66	85.03	86.91	100.00
Paddy as a percentage of total grain	50.39	68.70	41.37	58.77	52.82	38.99	18.10	53.80	1.13	/
Wheat as a percentage of total grain	11.88	14.27	14.92	10.28	10.50	7.90	7.42	11.20	7.91	/
Corn as a percentage of total grain	12.65	8.46	10.88	6.68	12.51	21.12	38.69	18.17	38.37	0.36
Sweet potatoes as percentage of total	14.90	4.03	23.91	17.11	14.63	13.33	2.37	1.42	0.16	/
Potatoes as percentage of total grain	2.76	1.28	0.33	0.26	3.43	8.92	17.82	6.62	12.63	1.62
Highland barley as percentage of total grain	0.25	/	/	/	/	/	/	/	7.25	55.53
Other grain as percentage of total grain	7.17	3.26	8.59	6.89	6.11	6.84	15.60	8.79	32.55	42.49

Master Table 6. Average Crop Yields in All Agricultural Regions of Sichuan

Crop	Whole Province	Zone I	Zone II	Zone III	Zone IV	Zone V	Zone VI	Zone VII	Zone VIII	Zone IX
Paddy	567	633	631	520	514	510	595	588	460	/
Wheat	237	310	260	241	196	149	223	210	308	/
Corn	329	412	453	368	270	284	320	317	349	331
Sweet potatoes	441	377	503	554	311	363	276	369	184	/
Potatoes	217	264	251	162	172	206	293	262	365	279
Highland barley	/	/	/	/	/	/	/	/	227	174
Cotton	67	69	72	33	42	39	/	/	/	/
Rapeseed	119	139	146	137	00	67	52	46	83	98
Sugarcane	3,654	4,468	3,542	3,505	2,155	2,410	5,039	6,042	/	/

Master Table 7. Distribution of Livestock in All Agricultural Regions of Sichuan Province

(Total number of livestock = 100)

Livestock	Whole province	Zone									Zone								
		I	II	III	IV	V	VI	VII	VIII	IX	I	II	III	IV	V	VI	VII	VIII	IX
Hogs	66.76	91.27	87.02	85.26	77.30	64.22	34.47	33.42	17.26	1.61									
Oxen	4.97	1.56	3.63	0.44	5.23	12.89	9.34	7.67	8.64	2.77									
Water buffalo	5.51	5.22	5.90	9.77	8.33	5.79	1.56	5.30	0.03	--									
Yaks and pien niu	5.05	--	--	--	--	0.02	0.06	0.18	20.36	44.41									
Horses, mules, donkeys	0.70	0.12	0.02	0.11	0.15	0.18	1.18	1.78	2.75	3.74									
Goats	10.68	1.83	3.41	4.42	8.99	16.67	22.70	38.73	34.54	10.51									
Sheep	6.33	--	0.02	--	--	0.23	30.69	12.92	16.42	36.96									
Figured in terms of natural number of head																			
Hogs	50.75	79.22	72.03	69.75	60.17	46.66	31.40	28.61	11.08	0.80									
Oxen	12.46	4.47	9.92	1.19	13.43	30.90	28.07	21.67	18.30	4.55									
Water buffalo	13.83	14.91	16.13	26.38	21.41	13.88	4.69	14.97	0.07	--									
Yaks and pien niu	12.66	--	--	--	--	0.04	0.19	0.52	43.13	72.91									
Horses, mules, donkeys	1.76	0.34	0.05	0.29	0.37	0.42	3.54	5.04	5.83	6.15									
Goats	5.36	1.05	1.86	2.39	4.62	7.99	13.66	21.89	14.63	3.45									
Sheep	3.18	0.01	0.01	--	--	0.11	18.45	7.30	6.96	12.14									
Figured in terms of converted number of head																			