

## **Irrigation Agriculture and Livestock Farming in Topi Village, Minfeng Prefecture, Xinjiang Uighur Autonomous Region, China\***

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Topi village, the focus of this paper, is one of the small villages situated on Minfeng oasis. As the water from the Niya river can be acquired only during the summer season, spring wheat and sorghum as summer crop had been the main crops. This self-supporting irrigation farming was transformed after the construction of a dam on the upstream of the Niya river in 1990 and the digging of wells for irrigation in the village since 1987. Both of these water sources made possible year-round irrigation. In growing crops, cotton growing has been replacing spring wheat as a summer crop, and winter wheat growing has been increasing remarkably in acreage as a winter crop. Cotton is grown as a cash-crop. The irrigation in Topi is regulated according to a schedule made by the Board of Water Supply of the prefecture. The board assigns the day, the time and the quantity of water supplied to each farm field. Under such an irrigation system, all of the farmers have to seed and harvest the same kind of crops in the same season.

Every farm household raises 10 to 20 head of sheep on average as a sideline. The surplus sheep remaining after private consumption are sold and the income from the sale is an important source of cash for the farmers.

[Keywords] 1 Taklimakan desert 2 Minfeng oasis 3 Irrigation agriculture 4 Irrigation system  
5 Irrigated crop

### **I Introduction**

In recent years, a great deal of research on the Taklimakan desert has been carried out by Chinese and Japanese researchers. Most, however, are studies designed to make clear the mechanisms, real situations, and causes of the desertification expanding within the Taklimakan.

Desertification is brought on not only by pure natural phenomena such as a long term change in climate, but also by human activities. A few studies have discussed the relationship between human activities and desertification. Yoshino and his group (1996) studied relations between desertification and the expansion of farmlands, and the increase in demand for firewood caused

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by population increase. Wang (1996) pointed out unreasonable land-use as one of the causes of desertification. Mitsui and his group (1995) and Ogura (1995) discussed the ruining of Niya, and insisted that it was brought on by the destruction of irrigation facilities in wars.

All of these studies have made as their central concern the relations between desertification and human activities, and they do not study human activity itself. The most important economic activities among the local people in the Taklimakan desert have been irrigation agriculture and livestock farming. Any detailed researches on these themes, however, has not been carried out yet.

The object of this paper is to report on an aspect of the irrigation agriculture and livestock farming as practiced in Topi, one of the villages within the Minfeng oasis in the southern margin of the Taklimakan desert. The research for this paper was carried out in early November, 1998.

## II An Outline of the Study Area

In the southern margins of the Taklimakan desert, numerous rivers flow out from the Kunlun Shan and form fans at the foot of the Kunlun. At a base of these large alluvial fans, there have developed large oases such as Qiemo, Yutian, Hotan, Yecheng and Shache (Fig. 1). Minfeng is also one of these large oases. The oasis is located at the base of the large alluvial fan formed by the Niya river. Most parts of the oasis consist of rural communities. The town of Minfeng has developed as the administrative and trade center in this region.

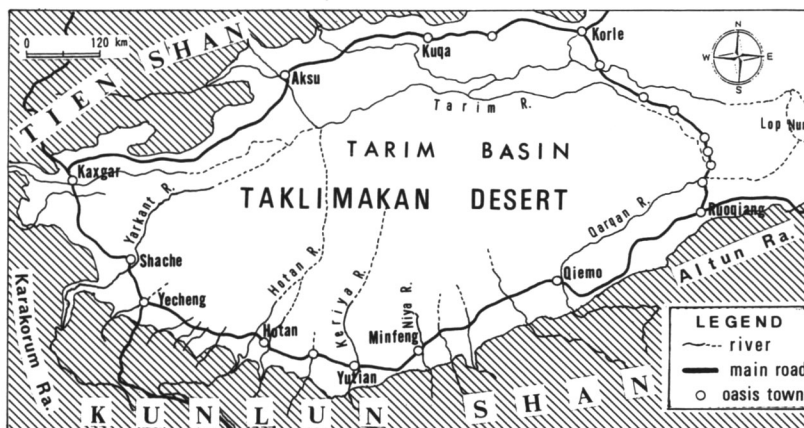


Fig. 1 The Taklimakan Desert

Topi, the focus of this paper, is one of the small villages situated on the Minfeng oasis. Topi is about 5 ~ 6 kilometers to the southwest of downtown Minfeng. The village has a population of 976 and 227 households (November, 1998). The village is at an altitude of about 1,450 meters and has an average annual precipitation of about 30 millimeters.

The villagers in Topi have relied on irrigation agriculture. Most of the irrigated farm land is devoted to the growing of wheat, sorghum and cotton, with small parts for vegetables and fruit gardens such as pear, apple, and walnut. There's no rice field because the village is situated on a alluvial fan.

The inner portion of the village is divided by many straight roads running grid-like in a regular pattern. Rows of tall white poplars fringe both sides of the roads. Behind them spread residential sections and farmland zones. The villagers' one-story flat-roof houses are constructed of adobe and all are surrounded by adobe walls about two meters tall. Most of the irrigated farmlands are concentrated in five farmland zones with acreage of about 15~20 hectares each.

### **III Irrigation Agriculture**

#### **1. Changes in Irrigation Agriculture**

The water level of the Niya river, which begins as melting snow in the Kunlun Shan, starts to rise at the end of March and crests in July. The river water fills up the wide river basin during the flood season, but flows in reticulated narrow water courses after October.

Since the river basin is several meters lower than the surface of the alluvial fan on which Topi is located, the villagers have not been able to draw up the river water directly even in the flood season. Then, they diverted canals from the upstream of the river.

As water from the river can be acquired only during the flood season, it was impossible to grow winter crops. In irrigated fields, spring wheat and sorghum had been the main crops, and a small acreage was devoted to cotton, vegetables and fruit growing. Most of these crops were consumed for self-sustenance. Spring wheat was sowed in the end of February and harvested around the 20th of August. Sorghum was sowed in late April and harvested in mid-September. For their water the villagers had relied on several common wells which have a depth of 4 ~ 11 meters.

This small scale and self-supporting irrigation and farming system was transformed after the construction of a dam on a point 56 kilometers upstream of the Niya river. The dam was built by the Autonomous and the prefectural government in 1990. In addition to the water diverted from the dam, five wells drawing up ground water with power pumps were dug by the prefectural government after 1987.

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
wheat			②	③	④	⑤	◇			× = ×	①	①
sorghum						×				◇		
cotton		①		×		②	③	④	⑤	◇	—	◇

×..... sowing, ○ ..... irrigation, ◇ ..... harvest, — ..... continuance,  
 ~~~~~ ..... growing term

Fig. 2 Farm Work Calendar (by interview)

Both of these water sources made possible year-round irrigation. Because of year-round irrigation, the agricultural production in Topi has developed remarkably through an increase in farmland acreage and yield. In growing crops, spring wheat has been changed to winter wheat as it is possible to get water even in winter. Furthermore, cotton growing, which had been grown for personal consumption in small acreage, has been increasing markedly in acreage, replacing spring wheat as a summer crop, and becoming the largest source of cash income for the villagers.

The five wells, dug by the provincial government after 1987, tap ground water at a depth of about 75 meters through electric pumps, and each can irrigate 0.4 hectares per hour. Since the water from the dam decreases in winter, the water provided by the wells is used mainly as a supplement for the water from the dam. Besides these wells, the prefectural government dug wells which have a depth of about 40 meters each, used for subsistence water. Owing to these wells, villagers have come to rely completely for their living water on well water, and the water from the dam is now used for just for irrigation.

## 2. Irrigated Crops and Irrigation System

The acreage in cultivated field per farm household is only about 0.4 hectares on average. Since the farmers grow two or more crops a year, however, the total acreage in crops is more than double that of the acreage in cultivation. Before the completion of the dam, double cropping was impossible because they could not get irrigation water in the winter season. So the villagers grew spring wheat and sorghum just in the summer season. Since the completion of the dam, double cropping, combining winter wheat as a winter crop and cotton and sorghum as summer crops, has become a most popular farming system. Of 174 hectares of cropland, 104 hectares are devoted to winter wheat and sorghum growing, and 47 hectares are for cotton. The rest are for vegetables and fruits (November, 1998). Wheat and sorghum fields are alternated with cotton fields every three years.

Winter wheat is sowed from the mid- to the end of September and harvested during the mid- to the end of June (Fig. 2). During a planting season, wheat fields are irrigated a total of five times (40 days after sowing, at the end of February, the middle and the end of March, and at the end of April). Towards the end of May, sorghum is sowed as a catch-crop between the rows of winter wheat. It is harvested until mid-September, and wheat is sowed in the same fields just after the sorghum harvest. After the wheat harvest, sorghum fields are irrigated once every two or three weeks according to the weather conditions.

Wheat farmers have to offer a part of their wheat harvest to the government according to acreage. Remaining wheat, after deducting personal consumption and a delivery quota from the harvest, is sold to merchants in downtown Minfeng. A sale price was about 80 Yuan (1,400 Japanese Yen) per 50 kilogram (1998). The bulk of the sorghum is consumed as personal food. Stems and leaves of sorghum and wheat are used as feed for domestic animals.

In contrast with wheat and sorghum, most of which is used for self-support, cotton is grown as a cash-crop. Cotton has increased its acreage remarkably, replacing spring wheat as a summer crop since 1990. Cotton is sowed early in April in holes bored in white plastic sheets covering the surface of the fields, and is harvested repeatedly from the end of August to early in November (Fig. 2). Cotton fields are irrigated in mid-February in advance of planting. After that, the fields are irrigated four times in total. After the cotton harvest, the fields are plowed by hoes in preparation for growing cotton in the next year.

Harvested cotton is put into bags and brought into the cotton processing factory, which is found in the east side of downtown Minfeng. It is transported by the producers themselves using donkey carts or motorized cultivators. The sale price is standardized at every quality, and it is about 4.6 Yuan (about 80 Japanese Yen) per kilogram on average.

The irrigated fields in Topi are concentrated in the five farmland zones, each of which a square area of about 300~500 meters on each side. A zone is divided into innumerable small rectangular patches of about 5 m × 10m. Each patch is surrounded by mud ridges of 20 centimeters in height, and many small irrigation canals run among patches. As mentioned above, a well, pumping up ground water from a depth of 40 meters, was dug within each farmland zone.

The farmers don't have a right to use water freely. The irrigation in the whole Minfeng oasis is regulated according to a schedule made by the Board of Water Supply of the prefecture. The board assigns the day, the time and the quantity of water supplied to each farmland zone.

The irrigation method introduced in the Minfeng oasis is one of surface irrigation, and there is no mechanical method such as using sprinklers. Therefore, the water supply for each small patch flows from the patches situated at the highest point in a zone and moves to the lower

patches successively.

The quantity of water directed into a given patch at any time is determined as follows ; a depth of 13 centimeters for a wheat field and a depth of 9 centimeters for a cotton field. The beneficiaries of irrigation water have to pay the rent. It is 50.4Yuan (about 860 Japanese Yen) a year per one mou (about 6.7 ares) of wheat and sorghum field, and 28 Yuan (about 480 Japanese Yen) for one mou of cotton field.

Under such an irrigation system, all of the farmers who have their patches in the same square have to seed the same kind of crops in the same season, since they are not able to irrigate their farmland except at a fixed date and time. Even though it was a response to the shortage of irrigation water, it seems that this irrigation system will cause stagnation in farming production ; it discourages farmers' original ideas, and dampens the spirit of innovation for the introduction of new farming methods.

Under such an irrigation system, therefore, an increase of agricultural production has to rely on the outward extension of irrigated fields, and it risks expansion of desertification areas.

#### **IV Livestock Farming**

The villagers in Topi raised 3,700 heads of cattle, horses, donkeys and sheep in total in November, 1998. There was no farmer specializing in livestock farming, and most of farm households raise 16 head of livestock on average as a sideline. Sheep make up the largest number of livestock and every farm household raises several heads of sheep.

Sheep are left to range free around the raiser's houses in the daytime during the season from spring to autumn, and they grazed on wild plants. There are cases in which several sheep raisers cooperatively hire a shepherd and entrust him to graze their sheep in the wilderness not far from the village. In autumn, sheep are corralled in harvested cotton fields. Sheep are fed stalks, stems and leaves of sorghum and wheat in winter when wild plants are unavailable.

Donkey, raised as the most popular means of transportation, is the second to sheep in number and every household raises at least one head. A very small number of cattle and horses are raised for transport and farming.

Mutton is one of the most important sources of food for villagers of the Uighul tribe. It is said that several heads of sheep are butchered each year on average for a household's daily foodstuff. As the number of lambs being born are half the number of female sheep, insufficient mutton is supplemented by purchases at the bazaar by the small scale livestock farmers. The villagers drink unpasturized sheep's milk and do not process it into dairy products.

The surplus sheep remaining after private consumption are sold at the bazaar in downtown

Minfeng (open in every Sunday and Wednesday), and this income is, with cotton, an important source of cash for the farmers. In many cases, the time invested in raising sheep is less than two years, since at one or one and half years of age sheep are able to be sold at the highest price (300 Yuan on an average, about 5,100 Japanese Yen).

Wool also brings cash income for sheep raisers. The shearing seasons are twice a year, in mid-May and early in September. A sheep provides 3~5 kilograms of wool per season. Sheared wool is sold to the merchants coming to the village at a price of approximately 4.5 Yuan (about 80 Japanese Yen) per kilogram.

## V Summary

The object of this paper is to describe the actual state of the irrigated agriculture and livestock farming carried out in Topi village, which is one of the villages within the Minfeng oasis lying on the southern edge of the Taklimakan desert.

The irrigated agriculture practiced in the Minfeng oasis containing Topi village has relied on water diverted from the Niya river. In the previous irrigated agricultural system in Topi, only a single crop of spring wheat or summer sorghum was planted on because of the drying of the Niya river in winter.

The digging of wells for irrigation by the prefectural government after 1987, and the construction of a dam on the upper Niya river by the autonomous government and the prefectural government in 1993, made possible year-round irrigation. Owing to year-round irrigation, the double cropping combining winter wheat as a winter crop and cotton and sorghum as summer crops was popularized among the villagers. Wheat and sorghum are grown mainly for self-sustenance, but all of the cotton and a part of the wheat are sold, and they have become the main source of cash income among villagers.

The irrigation method adopted in Topi is one of surface irrigation, flowing water along the surface down the inclination. The prefectural Board of Water Supply controls the irrigation in the Minfeng oasis. It assigns a day and a time for water distribution, and also determines quantity of water. Under this irrigation system, all farmers have to sow the same kind of crops in the same season. The users of the water have to pay a charge for water, according to the kind of crops grown.

Every farmer raises several head of sheep. The sheep remaining after personal consumption are sold at the bazaar in downtown Minfeng, and this, together with wool, brings a cash income to the villagers.

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## 中国新疆ウイグル自治区民豊県トピ村における灌漑農業と牧畜

澤田裕之\*

本稿は、タクリマカン沙漠南縁に位置する民豊オアシス中の1村落であるトピ村を事例に、オアシス農業の実態を明らかにすることを目的としたものである。

トピ村の灌漑農業はニャ川からの引水に依存してきたが、ニャ川は冬季には渇水するため、古くから行われてきた灌漑農業は、夏季に春コムギとコウリャンを栽培する自給的な一毛作であった。しかし1987年以降の県政府による灌漑用深井戸の掘削と、1990年の自治区政府と県政府とによるニャ川上流部におけるダム建設は、通年灌漑を可能にするを通じて従前の農業体系を大きく変化させる契機となった。春コムギに代わって綿花が夏作物の基幹的な地位を占めるようになり、さらに冬作物として冬コムギの作付けが増大した。こうしてトピ村の灌漑農業は、従前の春コムギとコウリャン栽培からなる夏作のみの自給的な一毛作から、夏作としての綿花およびコウリャンと、冬作としての冬コムギ栽培を組み合わせた二毛作が一般的な作付体系に変化した。また、換金作物としての綿花の導入により、自給的灌漑農業の色彩が薄らいだ。

トピ村でとられている灌漑方式は、畑地の傾斜に沿って水を流す地表灌漑である。灌漑用水の利用は個々の農民の自由ではない。県水利局がそれぞれの耕作区域ごとに灌漑の実施日時と給水量を指定するので、同一の耕作区画内に圃場を有するすべての農民は、同時期に同一種類の作物を作付けし、また収穫しなければならない。このような農業システムは、中世のヨーロッパで行われた三圃式農業における耕地強制を思わせるものであり、生産力の停滞をもたらす危惧がある。さらにこのようなシステムの下では、生産の拡大は灌漑農地の外縁の拡大に依存せざるをえず、その結果として沙漠化地域の拡大をもたらす危険性をはらんでいる。

すべての農家は副業的に平均10数頭の羊を飼育している。自家消費分を差し引いた残りの羊は民豊の町のバザールで販売され、羊毛とともに村人の現金収入源の一部をなしている。

[キーワード] 1 タクリマカン沙漠 2 民豊オアシス 3 灌漑農業 4 灌漑システム 5 灌漑作物

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