中央研究院

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ACADEMIA SINICA

Academia Sinica on East Asia
Series Editor: Dr. Chin-Shing Huang, Vice-President, Academia Sinica, Taiwan

Published in association with Academia Sinica, Taiwan

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Perspectives on Environmental History in East Asia

Changes in the Land, Water, and Air

Edited by Ts'ui-jung Liu and Micah Muscolino

Routledge
Taylor & Francis Group
LONDON AND NEW YORK

First published 2021
by Routledge
2 Park Square, Milton Park, Abingdon, Oxon OX14 4RN

and by Routledge
52 Vanderbilt Avenue, New York, NY 10017

Routledge is an imprint of the Taylor & Francis Group, an informa business

British Library Cataloguing-in-Publication Data
A catalogue record for this book is available from the British Library

Library of Congress Cataloging-in-Publication Data
A catalog record for this book has been requested

ISBN: 978-0-367-47386-0 (hbk)
ISBN: 978-1-003-08174-6 (ebk)

Typeset in Times New Roman
by Apex CoVantage, LLC

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Guannan Gao and Micah Muscolino

Introduction

How plants are used, as Arturo Warman has written, "is a product of culture."[1] Plant utilization bears the stamp of human decisions influenced by the dynamics of power. People use their knowledge of the traits and properties of plants to establish and define the uses of different flora. At the same time, new uses for plants frequently arise through the extension and adaptation of existing practices and knowledge, often as the result of interactions between fundamentally unequal social groups. The question of how such interactions have occurred at the level of knowledge and ideas, the role that power relations have played in them, and the environmental effects of these interactions are worth considering as entry points for thinking about historical relationships between people and the land.

Sigrid Schmalzer has examined understandings of scientific farming among different groups, including peasants, cadres, and technicians, in the People's Republic of China (PRC). She argues that the political vicissitudes of the Mao era (1949–1976) should not be understood in terms of a binary between scientific and anti-scientific ideological inclinations. Although some actors favored what Schmalzer calls *yang* 洋 ("foreign, Western, elite, professional, ivory-tower") science and others favored *tu* 土 ("native, Chinese, local, rustic, mass, crude") science, all groups accepted science as a core value.[2] Despite dominant discourses that cast peasants as "backward," she argues, "mass science" frequently collaborated and merged with elite science in the production of scientific agricultural knowledge. As this chapter makes evident, a productive interaction between practical experience and scientific experimentation also characterized agricultural research and extension under the Chinese Nationalist regime during the Republican period (1911–1949), and the PRC inherited this legacy. Specifically, the chapter uses the case of a single plant, sweet clover (*caomuxi* 草木樨), to investigate how the interweaving of peasant practice and scientific experimentation took place in terms of concrete ecological practices both before and during the Mao period. Focusing on how these practices shaped the adoption and diffusion of sweet clover from the 1940s to the 1960s also reveals what kind of environmental and social effects emerged when, mediated by power relations, this environmental knowledge garnered national attention and was drawn into larger-scale state agendas.

While certain types of sweet clover grow in northwestern and southwestern China, our concern here is not with indigenous sweet clover varieties. Rather, this chapter traces the history of *introduced* varieties of sweet clover that Gansu's Tianshui Water and Soil Conservation Experiment Area (*Tianshui shuitu baochi shiyanqu* 天水水土保持實驗區) imported beginning in 1943 from the United States. Because of the effectiveness of these introduced varieties in conserving water and soil, among other purposes, during the 1950s sweet clover received nationwide attention and became an important variety in agricultural extension efforts.

Over a period of nearly forty years, from their initial introduction in the early 1940s until their gradual decline in the 1980s, introduced varieties of sweet clover spread from Gansu 甘肅 to the northern Chinese provinces of Shaanxi 陝西, Inner Mongolia 內蒙古, Ningxia 寧夏, Liaoning 遼寧, and Shandong 山東. Materials prepared for the Nationwide Sweet Clover Academic Workshop (*Quanguo caomuxi xueshu taolunhui* 全國草木樨學術討論會) in 1982 stated,

> Sweet clover is distributed from Heilongjiang 黑龍江 province's Heihe 黑河 region in the north (41° north latitude) to Guangxi 廣西 province's Yulin 玉林 region (22.5° north latitude). Areas in our nation's vast North and in Jiangsu 江蘇, Anhui 安徽, Sichuan 四川, Hunan 湖南, and Yunnan 雲南 provinces in the South all have large areas of [sweet clover] cultivation and utilization. It is estimated that nationwide the cultivated area is approximately 10,000,000 *mu* [including introduced and indigenous varieties].[3]

This chapter addresses the question of how the remarkable diffusion of this plant species took place.

The origins of water and soil conservation in China

Sweet clover's introduction was intimately related to the development of water and soil conservation programs in China during the Republican period (1911–1949).[4] In a time of national crisis and peril, early twentieth-century Chinese intellectuals actively searched for methods to "save the nation." As the goal of using science to save China took on increasing importance, scientism as an ideological inclination gained far-reaching influence among intellectuals.[5] At the same time, Euro-American scholars traveled to China and disseminated the scientific theories of forestry, botany, and agronomy. Walter C. Lowdermilk was one of them.

Lowdermilk came to China in the 1920s, first teaching forestry at the University of Nanking and later conducting investigations and field research on deforestation, runoff, and soil erosion. His hypotheses and experiments on the ability of forests to retain water resources and decrease runoff and erosion influenced the formation of water and soil conservation's scientific basis and the beginnings of the discipline in China. Chinese scholars such as Ling Daoyang 淩道揚 (returned from studying abroad) and Ren Chengtong 任承統 (Lowdermilk's student) also contributed by disseminating Western theories, knowledge, and experimental techniques. In this reciprocal cultural exchange, a merging of Western water and soil conservation theories and Chinese local knowledge occurred.[6]

With the full outbreak of the Anti-Japanese War of Resistance in 1937, the Japanese military occupied most of the territories in eastern China that had traditionally been China's main grain producing centers.[7] Due to considerations of war preparedness and regime stability, the strategic status of China's Northwest region greatly increased, and the Nationalist government put forth a call to "develop the Northwest." To a large extent, the Nationalist regime's drive to develop the Northwest was a means to accumulate grain for military purposes, and grain production depended on water and soil. How should farmers conserve water and soil resources and increase grain production? To achieve the geostrategic goal of effectively mobilizing resources for China's war effort, this question made conservation a necessity. As a result, the scope of water and soil conservation's meaning in wartime China included a broad range of measures that furthered the efficient use of water and soil resources to support the economic development of the Northwest.[8]

This combination of factors motivated the Nationalist government to actively promote conservation efforts. When the Yellow River Conservancy Commission (YRCC, *Huanghe shuili weiyuanhui* 黃河水利委員會) was established in 1933, it included a Forestry Reclamation Group (*Linkenzu* 林墾組) responsible for addressing soil erosion problems, which later became the Forestry Reclamation Planning Commission (*Linken sheji weiyuanhui* 林墾設計委員會). In August 1940, Nationalist government agencies convened a conference to discuss the problem of soil erosion at which participants formally decided upon *shuitu baochi* 水土保持 as the Chinese rendering of the scientific term "water and soil conservation."[9]

In 1940 the Nationalist government established the Ministry of Agriculture and Forestry (*Nonglinbu* 農林部), which shared responsibility for water and soil conservation with the YRCC.[10] In 1941 the YRCC's Forestry Reclamation Planning Commission established the Longnan Water and Soil Conservation Experiment Area (*Longnan shuitu baochi shiyanqu* 隴南水土保持實驗區) in Tianshui, and the following year the Ministry of Agriculture and Forestry founded the Tianshui Water and Soil Conservation Experiment Area. The two experimental organs operated in parallel for more than three years until, in 1946, the Longnan Water and Soil Conservation Experiment Area merged with the Tianshui Water and Soil Conservation Experiment Area.[11] Most importantly for our purposes, it was the Tianshui Water and Soil Conservation Experiment Area that conducted wartime experiments related to the introduction and extension of sweet clover.

The characteristics of sweet clover

To obtain plants that could prove useful for conserving water and soil, the Tianshui Water and Soil Conservation Experiment Area acquired several hundred grass species through collection and exchange. Sweet clover was one of those plants.[12] Sweet clover is a kind of leguminous plant that China's rural populace often refers

to as "horse alfalfa" (*mamuxu* 馬苜蓿) or "foreign alfalfa" (*yangmuxu* 洋苜蓿). Wild sweet clover grows in China's Southeast, Northwest, and Southwest, and the nineteenth-century text *An Illustrated Book on Plants* (*Zhiwu mingshi tukao* 植物名實圖考) called it "eliminating sweat grass" (*pihancao* 辟汗草). The text also noted that wild sweet clover has fine, soft roots and fragrant yellow flowers.[13]

As mentioned previously, however, this chapter mainly discusses the introduced varieties of sweet clover planted and disseminated in Northwest China beginning in the 1940s. The distinctive biological features of these types of sweet clover are their resistance to drought, cold, infertile soil, and alkalinity. The plants have tall stalks and well-developed roots, stems, and rhizobia. The stalks also contain coumarins that give them a bitter flavor, so it is not clear how this plant got the name "sweet clover." Some have suggested that the name may derive from the fact that in the Mediterranean region, Europe, and North America, sweet clover is considered a nectar plant for raising honeybees, but its origin remains uncertain.[14]

Sweet clover stalks lignify easily, which makes them a good source of fuel since they burn well but a poor source of fodder because most livestock find them unpalatable. Sweet clover also grows relatively vigorously and can self-propagate, which makes it a good plant for re-vegetating barren mountains. Yet this quality presents a disadvantage when using sweet clover as a green fertilizer since its aggressive growth can impinge upon other crops. The value of a plant is relative and not absolute; it is intimately related to the temporal, spatial, and social aspects of a plant's use. As Sidney Mintz once noted of the relationship between use and meaning, "[T]he relationship between production and consumption may even be paralleled by the relationship between use and meaning." In his view, meaning does not inhere in substances naturally or inevitably. Rather, "that meaning arises out of use, as people use substances in social relationships."[15] This chapter adopts the same perspective.

Sweet clover's introduction and extension in the Republican period

If the initial impetus for research on soil-conserving plants was wartime demand for grain, plant breeding specialist Ye Peizhong 葉培忠 took the lead in carrying it out.[16] Ye was born in 1899 in Jiangsu province's Jiangyin 江陰 county, and at age 11 he began studying at a missionary school, where he learned English. Ye graduated from the University of Nanking in 1927, where he studied forestry with Walter C. Lowdermilk. After graduating, Ye directed a forestry station in Guangxi province but returned to Nanjing in 1929 to assist in designing a botanical garden at the Sun Yat-sen Mausoleum (*Zongli lingyuan* 總理陵園). To prepare for this task, Ye studied abroad from 1930 to 1931 at the Royal Botanical Garden in Edinburgh. This experience not only gave Ye connections with botanical gardens and seed distribution outlets in various foreign countries but also enabled him to gain a familiarity with scientific theories and techniques related to plant introduction and adaptability.

Following his return to China, Ye oversaw the Sun Yat-sen Mausoleum's botanical garden until the outbreak of the Anti-Japanese War in 1937, when the Japanese occupation of Nanjing forced him to take refuge in Hunan and Sichuan, where he engaged in teaching and research for several years. In 1942 Ye joined the Northwest Investigation Group (*Xibei kaochatuan* 西北考察團) led by Lowdermilk, which surveyed water and soil conservation in Shaanxi, Gansu, and Qinghai on behalf of the Nationalist regime. During this investigation, Ye paid a great deal of attention to observing and collecting plant species. After the survey's completion in 1943, Ye remained in Tianshui as a technician in the Ministry of Agriculture and Forestry's Water and Soil Conservation Experiment Area.

Ye eventually became director of the Tianshui Water and Soil Conservation Experiment Area in 1945, and while working at the Experiment Area he presided over the Experiment Area's selection of soil-conserving plants and its grass breeding experiments. The cosmopolitan theoretical knowledge that Ye acquired through his studies and work experience influenced the trajectory of sweet clover's introduction, utilization, and extension. However, sweet clover's introduction was not a unilinear process of research and experiment followed by extension and cultivation. Rather, it reflected a complex interweaving of modern scientific knowledge and the practical needs of the rural populace.

After the Experiment Area's founding, experiments with sweet clover immediately got underway. In 1942, during his travels with the Northwest Investigation Group, Ye Peizhong gathered wild sweet clover seeds and brought them back to the Experiment Area for further study. Experiments indicated that even though sweet clover's value as fodder was not as great as alfalfa and other grasses, it could be planted where alfalfa could not. At the same time, sweet clover had great effectiveness in "restoration of vegetation" and erosion prevention.[17] For these reasons, sweet clover stood out among the numerous plant varieties that the Tianshui Water and Soil Conservation Experiment Area introduced at the time.

In 1943 Ye Peizhong gave a small bag of sweet clover seeds to a farmer named Yang Shirong 楊世榮 in Tianshui's Shuijiagou 水家溝 village, and Yang tried planting them on his land.[18] In spring 1944 the Tianshui Experiment Area summarized Yang Shirong's experience and purchased 320 liters of his seeds.[19] But cultivating pasture grasses was not a familiar practice for local peasants. Tianshui is part of Gansu's loess hill and gully area (*huangtu qiuling gouhe qu* 黃土丘陵溝壑區), where hilly land makes farming conditions relatively poor. Without much level land, peasants instead cultivated large areas of inclined fields.[20] In the Tianshui region, as a source from the late 1940s explained, "A mixed herding and farming system is widespread, but herding does not have fixed pasturelands, so except for the crops there is no [vegetation] that does not suffer harm due to overgrazing."[21] Residents did not plant pasture grass or store seeds, so the planting of grasses like sweet clover represented a new form of knowledge to the local populace.

In 1944 the Experiment Area also introduced annual and biennial white sweet clover and yellow sweet clover obtained from the U.S. Department of Agriculture's Soil Conservation Bureau for experimental planting.[22] Experimental studies

indicated that these plants had tall stalks and grew quickly. Among them, biennial white sweet clover (*Melilotus alba-Arctic* 二年生白花草木樨) and biennial yellow sweet clover (*Melilotus officinallis-Madrid* 二年生黃花草木樨) yielded the best experimental planting results,[23] and after 1949 these two kinds of sweet clover were the main varieties used in extension and cultivation programs.[24] However, these two introduced varieties were not native varieties in the United States either. According to pasture grass variety registration records,

> Biennial white sweet clover was an 'Arctic variety' with strong resistance to cold that was selected at the University of Saskatchewan in Canada from the 'normal white' local variety of Siberian biennial white sweet clover originally grown in the Soviet Union. Biennial yellow sweet clover was originally grown in Spain and raised in Madrid.[25]

This source demonstrates that before sweet clover was introduced to China it had undergone human selection at least twice, so it also brought with it the legacy of previous cultivators' knowledge, priorities, and preferences.

The Tianshui Water and Soil Conservation Experiment Area not only selected plant varieties but also planted them on alluvial riverside land at the mouth of a gully called Lüergou 呂二溝 and in experimental fields to promote sediment retention and soil conservation. Because Tianshui, like much of Northwest China, suffered from severe fuel shortages, residents frequently dug up grass roots on slopes to burn as fuel. The wartime migration of refugees from Japanese-occupied territories to the Northwest after 1937 increased Tianshui's population, which further heightened pressure on scarce fuel resources.[26] Not surprisingly, the Experiment Area's pasture grass cultivation plots often suffered damage at the hands of nearby rural households desperately in need of fuel. Residents quickly discovered that sweet clover had large stalks, and its combustibility was superior to other grass varieties. To meet their need for biomass, the rural populace took advantage of sweet clover's potential as a fuel source.

Recognizing the plant's benefits, Tianshui's residents began asking the Experiment Station for sweet clover seeds and exchanged them with one another. Soon sweet clover was being cultivated by a small number of households. The Tianshui Water and Soil Conservation Experiment Area's extension methods also played a role in disseminating knowledge about the plant. To attract people's interest in water and soil conservation, the Experiment Area took part in the local Farmer's Day festival (*nongminjie dahui* 農民節大會) and "selected one hundred outstanding soil conservation plant samples, fifty kinds of seeds, and prepared photographs and charts for the local people to observe."[27] The Experiment Area also planted sweet clover grass belts along terraces, gullies, and fields. Once the sweet clover matured, the Experiment Area agreed to let farmers use it "free of charge."[28] Once sweet clover grass belts grew, the Experiment Area notified the populace, who cut them and gathered seeds. Farmers had to give the seeds to the Experiment Area but could keep the stalks for their own use.[29]

In 1947 peasants from Liguanwan 李官灣 village to the south of Tianshui, "seeing that sweet clover could protect against erosion on barren land and rejuvenated its productivity so its benefits were even greater than agricultural crops," came to the Experiment Area to request sweet clover seeds.[30] The Experiment Area also delegated the Tianshui Agricultural Extension Office (*Tianshui nongye tuiguangsuo* 天水農業推廣所) and the Longxi Farmers Bank (*Longxi nongmin yinhang* 隴西農民銀行) to invite independent cultivators to carry out planting demonstrations.[31] According to the station's records, peasants from five households in Liguanwan and other villages took seeds and planted 106 *mu* with sweet clover.[32] According to materials on Lüergou, a gully on the southern outskirts of Tianshui,

> Starting around 1947, the masses saw that sweet clover grew in gullies, on embankments, and beside roads in the Experiment Area, and their first impression was that it could be planted on gullies' steep cliffs and lots of fuel could be gathered from it, so they asked the Experiment Area for seeds, and after that they mutually dispensed them.[33]

In tandem with the planting of sweet clover, small-scale exchange networks formed and sweet clover became a commodity that could be marketed to make a living: "[f]armers carried sweet clover stalks on their backs and went into the city to sell them, calling it 'foreign alfalfa.' Since their combustion power was great, the price was two or three times higher than other kindling."[34]

Furthermore, sweet clover lent impetus to the development of agricultural production on previously marginal lands. Farmers found that if grain crops were cultivated on land where sweet clover had been planted, output increased. As a document from the mid-1950s noted,

> Around 1948 Caoleijiazhuang 曹雷家莊 [village]'s Cao Tianhui 曹天惠 planted six *mu* [of sweet clover] and harvested 16,000 *jin* of kindling. He then planted wheat in rotation and harvested 480 *jin*, which increased production by 300 *jin*. One could harvest fuel and make the land fertile, which made peasants with a lot of land but poor soil even more envious. In subsequent years, they expanded the land area cultivated [with sweet clover] and it has already expanded to steep slopes and infertile land.[35]

Sweet clover's effects, for cultivators with relatively large holdings of infertile land, were a great benefit.

Scientific experimentation went forward in tandem with peasant experience. The Experiment Area's scientific research personnel also paid attention to local knowledge about fuel acquisition and increasing soil fertility uncovered through local practice, seeking to subject this experience to modern scientific research and verification. In 1945 the Experiment Area conducted studies to determine the most suitable rotation systems on sloping land and included sweet clover as one of the plants in these rotation experiments.[36] After several years of experimentation,

it was proven that using sweet clover as green fertilizer yielded excellent results in increasing crop yields. In 1948 the Experiment Station decided to conduct further sweet clover fertilizer efficiency experiments and green manure experiments, comparing sweet clover with different types of green fertilizer.[37] Based on statistics from 1950, the area on which farmers on the outskirts of Tianshui spontaneously planted sweet clover reached over 10,000 *mu*.[38]

However, during the 1940s these extension efforts had a limited socioeconomic scope. The rural households invited to observe sweet clover demonstrations were independent cultivators who owned their own land as well as landlords. The extension sites were also restricted by transportation, so they were concentrated in villages relatively close to cities and towns, and residents of villages deep in the mountains had never even heard of sweet clover. Although sweet clover demonstrations were carried out, the Nationalist regime's limited state capacity during the 1940s meant that it could not form an effective extension system. These factors limited agricultural extension's scope and depth, so its influence was mainly limited to villages on the outskirts of the city of Tianshui.

As this section has shown, the introduction and cultivation of sweet clover during the Republican period were not research-divorced from the outside world. In the process of sweet clover's introduction, one can see the effective combination of modern science and local practice. Technical experts employed by the Nationalist government initiated the adoption of sweet clover as part of wartime efforts to limit erosion and boost agricultural production in the Northwest, but the plant took root in Chinese soil due to its ability to meet the pressing needs of Tianshui's rural populace. Burning sweet clover as fuel was a new use for the plant that the rural populace developed in response to mounting wartime pressure on fuel resources, and the widespread adoption of sweet clover for this purpose lent impetus to the plant's extension. The results of this practical experience and scientific experimentation were inherited after 1949, fusing into a system of knowledge about sweet clover.

Sweet clover in "New China"

After the founding of the PRC, China's political and economic systems underwent titanic changes. In many instances, environmental historians cannot use regime change for their periodization because the patterns and processes of the natural environment do not accord with human-constructed political chronologies. On the one hand, extension of sweet clover continued unabated before and after 1949 with the Tianshui Soil and Water Conservation Area, which the PRC government took over in 1949, and the same expert personnel employed during the 1940s taking charge of this work. On the other hand, the political and socioeconomic transformations that occurred during the 1950s greatly accelerated the diffusion and application of this plant species.

Large-scale extension of sweet clover in the 1950s

In the early PRC period, many industries remained undeveloped and living standards had not yet returned to prewar levels. Whether to maintain political stability,

ensure food security, or extract agricultural surpluses to support the development of heavy industry, agriculture demanded attention. The central government's prioritization of water conservancy also promoted the extension of sweet clover. During the early PRC, water conservancy was one of the main components of economic policy. During an inspection in 1952, Mao Zedong issued a directive stating that Yellow River work had to be done well. To prevent Yellow River flooding and promote agricultural production, the PRC paid enormous attention to water and soil conservation work.

By the founding of the PRC in 1949, local experience and scientific research results had already merged in the process of sweet clover's introduction. Against this background, in 1950 the PRC's Ministry of Agriculture 農業部 sent eight people, including Huang Nong 黃農 and Zhang Shaofang 張紹鈁, to the Experiment Area to gain an understanding of water and soil conservation work.[39] Local cadres, who believed that planting sweet clover was a method to address environmental problems, alleviate poverty, and increase agricultural production, spared no effort engaging in propaganda and seeking support from higher political authorities. In 1952 personnel from the Ministry of Agriculture went to Tianshui to purchase 105,000 kilograms of sweet clover seeds and sent them to other northern provinces to carry out experimental planting.[40] The government had started to prioritize sweet clover and combine it with the larger goal of increasing grain production. As a 1958 booklet titled *Sweet Clover*, edited by the Yellow River Conservancy Commission, stated,

> In the Soviet Union research on the cultivation, breeding, and utilization of sweet clover is most exquisite. In recent years, some scientists have seen it as an important grass variety for producing fodder and increasing soil fertility in arid regions in the southwest of the Soviet Union.[41]

At a time when PRC leaders emphasized learning from the Soviet Union, scientific workers in China viewed Soviet scientific and technical research as particularly important, and sweet clover garnered even greater attention for this reason.

In 1952 Tianshui prefecture drew up plans calling for the planting of sweet clover on 500,000 *mu* of land that had been taken out of rotation (*lunxiedi* 輪歇地) to change fallow land into a grain–grass rotation system.[42] In 1953 the Tianshui prefectural government enacted a plan that called for the prefecture's Longxi, Tongwei 通渭, Tianshui, Gangu 甘谷, Wushan 武山, and Qin'an 秦安 counties to plant sweet clover on 100,000 *mu* of land.[43] For the implementation of the plan, the Longnan Water and Soil Conservation Work Extension Station (*Longnan shuitu baochi gongzuo tuiguang zhan* 隴南水土保持工作推廣站) requested 237,000,000RMB from the Yellow River Middle Reaches Management Bureau (*Huanghe zhongyou guanli ju* 黃河中游管理局) for seed procurement, transport, and other expenses.[44] Even if we consider price inflation during the early 1950s, this was no small expense. To further promote extension of sweet clover, local governments and the Tianshui Water and Soil Conservation Area's scientific and technical personnel established an effective propaganda system that included publications, the promotion of models, and main point areas (*zhongdianqu* 重點區).

The Tianshui Water and Soil Conservation Area stationed work teams on the spot in main point areas to help with extension efforts. In the process of this work, cadres recruited activists to foster models and organized other villages to come study at these sites and then engage in further extension.

Nevertheless, extension work met with many difficulties and setbacks. Taking one area as an example, Wushan county's Dengjiabao 鄧家堡 was a main point established in 1952. When the work team first arrived, however, extension did not go smoothly. The populace thoroughly opposed planting sweet clover and believed that "[a]ll the weeds in the fields can't be hoed up and they tell us to plant grass. Who's willing to have a lifetime of trouble?" As for the clover seeds that were distributed, "some stuffed them into cracks in the wall" and "some simply threw them away." After much persuasion from local cadres, a villager named Li Liuwa 黎六娃 was willing to plant sweet clover on several *mu* of infertile land that he had originally intended to give away. The following year, Li "harvested 3,600 *jin* of kindling and over 400 *jin* of seeds" and had so much fuel that "even if [he] burned it for three years [he] couldn't burn it all."[45] Through these methods, cadres and officials spread propaganda about sweet clover's good points to win the support of local peasants, and the amount of sweet clover planted increased. Figure 1.1 shows that the extension of sweet clover was highly effective.

To plant even more sweet clover, the PRC government began to issue annual extension planting targets. For instance, Qin'an county's 1953 summary report stated that Qin'an had an extension target of 10,000 *jin* of sweet clover seeds.[46] Sweet clover planting had become a mandatory top-down mandate. As the area planted with sweet clover expanded, moreover, the problem of seed supplies arose along with it. In 1955, for instance, Qin'an issued a directive stating that the county needed to procure 61,000 *jin* of seeds, and the directive explicitly made procurement of sweet clover seeds a "political mission" (*zhengzhi renwu* 政治任務).[47] Supply and marketing cooperatives served as purchasing agents for seed supplies, and government cadres at various levels were responsible for propaganda. Seed procurement work conflicted with peasants' desire to save labor power for autumn planting, but labor shortages were not serious at the time, so the contradiction was not acute.

Furthermore, after negotiations with the Soviet Union in 1953, controlling the Yellow River was included as one of China's 156 Soviet-assisted projects. In 1954 Soviet experts carried out investigations of the Yellow River and determined the location for construction of the Sanmenxia 三門峽 reservoir.[48] To maintain downstream water conservancy facilities and expand upstream conservation efforts, a water and soil conservation campaign was launched in tandem with agricultural collectivization. At this time, the intensity of sweet clover planting also increased.

Statistical data on seed procurement in Tianshui prefecture from 1952 to 1956 are shown in the following graph (Figure 1.1).[49] Although the sources of this information and the statistical methods through which they were compiled are uncertain, the data from these years illustrate that the overall trend in the extension of sweet clover was one of expansion and growth.

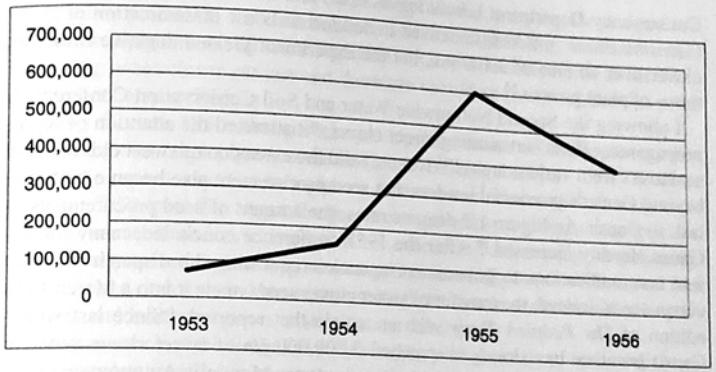

Figure 1.1 Seed procurement (kg) in the Tianshui Special area

Source: Drawn by the author.

Indeed, by 1957 sweet clover had already gained national recognition. At the Second Nationwide Water and Soil Conservation Conference (*Dierci quanguo shuitu baochi huiyi* 第二次全國水土保持會議), sweet clover was "named the Northwest region's 'treasure grass' (*baobei cao* 寶貝草)."[50] In reports given at the conference, vice-chairman Zhu De 朱德 and vice-premier Deng Zihui 鄧子恢 called for sweet clover's continued extension. In that year, *The People's Daily* published a report on sweet clover that stated,

> Now sweet clover has already been welcomed by the broad peasantry of the mountain areas. Many places have already made vigorously extending the planting of sweet clover an important measure for water and soil conservation, increasing agricultural production, and increasing the income of the people of the mountain areas.[51]

In November 1956, on the eve of the Second Nationwide Water and Soil Conservation Conference, vice-premier Tan Zhenlin 譚震林 heard a report from Zhao Mingfu 趙明甫, Lü Benshun 呂本順, and Zhang Xiaojie 張效杰 on the progress of water and soil conservation work in the Yellow River watershed. While listening to the report, Tan took an interest in sweet clover and inquired about its annual production. Tan stated that "areas of severe water and soil loss in Northwest China's Loess Plateau should all plant sweet clover" and asserted that he would make a request to Premier Zhou Enlai 周恩來 for an airplane to use in aerial planting. In line with this directive, "[i]n 1958 Tianshui prefecture for the first time carried out experiments with planting sweet clover by airplane."[52] In Tan's mind, planting from the sky could "green barren mountains, increase vegetation cover, conserve water and soil, improve the soil, increase grain production, and improve peasant livelihoods, which is a great thing!"[53] After the meeting, Gansu province's Water

Conservancy Department (*shuiliting* 水利廳) and the Tianshui party committee (*Tianshui diwei* 天水地委) resolved to conduct airborne dissemination of sweet clover over an area of 3,100 *mu*, but the experiment yielded negative results in terms of plant growth.[54]

Following the Second Nationwide Water and Soil Conservation Conference's propaganda efforts surrounding sweet clover, "it attracted the attention of representatives from various areas."[55] Not only did the extension of sweet clover move beyond Gansu's provincial borders, but seed procurement also became a routine task in Gansu. As Figure 1.2 demonstrates, the amount of seed procurements in Gansu steadily increased.[56] After the 1957 conference concluded, many locales sent communications to government agencies requesting the dispatch of sweet clover seeds. Indeed, the transfer of sweet clover seeds made it into a March 1958 edition of *The People's Daily* with an article that reported, "Since last winter Gansu province has already dispatched 2,000,000 *jin* of sweet clover seeds to assist more than ten provinces, including the Inner Mongolia Autonomous Area, Shanxi, Henan, Shandong, and Jiangsu."[57]

A contradiction existed in this situation since propaganda surrounding sweet clover praised its ability to help peasants solve their problems obtaining the "three materials" (*sanliao* 三料) (fuel, fertilizer, and fodder) and save labor power to increase agricultural production. During the mid-twentieth century, fuel, fertilizer, and fodder shortages had emerged in Northwest China due to human destruction of the region's vegetation cover. Under these circumstances, peasants often had to travel great distances to obtain biomass, so cultivation of sweet clover could decrease their labor burden. Based on interviews with the residents of Dengjiabao in Gansu's Wushan county, planting sweet clover on abandoned land near the village did in fact alleviate this difficulty by shortening the distance they had to travel to collect fuel.[58] The contradiction was that once government targets for procuring seeds were issued, supplying seeds to the state took precedence over

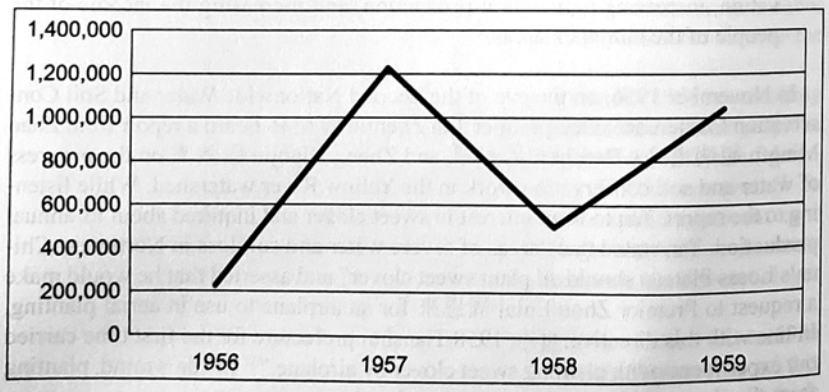

Figure 1.2 Seed procurement (kg) in the Gansu province

Source: Drawn by the author.

peasants' own uses for sweet clover, so the plant did not promote the goal of saving labor power. On the contrary, intensified seed gathering increased peasants' labor expenditures. This was especially true in Tianshui, which had started cultivating sweet clover earliest and therefore shouldered most of Gansu's seed procurement responsibilities.

During the late 1950s the government's prioritization of sweet clover, like other production targets, grew more and more extreme. In April 1958 *The People's Daily* reported on Gansu's plan to extend sweet clover seeds to eighteen provinces.[59] To meet this target, the provincial government increased the price of sweet clover seeds and conducted political education work among the peasantry to stimulate production, but its goal was not achieved. By June 1958, Gansu had already issued documents demanding greater attention to sweet clover seed procurement and increased prices to stimulate production.[60]

With the launch of the Great Leap Forward in 1958, even more serious difficulties appeared as rural labor power grew increasingly scarce. Smelting steel, constructing water conservancy projects, building terraces, agricultural production, and other tasks arose one after another, so peasants simply did not have time to attend to sweet clover planting and seed gathering. The drought that struck Gansu in 1958 also negatively influenced the growth of sweet clover plants and upset procurement plans.[61] In that year, the plan was to purchase 32,000,000 *jin* of seeds for export alone, but the total amount of seeds acquired came to only 1,000,000 *jin*, so seed procurement efforts ended in total failure. In 1959 the Gansu provincial government learned the lesson from the previous year and decreased procurement targets and started the process earlier to avoid delays in sweet clover procurement, and the amount of seeds procured increased.[62]

Sweet clover in the 1960s and 1970s

During the late 1950s and early 1960s, peasants endured a period of hunger and hardship. In response to the threat of starvation and the central government's policy of encouraging peasants to cultivate household plots after 1961, rural households enthusiastically reclaimed wasteland to increase production and improve living standards. The craze for wasteland reclamation adversely affected the results that had been gained during the 1950s by planting sweet clover. A situation of "wantonly destroying forests to reclaim wasteland, opening land on steeply inclined slopes, cutting grasses, and digging up grass roots" emerged.[63] The area on which sweet clover was planted greatly decreased, and by 1962, based on incomplete statistics from the Tianshui region, it had dwindled to only 10,000 *mu*.[64] To rectify this situation, in 1963 Gansu's Agriculture and Animal Husbandry Department (*nongmuting* 農牧廳) issued an urgent notice calling for spring afforestation and planting of sweet clover.[65]

Thereafter, the government relaxed its policies toward rural handicrafts and at the same time stressed restoration of economic crops that had been forced out during the Great Leap. Sweet clover's recovery fell squarely in line with these policies, as peasants' enthusiasm for sideline employments revitalized the plant's

cultivation and diffusion. In addition to selling sweet clover seeds, stalks could be sold as kindling, the plant was an excellent source of nectar for making honey that could be sold to increase income, and stalks could be stripped to obtain fibers to make rope to sell for cash. For this reason, sweet clover held tremendous economic value. In 1964, moreover, central government agricultural policy turned toward establishing stable and high production fields, so increasing use of green manure became a main point of propaganda in Gansu and elsewhere.[66] Given sweet clover's effectiveness as fertilizer, this trend further increased the plant's importance.

Archival documents related to sweet clover in Gansu after the start of the Cultural Revolution in 1966 have not yet been uncovered. But materials from other regions that grew sweet clover indicate that during this time period sweet clover was integrated into the radical discourse of propaganda materials. Except for its application as a green manure crop, sweet clover's other uses were all criticized as "capitalist-roader."[67] After the conclusion of the Cultural Revolution, however, production capacity gradually recovered, and the area planted with sweet clover increased once again.[68]

Even though at the start of this chapter it was mentioned that sweet clover grew until the 1980s, when its distribution was extremely broad, some other sources indicate that in the early 1980s the area planted with sweet clover had already started to decrease. As the 1982 sweet clover conference's concluding remarks put it, "This conference of ours . . . has been convened during a 'low tide' in which, over the past few years, green fertilizer area has greatly decreased, and sweet clover area has also decreased."[69] Sweet clover was influenced by the household responsibility system, which dissolved the agricultural collectives that had served as the transport and cultivation networks for this plant. In the process of decollectivization, reclamation of uncultivated wasteland also took place.[70] Changes in production organization caused the area planted with sweet clover to decrease, while shifts in village consumption patterns made demand for the plant gradually disappear. During interviews, villagers' answers to questions about the decline of sweet clover during the 1980s were noteworthy:

> After a few years it got better and better. There were things to eat, and when there were things to eat there was certainly fuel. When there were things to eat, the crops that were planted grew, fuel was plentiful, and there was grain. Once there was enough to eat, there was everything else as well.[71]

Under these conditions of relative abundance, sweet clover no longer held the importance it once did.

Conclusion

This chapter has focused on the production of knowledge about plants and how that knowledge is converted into ecological effects. In that process, the role of power relations in mediating knowledge conversion carries great importance.

From the perspective of state governance, the combination of knowledge about sweet clover and official policymaking clearly entailed relations of power. Furthermore, power relations among scientists and peasants, cadres and peasants, and technical personnel and administrative cadres influenced the production of knowledge about sweet clover and the expansion of the landscapes on which the plant was cultivated.

The history of sweet clover from the Republican period into the PRC, in other words, exhibits the influence of power relations on the production of environmental knowledge. From 1942 to 1949, state power did not have a particularly strong influence over local ecological practices. Guided by the subsistence needs of the rural populace, under the Chinese Nationalist regime in the 1940s *tu* practice and *yang* science combined in the extension of sweet clover. In the earliest stages of sweet clover's introduction, Ye Peizhong's thought, experience, and beliefs influenced this process. But the dissemination of sweet clover, guided by pursuit of economic benefits and subsistence needs, also added to the knowledge of a small number of rural residents and endowed them with new skills and techniques. Lack of state capacity meant that knowledge about the use of sweet clover was not extended over a wider area. Yet environmental knowledge from the Republican period persisted in environmental policy after 1949, becoming part of "[s]ocialist Chinese agriculture's patchwork of old and new, ecological and chemical, arduous and labor-saving technologies."[72]

In the dissemination of sweet clover after 1949, especially after 1952, social organization and rural China's land tenure system underwent tremendous changes, and the political dimensions of agricultural extension grew even clearer. The results of practical experience and experimentation with sweet clover plants produced knowledge that, after 1949, gained state recognition. The importance that radicals ascribed to popular science also appeared in knowledge about sweet clover. Prioritization of mass experience, which was intimately related to state agendas, made sweet clover continuously take on new uses and functions. To a definite extent, sweet clover's multiple uses also reflected the material shortages of the time, as the state hoped to solve various problems through this multi-use "treasure grass."

Sweet clover's importance and its large-scale promotion also made knowledge about this plant spread out along pathways of extension, leading to changes in peasant knowledge. The Tianshui region's preexisting agricultural customs of extensive cultivation of unproductive land, unregulated grazing, and not storing fodder were altered. During the Great Leap Forward, however, the work of procuring sweet clover seeds for state-imposed procurements increased labor intensity, and the importance of supplying seeds took precedence over peasants' use of sweet clover to meet their own needs, with the result that extension of sweet clover did not achieve its originally stated goals.

The history of sweet clover shows how a complicated intertwining of power and knowledge constructs multiple roles for different plants. These plants become part of everyday life via different pathways of transmission, and plants with different uses become connected to the land in specific ways. Humans select plants with certain features and attributes and introduce them into particular environments.

Behind these plants lay systems of knowledge that, with the plants as intermediary, alter land use and remold the landscape. Sweet clover was only one of the plants promoted via agricultural extension in socialist China, and agricultural extension brought the rural populace into contact with many others. The environmental and social effects of the extension and transformation of agricultural knowledge from the Republican era to the post-1949 period demand a more detailed evaluation.

Acknowledgments

Guannan Gao wishes to thank Prof. Micah Muscolino, without whose help this chapter would not exist. Thanks also to Dr. Li Rudong, Prof. Hou Yongjian, and Prof. Ts'ui-jung Liu for reading earlier drafts of this chapter and putting forward valuable suggestions. A draft of the Chinese language version of this chapter was presented at the UC San Diego-East China Normal University Graduate Workshop on Modern Chinese History, held on August 30–31, 2019, where Prof. Yang Kuisong, Zhang Rui, Peter Braden, and other graduate students posed significant questions and offered helpful advice.

Notes

1 Arturo Warman, *Corn & Capitalism: How a Botanical Bastard Grew to Global Dominance*, translated by Nancy L. Westrate (Chapel Hill: University of North Carolina Press, 2003), p. 3.

2 Sigrid Schmalzer, *Red Revolution, Green Revolution: Scientific Farming in Socialist China* (Chicago: University of Chicago Press, 2016), p. 25.

3 Nationwide Sweet Clover Academic Workshop Preparatory Group [全國草木樨學討論會籌備小組編] (ed.), *Selected Scientific and Technological Data on Sweet Clover* [草木樨科技資料選編] (August 1982), "前言 (Preface)," n. p.

4 During the Qing dynasty, officials had already started to recognize the importance of afforestation in conserving water and soil and controlling the Yellow River, but these ideas existed only among a small number of elites. They did not garner widespread attention and were divorced from subsistence-oriented considerations of the rural populace. See, for example, Tao Mo [陶模], "The Shaanxi-Gansu Governor-General Urges Tree-Planting [陝甘總督陶勘種樹木諭]," *The Journal of Agronomy* [農學報] 5 (1987): 3–5, cited in Luo Guihuan [羅桂環] and Shu Jianmin [舒儉民], *Population Changes and Environment Protection during the Historical Period in China* [中國歷史時期的人口變遷與環境保護] (Beijing: Metallurgical Industry Press [冶金工業出版社], 1995), p. 168.

5 D.W.Y. Kwok, *Scientism in Chinese Thought, 1900–1950* (New Haven: Yale University Press, 1965).

6 Luo Guihuan [羅桂環], "The Promotion of Water and Soil Conservation Enterprises by Western Scholars in China during the First Half of the Twentieth Century [20世紀上半葉西方學者對中國水土保持事業的促進]," *Water and Soil Conservation Science* [中國水土保持科學] 1:3 (2003): 106–110; Micah S. Muscolino, "Woodlands, Warlords, and Wasteful Nations: Transnational Networks and Conservation Science in 1920s China," *Comparative Studies in Society and History* 61:3 (2019): 712–738.

7 Micah S. Muscolino, "Refugees, Land Reclamation, and Militarized Landscapes in Wartime China: Huanglongshan, Shaanxi, 1937–45," *The Journal of Asian Studies* 69:2 (2010): 453–478.

8 Fu Huanguang [傅煥光], "Water and Soil Conservation and Water and Soil Conservation Enterprise [水土保持與水土保持事業]," in Ministry of Agriculture and Forestry Water and Soil Conservation Experiment Area [農林部水土保持實驗區] (ed.), *The Tianshui Water and Soil Conservation Experiment Area over the Past Three Years* [三年來之天水水土保持實驗區] (1946), p. 14. See also Micah S. Muscolino, "Tianshui's Three Treasures: Water and Soil Conservation in Wartime Northwest China," *Journal of Modern Chinese History* 13:1 (2019): 148–168.

9 Mo shiao [莫世鰲], "Soil and Water Conservation in the Yellow River Valley in the 1940 [四十年代的黃河流域水土保持工作]," *Soil and Water Conservation in China* [中國水土保持] 8 (1988): 55–57.

10 Chih-Cheng Lin [林志晟], "The Establishment and Development of the Ministry of Agriculture and Forestry's Water and Soil Conservation Experimental Area (1942–1946) [國民政府農林部水土保持實驗區的設置與發展,1942–1946]," *The Journal of Academia Historica* [國史館館刊] 31 (2012): 82.

11 Yang Hongwei [楊紅偉], "The Tianshui Water and Soil Conservation Experiment Area during the 1940s [1940年代的天水水土保持試驗區述論]," *Water and Soil Conservation Research* [水土保持研究] 6 (2011): 278–282.

12 The Tianshui Water and Soil Conservation Experiment Area also experimented with runoff plots, terraces and ditches, gully erosion control, willow check dams, afforestation, and agricultural cultivation practices to conserve soil as well as the breeding of improved varieties for mountain fields. See Yang Hongwei [楊紅偉], "The Tianshui Water and Soil Conservation Experiment Area during the 1940s [1940年代的天水水土保持試驗區述論]," pp. 278–282; Muscolino, "Tianshui's Three Treasures."

13 Wu Qijun [吳其濬], *An Illustrated Book on Plants* [植物名實圖考 (1848)] (Beijing: Commercial Press 商務印書館, 1957), p. 649. Zhang Baolie points out that *pihancao* is sweet clover. Zhang Baolie [張保烈] and Wen Rongwei [文榮威] (eds.), *Sweet Clover* [草木樨] (Beijing: Agriculture Press, 1989), p. 1.

14 Zhang Baolie [張保烈] and Wen Rongwei [文榮威] (eds.), *Sweet Clover* [草木樨], p. 1; W.A. Lloyd, "Sweet Clover: A Field Survey of Its Distribution, Soil Adaptation Habits and Agricultural Value," *Bulletin of the Ohio Agricultural Experiment* 244 (1912): 595.

15 Sidney W. Mintz, *Sweetness and Power: The Place of Sugar in Modern History*, (London: Penguin Press, 1986), "Introduction," p. xxix.

16 This section on Ye Peizhong draws on the biography written by his daughter. Ye Heping [葉和平], *Ye Peizhong* [葉培忠] (Beijing: China Forestry Publishing House [中國林業出版社], 2009). See also Muscolino, "Tianshui's Three Treasures," pp. 156–157.

17 "A Comparative Table of the Achievements of the Ministry of Agriculture and Forestry Water and Soil Conservation Experiment Area in 1944 [農林部水土保持實驗區三十三年度政績比較表]," Gansu Provincial Archives [甘肅省檔案館藏], File No.: 27-2-44.

18 Gao Jishan 高繼善, "A Brief Introduction of the Extension and Planting of Biennial White Sweet Clover in Tianshui, Gansu [甘肅省天水二年生白花草木樨試驗推廣情況簡介]," in *The Collected Materials of the Nationwide Sweet Clover Academic Workshop* [全國草木樨學術討論會資料彙編] (Tianshui: Tianshui Water and Soil Conservation Experiment Station of the Yellow River Conservancy Commission [黃河水利委員會天水水土保持科學試驗站], 1982), p. 25.

19 Ministry of Water Control and Hydroelectric Power Yellow River Conservancy Commission [水利電力部黃河水利委員會編] (ed.), *Sweet Clover* [草木樨] (Beijing: Water Conservancy and Hydroelectric Power Press [水利電力出版社], 1958), p. 3. Emphasis on popular science during the Mao era is reflected in accounts of the introduction of sweet clover; after the 1950s the emphasis on the scientific elite represented by Ye Peizhong faded and people attributed the discovery of sweet clover to the peasant Yang Shirong.

20 Li Guochen [李國珍], "A Bird's Eye View of Rural Villages at Tianshui, Gansu [甘肅天水農村之鳥瞰]," *China Farmers Bank Monthly* [中國農民銀行月刊] 1:2 (1936): 79.

21 "Table Evaluating Cultivation Progress at the Ministry of Agriculture and Forestry Water and Soil Conservation Experiment Area in the First Half of 1948 [農林部水土

保持實驗區三十七年度上半年耕作進度檢討報告表]," Gansu Provincial Archives [甘肅省檔案館藏], File No.: 27-2-46.

22 Mo Shiao [莫世鰲] (ed.), "A List of Introduced Species of Grass in Our Station [我站歷年引種各類草種名錄]," in *Compilation of Water and Soil Conservation Experiment and Research Results (1942~1980)*, Second Volume [水土保持試驗研究成果彙編(1942–1980)·第二集] (Tianshui Water and Soil Conservation Experiment Station of the Yellow River Conservancy Commission [黃河水利委員會天水水土保持科學試驗站], 1981), p. 146; Mo Shiao [莫世鰲], "A Brief History of Sweet Clover [草木樨史話]," in *Compilation of Water and Soil Conservation Experiment and Research Results (1942~1980)*, Second Volume [水土保持試驗研究成果彙編 (1942～1980)·第二集] (Tianshui: Tianshui Water and Soil Conservation Experiment Station of the Yellow River Conservancy Commission [黃河水利委員會天水水土保持科學試驗站], 1981), p. 102.

23 Mo Shiao [莫世鰲], "Introduction and Extension of Melilotus spp. in China [我國草木樨的引種推廣經過]," *Pratacultural Science* [草業科學] 3 (1991): 67; Muscolino, "Tianshui's Three Treasures," p. 157. Mo's record of the plant's name has been altered to reflect current botanical classification.

24 Mo Shiao [莫世鰲], "Introduction and Extension of Melilotus spp. in China [我國草木樨的引種推廣經過]," p. 67.

25 Wu Yongfu [吳永敷] (ed.), *A Collection of Registered Forage Species in China* (revised version) [中國牧草登記品種集 (修訂版)] (Beijing: China Agriculture University Press [中國農業大學出版社], 1999), pp. 151–153.

26 Ren Chengtong [任承統], "Survey of the Gansu Water and Soil Conservation Experiment Area [甘肅水土保持實驗區之勘察]," *Northwest Research* [西北研究] 6 (1941): 4–10. Cited in Muscolino, "Tianshui's Three Treasures," p. 158.

27 "Brief Table Reporting the Work of the Ministry of Agriculture and Forestry Water and Soil Conservation Experiment Area in July 1947 [農林部水土保持實驗區三十六年七月份工作簡報表]," Gansu Provincial Archives [甘肅省檔案館藏], File No.: 27-3-39.

28 "Comparative Table of the Achievements of the Ministry of Agriculture and Forestry Water and Soil Conservation Experiment Area in 1946 [農林部水土保持實驗區三十五年度政績比較表]," Gansu Provincial Archives [甘肅省檔案館藏], File No.: 27-2-63.

29 "Comparative Table of the Achievements of the Ministry of Agriculture and Forestry Water and Soil Conservation Experiment Area in 1948 [農林部水土保持實驗區三十七年度政績比較表]," Gansu Provincial Archives [甘肅省檔案館藏], File No.: 27-2-49.

30 "Brief Table Reporting the Work of the Ministry of Agriculture and Forestry Water and Soil Conservation Experiment Area in July 1947 [農林部水土保持實驗區三十六年七月份工作簡報表]," Gansu Provincial Archives [甘肅省檔案館藏], File No.: 27-3-39.

31 Mo Shiao [莫世鰲], "A Brief History of Sweet Clover [草木樨史話]," p. 102.

32 See note 30.

33 Tianshui Water and Conservation Extension Station [天水水土保持推廣站], *Tianshui Water and Soil Conservation Extension and Experiment Station Typical Watershed Management and Experimental Research Work* [天水水土保持推廣試驗站典型流域治理和試驗研究工作] (Yangling: Materials Room of the Institute of Water and Soil Conservation, CAS&MWR [中國科學院水利部水土保持研究所資料室藏], October 1955).

34 Mo Shiao [莫世鰲], "A Brief History of Sweet Clover [草木樨史話]," p. 102.

35 See note 33.

36 "Comparative Table of the Achievements of the Ministry of Agriculture and Forestry Water and Soil Conservation Experiment Area in 1945 [農林部水土保持實驗區三十四年度政績比較表]," Gansu Provincial Archives [甘肅省檔案館藏], File No.: 27-2-44.

37 Mo Shiao [莫世鰲], "A Brief History of Sweet Clover [草木樨史話]," p. 102.

38 Ibid.

39 Mo Shiao [莫世鰲] (ed.), *Gazetteer of the Yellow River Water Conservancy Commission Tianshui Water and Soil Conservation Experiment Station* [黃河委員會天水水土保持試驗站站志] (Unpublished manuscript, 1992), p. 7.

40 Ibid., p. 8; Yan Wenguan [閆文光] and Mo Shiao [莫世鰲], "A Survey of the Early Development of Sweet Clover in China [草木樨在我國早期發展概況]," Nationwide Sweet Clover Academic Workshop Preparatory Group [全國草木樨學討論會籌備小組] (ed.), *Selected Scientific and Technological Data on Sweet Clover* [草木樨科技資料選編] (August 1982), p. 1.

41 Ministry of Water Conservancy and Hydroelectric Power Yellow River Conservancy Commission [水利電力部黃河水利委員會] (ed.), *Sweet Clover* [草木樨] (Beijing: Water Control and Hydroelectric Power Press [水利電力出版社], September 1958), p. 1.

42 Mo Shiao [莫世鰲], "Introduction and Extension of Melilotus spp. in China [我國草木樨的引種和推廣過程]," p. 67.

43 "Simple Plan for Extending Sweet Clover in Tianshui Prefecture [天水專區推廣草木樨簡單計劃]," 1953, Tianshui Municipal Archives [藏于天水市檔案館].

44 Northwest Yellow River Engineering Service [西北黃河工程局], [函達撥匯草木樨種籽款請核收後備據送局由], October 8, 1953, Tianshui Municipal Archives [藏于天水市檔案館].

45 Reporters of Gansu Daily [甘肅日報記者集體采寫], "Dengjiabao – A Model of Constructing Mountain Areas [鄧家堡 – 建設山區的榜樣]," in People's Committee of Gansu [甘肅省人民委員會] (ed.), *Water and Soil Conservation in Gansu* [甘肅的水利水土保持] (September 1958), p. 129.

46 Longnan Water and Soil Conservation Promotion Station Qin'an Work Group [隴南水土保持推廣站秦安工作組], "Summary Report on Water and Soil Conservation Work in Qin'an County in 1953 [秦安縣五三年水土保持工作總結報告]," January 1954, Qin'an County Archives [藏于秦安縣檔案館], File No.: 長期-1.

47 Directive on Acquisition of Sweet Clover Seeds [關于收購草木樨種子的指示], 29 August 1955, Qin'an County Archives [藏于秦安縣檔案館], File No.: 長期-122.

48 Wang Huayun 王化雲, *My Practice of Controlling the Yellow River* [我的治河實踐], (Zhengzhou: Henan Science and Technology Press [河南科學技術出版社], February 1989), pp. 152–156.

49 "An Introduction to Experience with Biennial White Sweet Clover in Tianshui [天水二年生白花草木樨經驗介紹]," in Ministry of Water Conservancy and Hydroelectric Power Yellow River Water Conservancy Commission水利電力部黃河水利委員會 (ed.), *Collection of the Workshop on Water and Soil Conservation Scientific Experiment and Research Work in Middle Reaches of the Yellow River* [黃河中游水土保持科學試驗研究工作工作會議彙刊] (April 1958), p. 61.

50 Ministry of Water Control and Hydroelectric Power Yellow River Water Conservancy Commission [水利電力部黃河水利委員會] (ed.), *Sweet Clover* [草木樨], p. 1.

51 "Treasure Grass – Sweet Clover [寶貝草 – 草木樨]," *People's Daily* [人民日報], 21 December 1957, p. 2.

52 Yellow River Conservancy Commission Yellow River Upper and Middle Reaches Management Bureau [黃河水利委員會黃河上中游管理局] (ed.), *Yellow River Water and Soil Conservation Chronology* [黃河水土保持大事記] (Xi'an: Shaanxi People's Publishing House [陝西人民出版社], 1996), p. 127.

53 Ibid.

54 Yu Tianshou [余天壽] and Mao Tingyu [茅廷玉], "Aerial Seeding Sweet Clover Experiments [飛機播種草木栖試驗]," in *Compilation of Water and Soil Conservation Experiment and Research Results (1942~1980)*, Second Volume [水土保持試驗研究成果彙編(1942～1980)·第二集] (Tianshui Water and Soil Conservation Experiment Station of the Yellow River Conservancy Commission [黃河水利委員會天水水土保持科學試驗站], 1981), pp. 66–70.

55 "Treasure Grass – Sweet Clover [寶貝草 – 草木樨]," *People's Daily* [人民日報], 21 December 1957, p. 2.

56 Sources of data: "Correspondence Regarding the Exact Amount of Sweet Clover Seeds that Can be Procured [函詢可能外調草木樨種子確切數量]," 29 January 1957, Gansu Provincial Archives [甘肅省檔案館藏], File No.: 216-002-1099-0002; "Report on Sweet Clover and Alfalfa Seed Distribution Ideas [關于草木樨苜蓿種籽分配意見報告]," 26 February 1958, Gansu Provincial Archives [甘肅省檔案館藏], File No.: 216-002-1355-0001; "Report on the Sweet Clover and Alfalfa Seed Acquisition and Supply Situation [關于草木樨苜蓿種子收購供應情況報告]," 9 April 1958, Gansu Provincial Archives [甘肅省檔案館藏], File No.: 216-002-1355-0002; "Alfalfa and Sweet Clover Seed Acquisition and Supply Report [苜蓿草木樨種子收購供應報告]," 9 April 1958, Gansu Provincial Archives [甘肅省檔案館藏], File No.: 216-002-1345-0010; "Report on Alfalfa and Sweet Clover Seed Acquisition and Allocation Situation [關于苜蓿和草木樨種子收購和調撥情況報告]," 1 January 1960, Gansu Provincial Archives [甘肅省檔案館藏], File No.: 216-001-0814-0001. Seed purchase work was not transferred from the Tianshui Special Area to Gansu Province until November 1956, so for 1956 the amount of seed purchased in the province was less than in the special area.

57 "Transferring of the Seeds of Gansu's 'Treasure Grass' [甘肅"寶貝草"種子外調]," in *People's Daily* [人民日報], 14 March 1958, p. 2.

58 Interview: September 7, 2019, in Wushan county.

59 "Treasure Grass Will Take Root in Eighteen Provinces [寶貝草將在十八省生根]," *People's Daily* [人民日報], 7 April 1958, p. 2.

60 "Announcement Regarding Acquisition of Alfalfa and Sweet Clover Seeds in 1958 [關于1958年苜蓿草木樨種子收購工作的通知]," 27 June 1958, Gansu Provincial Archives [甘肅省檔案館藏], File No.: 216-002-1355-0005.

61 "Announcement on Strengthening Alfalfa and Sweet Clover Seed Acquisition Work [加强草木樨苜蓿種子收購工作通知]," 29 October 1958, Gansu Provincial Archives [甘肅省檔案館藏], File No.: 216-002-1355-0004; "Letter Requesting that Personnel Not be Sent Because Sweet Clover, Alfalfa and Grain Crops Seeds Cannot be Supplied [草木樨苜蓿種子及糧食作物良種無法供應請勿派員前來的函]," 15 December 1958, Gansu Provincial Archives [甘肅省檔案館藏], File No.: 216-002-1355-0006.

62 "Report on Alfalfa and Sweet Clover Seed Acquisition and Allocation Situation [關于苜蓿和草木樨種子收購和調撥情況報告]," 1 January 1960, Gansu Provincial Archives [甘肅省檔案館藏], File No.: 216-001-0814-0001.

63 "Notification on Seizing the Opportunity to Plant Sweet Clover and Other Grasses in Large Amounts [關于抓緊時機大量種植草木樨等草子的緊急通知]," 30 March 1963, Gansu Provincial Archives [甘肅省檔案館藏], File No.: 228-001-0520-0007.

64 Tianshui Municipality Local Gazetteer Compilation Committee [天水市地方志編纂委員會] (ed.), *Tianshui Municipal Gazetteer*, Middle Volume [天水市志·中卷], (Beijing: Local Gazetteer Press [方志出版社], 2004), p. 958.

65 See note 63.

66 See note 64.

67 Shanxi Province Yanbei Municipality Youyu Water and Soil Conservation Experiment Station [山西省雁北市右玉水保試驗站領導小組], *The Position of Sweet Clover in Agricultural Production and its Cultivation Methods* [草木樨在農業生産中的地位和栽培方法] (Yangling: Materials Room of the Institute of Water and Soil Conservation, CAS&MWR [中國科學院水利部水土保持研究所資料室藏], January 1969); Shanxi Province Yanbei Area Scientific and Technical Committee, Shanxi Province Agricultural Science Institute Crop Research Office [山西省雁北區科學技術委員會、山西省農業科學院大同作物研究所編印] (ed.), *Hold High the Great Red Flag of Mao Zedong Thought and Greatly Plant and Use Sweet Clover* [高舉毛澤東思想偉大紅旗大種大用草木樨] (Yangling: Materials Room of the Institute of Water and Soil Conservation, CAS&MWR [中國科學院水利部水土保持研究所資料室藏], November 1967).

68 See note 64.

69 "Chinese Agronomy Association Soil and Fertilizer Research Committee Vice-Secretary Comrade Jiao Bin's Concluding Speech at the Nationwide Sweet Clover Academic Workshop [中國農學會土壤肥料研究會副秘書長焦彬同志在全國草木樨學術討論會閉幕式上的小結講話]," in *The Collected Materials of the Nationwide Sweet Clover Academic Workshop* [全國草木樨學術討論會資料彙編] (Tianshui: Tianshui Water and Soil Conservation Experiment Station of the Yellow River Conservancy Commission [黃河水利委員會天水水土保持科學試驗站], 1982), p. 7.

70 Yellow River Conservancy Commission Yellow River Upper and Middle Reaches Management Bureau [黃河水利委員會黃河上中游管理局] (ed.), *Yellow River Water and Soil Conservation Gazetteer* [黃河水土保持志] (Zhengzhou: Henan People's Publishing House [河南人民出版社], 1993), p. 48.

71 Interview: May 17, 2018, in Qin'an county.

72 Sigrid Schmalzer, *Red Revolution, Green Revolution: Scientific Farming in Socialist China* (Chicago: University of Chicago Press, 2016), p. 128.