

CHAPTER 4

PREVAILING INSTITUTIONS AND TECHNOLOGY ADOPTION IN THE PRESENT CROP PRODUCTION SYSTEMS OF GUIZHOU PROVINCE

4.1 General Information About Surveyed Villages

In order to understand the whole crop production systems of Guizhou province, and to get a sound picture of present institutions, input use and working processes of the agricultural systems, three aspects were taken into account in village selection, (1) Distance from the capital city, the provincial economic and technology generating center, (2) Resources endowments, and (3) Proportion of minority people. These three respects are supposed to reveal the characteristics of the whole province which is rich in culture and has diverse economic environments and widely-varied physical factors.

Jiantan village locates in the north, more than 500 kilometers away from the provincial capital city. This village is in the region which was relatively earlier developed and densely populated, economic progress is ahead of other regions of the province. Agricultural production is the main activities at this village. Crops grown are rice, corn, oilseed, soybean, wheat, also mungbean as a minor crop. Soil is mostly steep upland type, Terraced paddy fields are highly fragmented and widely scattered. Approximately, there is around 70 % of the total paddy is rainfed, the rest is irrigated by gravity running stream water, man-made reservoir water resources are very limited and used inefficiently.

Huaxi is on just the outskirts of the capital city where there is a good accessibility to input and output markets. This village is in the central part of the province, topography is in a better situation than the former village. Provincial agricultural research academy and other agriculture related institutions are located nearby this village. Rice, corn, oilseed, soybean among others, are the main crops distributed in the village. Production activities in farm households are not confined to agricultural production, non-agricultural employment opportunities around the village are available.

Kaizho village lies in the south Guizhou province, about 60 kilometers from Guiyang. Most of the people living in this village are Buyi, a common minority group in Guizhou province. This hilly village has more than half of its land resources being paddy field, the small percentage of upland is devoted to grow corn for animal feed. Land availability per capita tops most other regions in this province. Irrigation is mostly surface irrigation type by using the stream water source. Besides, reservoir water resource is also ready to be utilized.

4.2 Family and Farm Operation Size

Different family sizes in the three investigated village were found. At Jiantan village, smaller sized family is preferred, which maintains mostly (92% of the total surveyed households) the family size at the size of 1 to 5 persons. While at Kaizho 6-10 member families are commonly existing. At the third village--Huaxi, family size is in between. Family size is a reflection of the cultural background of

different group of people. The same trend is followed by the farm size (Figure 7). Majority of the families at Jiantan in the northern region have the landholding of 0.5 to 5 mu, but in the southern village of Kaizho farm size is greater than 20 mu. A slight difference between Jiantan and Huaxi village.

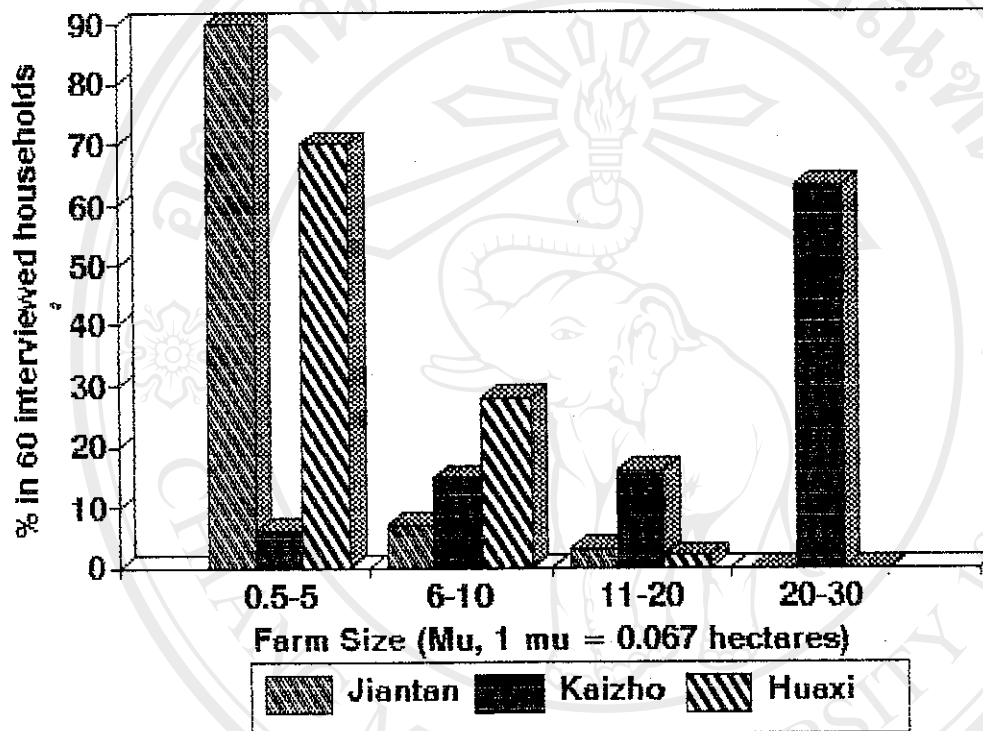


Figure 7. Frequencies of farm size at three villages in 1992

4.3 Land Resource and Distribution

The most important event occurred in China's economic reform at the end of 1970s was land allocation. Since then, even the ownership is

still commanded by the government, rights of land utilization have been given to the individual households. Land was divided based on family members, each person got exactly the same amount of land to use, but this confines only to the boundary of former production team. Land each person obtained across the different production teams may not be the same, even among those nearby. Lot drawing was the common approach being employed for land allocation after land grading and combining of fertile with infertile land. The popular method, among some others, caused land resources highly fragmented, farm land of individual household spreads widely and plots are far from each other, particularly in the mountainous areas (Table 1). This widespread plots of small area have caused difficulties in field management, pest control, irrigation, etc. in production processes, and probably, it may lead to input use less effectively, eventually result in a higher inefficiency and raise conflicts among households.

This existing land resource allocation institution has raised the uneven land distribution to a certain extent. It is reported that at the beginning farmers were told to contract land for five year, later, extended to ten years. Up to now 13 years have passed since the first land allocation in 1978, nothing about land allocation is changed. With the once and for a long time land policy and different population growth rate in each individual household, man-land ratio is changing across households, this increasing inequity in land resource distribution was widely observed.

Table 1. Spread of farm land classified by the number of locations

| No. of locations farm land spread | Village | | | | | | | | | | |
|-----------------------------------------|----------------------------|---------|--------------------|-----------|------|--------------------|-----------|------|--------------------|----|------|
| | Jiantan | | | Kaizho | | | Huaxi | | | | |
| | No. of HH | % | ave. plot size(mu) | No. of HH | % | ave. plot size(mu) | No. of HH | % | ave. plot size(mu) | | |
| Paddy | Location | 1 | 19 | 32 | 1.32 | 2 | 2 | 3.5 | 12 | 20 | 0.7 |
| | | 2-4 | 35 | 58 | 0.76 | 25 | 43 | 1.9 | 42 | 70 | 0.8 |
| | | 5-7 | 5 | 8 | 0.52 | 30 | 50 | 2.1 | 6 | 10 | 0.4 |
| | | 8-10 | 1 | 2 | 0.25 | 3 | 5 | 1.6 | - | - | - |
| Field | Ave. distance of plots(KM) | 1.2-1.5 | 44 | 73 | - | 60 | 100 | - | 36 | 60 | - |
| | | 1.6-3.0 | 9 | 15 | - | - | - | - | 18 | 30 | - |
| | | 3.1-4.5 | 7 | 12 | - | - | - | - | 6 | 10 | - |
| Up-land | Locations | 1 | 2 | 3 | 1.15 | 3 | 5 | 0.63 | 13 | 22 | 0.86 |
| | | 2-4 | 17 | 28 | 0.20 | 36 | 60 | 0.75 | 27 | 45 | 0.70 |
| | | 5-7 | 21 | 35 | 0.26 | 19 | 31 | 0.79 | 12 | 20 | 0.81 |
| | | 8-10 | 10 | 17 | 0.20 | 2 | 4 | 0.75 | 8 | 13 | 0.70 |
| | | >11 | 10 | 17 | 0.15 | - | - | - | - | - | - |
| | Ave. distance of plots(km) | 0.3-1.5 | 23 | 38 | - | 56 | 93 | - | 32 | 54 | - |
| | | 1.6-3.0 | 24 | 40 | - | 3 | 5 | - | 20 | 33 | - |
| | 3.1-4.5 | 10 | 17 | - | 1 | 2 | - | 8 | 13 | - | |
| | >4.5 | 3 | 5 | - | - | - | - | - | - | - | |

Source: formal survey

Table 2. reveals that at Jiantan village the average man-land ratio in 0.1 to 0.5 category is as many as three times less than that of households with 0.6-1.0 man-land ratio. Similar cases are found at other two surveyed villages. This table also shows a wide difference in man-land ratio across villages located in different regions.

Table 2. Distribution of man-land ratio (MLR in mu/person) in the three surveyed villages in 1992

| Man-land ratio category | Village | | | | | | | | |
|-------------------------|-----------|------|-----------|-----------|------|-----------|-----------|------|-----------|
| | Jiantan | | | Kaizho | | | Huaxi | | |
| | No. of HH | % | aver. MLR | No. of HH | % | aver. MLR | No. of HH | % | aver. MLR |
| 0.1-0.5 | 19 | 32 | 0.28 | 1 | 2 | 0.50 | 25 | 41 | 0.35 |
| 0.6-1.0 | 31 | 52 | 0.85 | 3 | 6 | 0.73 | 20 | 33 | 0.85 |
| 1.1-1.5 | 8 | 13 | 1.19 | 10 | 16 | 1.36 | 5 | 8 | 1.35 |
| 1.6-2.0 | - | - | - | 16 | 27 | 1.80 | 10 | 18 | 1.60 |
| 2.1-2.5 | 2 | 3 | 2.40 | 15 | 25 | 2.32 | - | - | - |
| 2.6-3.0 | - | - | - | 7 | 11 | 2.79 | - | - | - |
| 3.1-3.5 | - | - | - | 5 | 8 | 3.25 | - | - | - |
| > 3.5 | - | - | - | 3 | 5 | 4.60 | - | - | - |
| Village aver. MLR | | 0.76 | | | 2.12 | | | 0.81 | |

* 1 mu = 0.067 hectares.

Source: formal survey

4.4 Farmer's Investment on Land

Investment on farm land by farmers has been surprisingly low after the land reform. For instance, at Jiantan, 78% of interviewed farmers never invested on their land. Among those who have some investment activities, the level of their investment was less than 100 yuan. At Huaxi village, this situation is even worse with 83% of the total investigated households having no investment at all. The third village, kaizho, is a bit better (Table 3).

Table 3. Investment by farmers on their contracted land

| Investment (yuan) | Village | | | | | |
|----------------------|-----------|-----|-----------|-----|-----------|-----|
| | Jiantan | | Kaizho | | Huaxi | |
| | No. of HH | % | No. of HH | % | No. of HH | % |
| No invest. | 47 | 78 | 52 | 87 | 50 | 83 |
| < 100 | 13 | 22 | 2 | 3 | 10 | 17 |
| 101-500 | - | - | 5 | 8 | - | - |
| >500 | - | - | 1 | 2 | - | - |
| Total | 60 | 100 | 60 | 100 | 60 | 100 |

Note: 1 Chinese yuan = US \$ 0.17 equivalent to 4.5 baht.

Source: formal survey

One reason causing low investment, among many others, worth mentioning is incomplete contract systems. Farmers do not hold any land use contract, instead, they have contracts on amount of grain obligated to sell to the government and amount of grain for land tax. This contract was through the head of villages or other related village leaders, not the farmer to government officer directly, this incomplete contract system becomes more incomplete with land subdivision within households. Grown-up children usually separate from their parents and form new households. The newly-formed household of course has no land use contract. Social survey indicated that 23% households at Jiantan have no contracts, while at Huaxi it is 38%. The rest hold above-mentioned grain selling contracts.

Incomplete contract systems has brought about confusions in duration of land use. 86% surveyed farms at Jiantan, 91% at Kaizho and

100% at Huaxi reported have no idea on how many years they can go on using their contracted land. Without certainty, farmers are reluctant to get their capital and labor fixed on the land.

On the present land distribution systems, farmers showed their satisfaction. More often than not, one advantage is the independence in farming decision making and free choices for family activities. The advantage of land allocation policy has function of promoting incentives to the farmers for production. Nevertheless, this land institution has also its disadvantage. As Table 4 indicates, 47% of total sampled farms feel unsatisfied toward the land allocation institution.

Table 4. Opinions toward existing land allocation

| Village | Satisfied | | Unsatisfied | | | | | | subtotal % | |
|---------|-----------|----|-----------------------------------|----|----------------------------|----|-------------------------|----|------------|----|
| | No. of HH | % | Highly fragmen- -ted farm land | | Unfair in manland ratio | | Unfair in soil fert. | | | |
| | | | No. of HH | % | No. of HH | % | No. of HH | % | | |
| Jiantan | 8 | 13 | 33 | 55 | 28 | 47 | 9 | 15 | 52 | 87 |
| Kaizho | 42 | 70 | 5 | 8 | 14 | 23 | - | - | 18 | 30 |
| Huaxi | 46 | 77 | 14 | 23 | 14 | 23 | - | - | 14 | 23 |
| Total | 96 | 53 | 52 | 29 | 56 | 31 | 9 | 5 | 84 | 47 |

n=180

Source: formal survey

Increasing uneven man-land ratio seems to be the predominant reason among other two, which accounts for 31% of total unsatisfied households, high fragmentation of land is another important reason. However, soil fertility is not a severe problem, which can be explained

by the careful grading of land before division. Different regions the disadvantages of present land allocation system are varying, seriousness of the problems differs across villages.

4.5 Institutions of Irrigation Facility Maintenance

The three villages all have persons who are in charge of irrigation facilities maintenance. These persons get payment collected from farmers. This study reveals that these persons bearing responsibility are not responsible. Congested and damaged irrigation canals can not get timely repaired, poor maintenance is widely reported (Figure 8.).

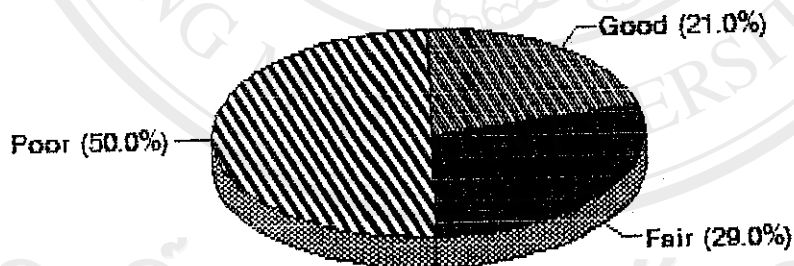


Figure 8. Farmers' evaluation on irrigation facility maintenance

Inefficient functions of irrigation canals caused by improper care gave rise to crop damage, especially at where has serious water scarcity and when drought has occurred. For instance, on the 180 sampled farms, 78 households, 43% of the total sample reported they incurred some loss. Jiantan alone, 39 households got crop damage of various degree, Kaizho 30 farms have suffered loss. In much better situation, only 9 farms in total 60 at Huaxi village have been affected by shortage of irrigation water.

Poor maintenance of irrigation facilities, plus other reasons, may cause water use conflicts among households. Table 5 clearly states that 47% of the total farms investigated have experienced some conflicts with their neighboring farms.

Table 5. Water use conflicts and its causes

| Village | Conflict | | | | | | | |
|-----------|-----------------------|----|----------------------|---|----------------------|----|-------------------------------|----|
| | No water use conflict | | Scarce water sources | | Lack of organization | | Passing through other's field | |
| | No. of HH | % | No. of HH | % | No. of HH | % | No. of HH | % |
| Jiantan | 21 | 35 | 4 | 7 | 6 | 10 | 29 | 48 |
| Kaizho | 29 | 48 | - | - | 12 | 20 | 19 | 32 |
| Huaxi | 46 | 77 | 5 | 8 | - | - | 9 | 15 |
| Total | | | | | | | | |
| No. of HH | 96 | | | | 84 | | n=180 | |
| % | 53 | | | | 47 | | | |

Source: formal survey

It seems that the conflicts cropped up are the problems of organization and passing through others' fields due to the incomplete irrigation systems, rather than the shortage of water source in many cases. Incomplete irrigation system induced passing through conflict is the main type of conflicts across the three villages, it is followed by lack of effective management. Occurrence of conflicts varies from village to village.

4.6 Inputs Used

In this study, the emphasis is placed on chemical fertilizer use, modern variety application including high yielding rice and corn varieties, and machinery utilization on the surveyed farms. In relation to traditional input use, main considerations were given to the use level of compost, the long time practiced fertilization technique. Survey results indicate that urea occupies the first place of importance in all types of chemical fertilizer (Table 6.). Above 90% of the total farms use urea with the application level of 13.3 kg/mu or more. The second most popular is calcium magnesium phosphate. Totally, there are 65 households out of 180 are using calcium magnesium phosphate.

High-yielding variety adoption, both rice and corn, has become common, in particular high yielding rice variety at villages of Jiantan and Huaxi where man-land ratios are comparatively lower. For corn the lowest percentage of modern variety growing area is as high as 69% of the total, only a slight difference exists across the villages.

Table 6. Level of input use in the three investigated villages in 1992

| Input applied level | | Village | | |
|---------------------|--------------------------------------------------|---------|--------|-------|
| | | Jiantan | Kaizho | Huaxi |
| Chemical fert. | <u>Urea</u> | | | |
| | No. of HH use | 57 | 53 | 60 |
| | Aver. amount used (kg/mu) | 15.5 | 13.3 | 15.7 |
| | <u>Ammonium bicarbonate</u> | | | |
| | No. of HH use | 5 | 33 | 3 |
| | Aver. amount used (kg/mu) | 29 | 19 | 20 |
| | <u>Calcium Magnesium phosphate</u> | | | |
| | No. of HH used | 26 | 34 | 5 |
| | Aver. amount used (kg/mu) | 46 | 49 | 20 |
| Tradition-al fert. | <u>Compost</u> | | | |
| | No. of HH use | 50 | 52 | 51 |
| | Aver. amount used (kg/mu) | 1354 | 962 | 936 |
| Modern variety | <u>Rice High yielding variety (HYV)</u> | | | |
| | No. of HH use | 56 | 47 | 57 |
| | proportion of Rice HYV in total rice area (%) | 93 | 63 | 94 |
| | <u>Hybrid corn</u> | | | |
| | No. of HH used | 46 | 51 | 54 |
| | proportion of Hybrid corn in total corn area (%) | 69 | 71 | 80 |

Source: formal survey

Chemical spraying, irrigation, and transportation seem to be the major areas in which machinery has its involvements. Particularly, use for irrigation, followed by chemical spraying. Machinery use for transportation is affected by topography and road conditions at given place, at the relatively flat areas transportation use is more commonly practiced, while in the mountainous region such as Jiantan village,

transportation use of machinery is hardly found. Another striking result is the number of households in which machinery is never involved in any activities. However, the numbers of households never use machinery are significantly different across villages.

Table 7. Machinery use in agricultural production processes in three surveyed villages in 1992

| Purpose of machinery use | Village | | | | | | | |
|--------------------------|-----------|----|-----------|----|-----------|----|-----------|----|
| | Jiantan | | Kaizho | | Huaxi | | Total | |
| | No. of HH | % | No. of HH | % | No. of HH | % | No. of HH | % |
| Never use | 40 | 67 | 1 | 2 | 13 | 22 | 54 | 30 |
| Chemical spraying | 15 | 25 | 11 | 18 | 42 | 68 | 68 | 38 |
| Irrigation | - | - | 54 | 90 | 40 | 67 | 94 | 52 |
| Transportation | 5 | 8 | 45 | 75 | 14 | 23 | 64 | 36 |

Source: formal survey

Compost is still an essential input in crop production in Guizhou province. 153 households in the three villages are applying compost to fertilize their farmland. Applied amount of compost is quite high with more than 930 kg per mu. Even on the farms at Huaxi village which near the urban city having good access to the modern input market, the average compost use level is still not lower than 936 kg/mu.

4.7 Input and Output Marketing

The economic reform brought in a considerable change in marketing processes for agricultural inputs and produces. Policy allows farmers to

transact their excessive commodities in the marketplaces at freely settled price based upon the demand and supply. Marketing function development has created convenience to a certain extent for farmers to buy needed material inputs and sell their products, marketing channels and outlets for farmers have also been increased.

But some obstacles in agricultural markets however, do exist. Because of the shortage in supply side of some inputs, chemical fertilizer, high quality crop seed, and plastic film for instance, as the result, those commodities are brought under the control of government with one of the initial purposes to avoid price manipulations, state-run shops or agencies are the monopolistic suppliers of these agricultural inputs. Chemical fertilizer especially urea, is allocated at the subsidized price to household based on the amount of contracted grain the household sold to the government and the amount of pig supplied by the farmer to the government. As a common phenomena the quota fertilizer is well not enough, more importantly, in many cases, if not most, the quota supply was failed to be met. Reportedly, one reason is because of the leak from state owned shops to the free markets for high price at local level. Many farmers buy chemical fertilizer from the free markets at much higher price to fill the shortage of supply by the fertilizer quota (Table 8.). For those farmers who have run out of their capital can not do so to make up their shortage, certainly, will use less input, and in turn produce lower output level.

Table 8. Urea prices at different markets in 1992

| Market | Urea price (yuan/kg) | | | | | |
|-------------------------------------------|----------------------|------|------|------|-----|------|
| | 0.57 | 0.60 | 1.00 | 1.15 | 1.2 | 1.25 |
| State owned shop | 0.57 | 0.60 | | | | |
| Free markets | | | 1.00 | 1.15 | 1.2 | 1.25 |
| No. of HH buying at different prices | 50 | 35 | 22 | 38 | 14 | 21 |
| % of HH buying at different prices | 28 | 19 | 12 | 21 | 8 | 12 |
| % of HH buying at govern. supported price | 47 | | | | | |
| % of HH buying at free mkt prices | | | | 53 | | |

Source: formal survey

Shortage of material input supply can be reflected by Figure 9. Based on the figure, it can conclude that only small percentage of households have no input supply shortage problem. Chemical fertilizer shortage is the most severe problem facing farmers. Crop seed and pesticide supply however, is not so much of a problem. Here input supply shortage is referred to as both not timely available and shortage in absolute amount of inputs.

For the outlets of agricultural products, there are mainly two categories, one is government buying shop, the other is free selling markets. The former deals with contracted selling of agricultural products, excessive portion of production over contracted selling and family consumption changes hands at free markets or government shops at agreed prices. However, before the government shops have collected all

the contracted grain, individual transactions of cereal at free markets are not allowed, private engagement in grain trade among different

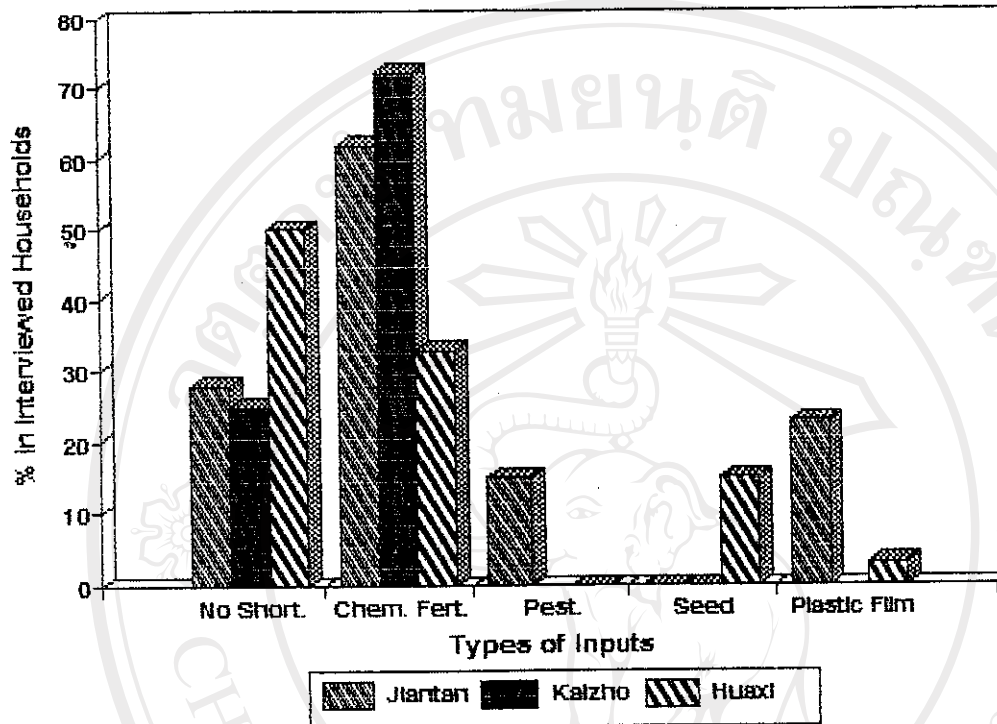


Figure 9. Shortage of input supply in surveyed villages

jurisdiction regions is again not allowed, except the authorized agencies by government. Although after reform, marketing channels for agricultural products have got increased and improved, at least, farmers can freely sell and buy once they have fulfilled contracted selling, products outlets are still rigid and constrained by the government monopolized market, the existing completely different priced marketing system (Table 9.) to a certain degree jeopardizes agricultural production.

Table 9. Output markets and prices in 1992

| Products | Price (yuan/kg) | | | | | |
|----------|-----------------------|--------|-------|--------------|--------|-------|
| | Govern. buying agency | | | Free markets | | |
| | Jiantan | Kaizho | Huaxi | Jiantan | Kaizho | Huaxi |
| Rice | 0.52 | 0.56 | 0.52 | 0.90 | 0.95 | 1.20 |
| Oilseed | 1.40 | 1.40 | 1.70 | - | - | - |
| Pig | 2.30 | 2.40 | 2.80 | 2.50 | 4.50 | 5.30 |

Source: formal survey

4.8 Technology Diffusion Institutions

Technology transfer from research centers to the villages and individual users rests on the researchers from agriculture related educational and technology generating institutions, and depends on the extension officers from agricultural administration offices of different levels. For the grassroots users, those at far-away areas in particular, the most common source is contracted extension officers, who were formerly farmers having been trained for a short time. Apart from the extension workers, nearby farmers and self-learning are important complementary means to reach the newly-developed or improved production techniques (Table 10.).

Lack of qualifications for those short-trained workers is suspected to be one reason resulting in an increase in frequency of failures in technology transfer, low service quality of contracted extension workers (Table 11) is also a worrying problem along with others.

Table 10. Ways to learn new production technique for the three villages

| Technique source | Village | | | | | |
|---------------------------------|-----------|----|-----------|----|-----------|----|
| | Jiantan | | Kaizho | | Huaxi | |
| | No. of HH | % | No. of HH | % | No. of HH | % |
| Extension officer | 32 | 53 | 35 | 59 | 39 | 65 |
| Nearby farmers | 16 | 27 | 9 | 15 | 5 | 8 |
| Books, radio or other materials | 3 | 5 | 5 | 8 | 11 | 18 |
| Total | 51 | 85 | 49 | 82 | 55 | 91 |

Table 11. Extension service by times visited by extension worker in a year

| Times visited by extension officer | Village | | | | | |
|------------------------------------|-----------|-----------|-----------|-----------|----|--|
| | Jiantan | Kaizho | Huaxi | subtotal | | |
| | No. of HH | No. of HH | No. of HH | No. of HH | % | |
| 0 | 16 | 13 | 5 | 34 | 19 | |
| 1-3 | 35 | 29 | 32 | 96 | 53 | |
| 4-10 | 4 | 18 | 7 | 29 | 16 | |
| > 10 | - | 6 | - | 6 | 3 | |
| Total | | | | 165 | 91 | |
| | n=180 | | | | | |

Source: formal survey

In this study, there are only 15 households in 60 at Jiantan village having no problem of crop seed quality, at Kaizho and Huaxi village it is 45 and 40 respectively. Number of households experienced

low quality hybrid corn is 30 at Jiantan, 8 at Kaizho, and 11 from Huaxi. While for high yielding rice variety in the village of Jiantan, 16 farms have come across low quality problem, 8 farms from Kaizho, and 9 farms are found from Huaxi village. Low quality problem is mainly referring to as low seed germination rate. It is reported that, usually germination rate of rice seed has only as much as 70%, 75% for hybrid corn. In some cases, germination rate of hybrid corn is as low as 50 %, which imposed a strong negative psychological effects on farmers in adopting new technology.

Corresponding to the question that while encountering problems in production whom the farmer was going to turn to for solutions, 119 households, 66% of the sampled households answered they would go to the extension officers, other two ways, namely, consulting the nearby neighbors and self-learning from books etc. got the some weight from the surveyed households (17% each in Table 12.). Difference across villages in this survey is also observed.

Table 12. Technique sources being trusted by farmers

| Village | Technician | Neighbors | Farmer himself |
|-----------------------|------------|-----------|----------------|
| Jiantan (No.of HH) | 35 | 12 | 13 |
| Kaizho (No.of HH) | 36 | 14 | 10 |
| Huaxi (No.of HH) | 48 | 5 | 7 |
| Total | 119 (66%) | 31 (17%) | 30 (17%) |

Source: formal survey