Study of Land Measurement (Mu System) in Zhaoyuan County, Dengzhou Prefecture, Shandong Province during the Qing Dynasty

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Abstract: The whole issue of land measurement has been a major problem when studying the Qing Dynasty's economy. In the past, researchers tried to get a general idea about land measurements, but their methods had a lot of flaws and didn't provide solid answers. To tackle this problem, this paper decided to go back to the basics and take a closer look at each county. By using some techniques, we've pretty much solved how land was measured and converted in these counties. The techniques we used include comparing info, looking at how things were connected, analyzing the history logically, and making intelligent guesses. This paper dives deep into the specifics of Zhaoyuan County, part of Dengzhou Prefecture, to find out how to solve these tricky questions about land measurement.

1. Introduction

The study of land measurement in the Qing Dynasty, encapsulated by the 'Mu' system, remains a persistent challenge in economic research. Two primary factors contribute to this complexity: firstly, the system's alignment with taxation needs led to the dominance of 'taxed Mu' over 'Real mu', the actual cultivated land. [1] Secondly, this taxation-driven approach gave rise to widespread discrepancies, notably the phenomenon of 'Zhe-Mu'. [2]Contemporary analyses often lack empirical evidence, relying instead on speculative interpretations. Scholars like Gao Wangling and Shi Zhihong provide insights, but their approaches suffer from subjective interpretations and limited empirical support. Gao Wangling's assessment of land measurement during this era relies heavily on agricultural data and lacks the empirical underpinning necessary for solid conclusions. [3] Similarly, Shi Zhihong's reasoning falls short of rigorous substantiation.[4]

This paper focuses on Dengzhou Prefecture's Zhaoyuan County in Shandong Province and aims to provide precise land measurement data and offer a deeper understanding of the intricacies of land management during the Qing Dynasty, thus contributing to a more robust scholarly inquiry into Qing Dynasty economics.

2. Manuscript Preparation

2.1 Historical Data on Land Measurements in Zhao Yuan County

During the Ming Dynasty's Hongwu era, Zhao Yuan County belonged to Shandong Province's Laizhou Prefecture before being transferred to Dengzhou Prefecture in 1376, remaining there throughout the Qing Dynasty. Zhao Yuan County's research significance lies in its lack of direct historical records on land measurement systems (Mu system) and their conversions (Zhe-Mu), posing challenges but offering diverse research perspectives.

The "Zhao Yuan County Annals" from the Qing Shunzhi era's seventeenth year detail the conversion of land measurements. Initially, during the Ming Dynasty's Wanli era, the county had a surveyed area of 5,641.99 hectares, standardized to 3,930.52 hectares during the Chongzhen era. This process accounted for reclaimed land and excluded uncultivated areas, resulting in 3,848.19 hectares of taxable land.[5]

The "Zhao Yuan County Continued Annals" elaborate on Dengzhou Wei's incorporation, detailing

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conversion rates for different land qualities. [6] However, whether Zhao Yuan County applied the same conversion process remains uncertain, requiring further investigation. Historical records, including the "Dengzhou Prefecture Annals" and its continuations, offer additional insights into land measurements but do not significantly deviate from the county annals' information.[7]

The study of land measurements in Zhao Yuan County involves multiple research perspectives and is thus representative. These records suggest stability in the Mu system and Zhe Mu process, with land measurement values remaining unchanged from the Ming to the Qing Dynasty.

Moreover, the choice of Zhao Yuan County as a research subject reflects its complexity and importance within the broader context of land measurement studies during the Qing Dynasty. While other prefectures and counties may have more direct historical records, Zhao Yuan County's lack of such information presents an opportunity to explore different research methodologies and perspectives to understand land measurement systems better.

One such approach is advocated by scholars like Zhu Yiming, who propose a meticulous county-by-county analysis.[8]By comprehensively gathering and analyzing information related to land measurement for each Qing Dynasty county, scholars aim to generate precise data and deepen our understanding of this complex aspect of Qing Dynasty economics. This approach allows for a nuanced examination of local variations in land measurement systems, accounting for factors such as geography, agricultural practices, and administrative policies.[9]

Additionally, the study of land measurements in Zhao Yuan County sheds light on broader economic and administrative trends during the Qing Dynasty. For example, the conversion of land measurements reflects changes in taxation policies and administrative practices over time. Understanding these dynamics can provide valuable insights into the Qing Dynasty's agrarian economy and its interactions with broader social and political structures.

2.2 Examination and Analysis of the Mu System in Zhao Yuan County During the Qing Dynasty

Zhao Yuan County does not have explicit records of the Mu system, which presents certain challenges for research. However, by thoroughly reviewing materials and employing associative logical research, some clues can be found.

After extensively reviewing various editions of the county annals, an important record can be found in Volume 3 of the "Zhao Yuan County Annals" during the Shunzhi era of the Qing Dynasty, specifically in the "School Fields" section. It states, “In the forty-first year of the Wanli era, the Prefect Tao Lang initially set aside one area of school fields, totaling one hectare, with an annual grain yield of twenty stones.” In the same volume, Yang Guangguang's "Preface to Yang Gong's Charity to Scholars" records, “Carefully calculating the fourth-class land, one hectare and four mu were donated to the school temple to continue the legacy of the former senior official. The upper-class land measures twelve Mu, two fen, eight li, nine hao; the medium-quality land, twenty-nine Mu, eight fen, six li, five hao; the lower land, thirty-four Mu, three fen, five li, three hao; the lowest land, twenty-eight Mu, three fen, one li, five hao. Together, these four classes total one hectare, four Mu, seven fen, two li, two hao. The land includes two She, totaling twenty-nine steps, amounting to 25,134 steps and four chi.”

These two sections contain rich information. First, during the Wanli era, Prefect Tao Lang set aside an area of school fields measuring 100 Mu, with an annual grain yield of 20 stones, where one stone equals ten dou. This equates to an average yield of only two dou per Mu, indicating a very low per Mu yield and likely not a large Mu measurement standard.

The subsequent records further confirm that these school fields indeed followed the 240-step Mu system. The total area of the four classes of land is 104.722 Mu. The term “She totals two,” covering 25,133.28 steps. Dividing 25,133.28 steps by 240 steps equals 104.722, demonstrating that Zhao Yuan County’s school fields were indeed based on a 240-step Mu system.

2.3 Examination and Analysis of the Conversion of Mu in Zhao Yuan County during the Qing Dynasty

During the Chongzhen era of the Ming Dynasty, Zhao Yuan County experienced a significant conversion of Mu, the land measurement units. Historical records indicate that land surveyed into

four classes during the Wanli era was standardized into real land during the Chongzhen era. This suggests a shift from the previous system to a more uniform classification, likely dividing the land into upper, middle, or lower classes rather than using a virtual Mu for grain levy. However, the specifics of this conversion remain unclear from the available records.

Interestingly, there is mention in the records of a similar conversion occurring in Dengzhou Wei during its incorporation into Zhao Yuan County.[5] It is noted that there was a conversion from fourth-class land to standard upper-class land in Dengzhou Wei during this process. This raises questions about the relationship between the conversion of Mu in Dengzhou Wei and Zhao Yuan County. Further insight into this matter is provided by historical information regarding the incorporation of Dengzhou Wei into various prefectures and counties in Shandong during the Qing Dynasty. In the sixteenth year of the Shunzhi era, Dengzhou Wei was divided and incorporated into five prefectures and counties, including Penglai County, Fushan County, Zhao Yuan County, Laiyang County, and Huang County. Each county had its own system of land measurement classes, taxation, and Mu conversion rates.

For example, in Penglai County, Dengzhou Wei's garrisoned land was organized and taxed according to the land measurement situation in Penglai County itself. In Fushan County, Dengzhou Wei's land measurements were transformed into upper, middle, and lower three-class garrisoned land during the incorporation process.

In conclusion, the conversion of Mu in Zhao Yuan County likely mirrored the process during the incorporation of Dengzhou Wei. It involved transforming four classes of large grain land into a standard upper-class land, with varying conversion rates for medium-quality, lower, and lowest lands. This underscores the complexity and variability of land measurement practices during historical periods and highlights the importance of understanding local contexts and systems in interpreting historical records.

2.4 Estimation of Land Measurement Grades in Zhao Yuan County during the Qing Dynasty

According to the records in the "Zhao Yuan County Annals" from the seventeenth year of the Shunzhi era of the Qing Dynasty, “During the Wanli era, the original surveyed area of four classes of land was 564199.263 Mu; during the Chongzhen era, it was converted to a standardized real land area of 393052.57 Mu, returning land allocated for Western-style kitchen stoves measuring 19999.999 Mu, and including 62335.5 Mu of uncultivated land under the Tun Institute's jurisdiction, resulting in a total of 384819.521 Mu of mature and owner-claimed uncultivated land.” Clearly, since the Qing Dynasty always used the land measurement of 384819.521 Mu from the Chongzhen era as the original quota, there has been no further conversion of Mu since then. That is, based on the known conversion rates, the 564199.263 Mu from the Wanli era was converted into a standardized actual land area of 393052.57 Mu.

Since Zhao Yuan County originally had four classes of land, it is not possible to obtain accurate Mu numbers for each class. Therefore, estimation must be based on certain data and information.

Information 1: "Zhao Yuan County, being a remote region, is predominantly mountainous with poor soil, impoverished residents, and simple and honest customs."

Information 2: According to the 1991 "Zhao Yuan County Annals," based on the second national soil survey land grading standards, there is no first-class land in the area. Second-class land accounts for 4.37%, with flat terrain and deep soil, conducive to stable and high crop yields; third-class land accounts for 19.58%, similar to second-class but with severe soil drought and poor irrigation conditions; fourth-class land accounts for 43.14%, mainly located in hills and riverbanks with poor water retention, selective for crops and with many limiting factors; fifth-class land accounts for 21.32%, with steep slopes, severe erosion, and shallow soil, mainly cultivated with sweet potatoes, peanuts, and orchards; sixth-class land accounts for 10.6%, with steep slopes, fragile soil or exposed rocks; seventh-class land accounts for 0.99%, located on the middle and upper parts of hills, with the poorest soil quality. It can be roughly assumed that the second-class land corresponds to the upper-class land of Qing Dynasty Zhao Yuan County; third-class land to medium-quality land; fourth-class land to lower land; and fifth, sixth, and seventh-class land to the lowest land. If following these

standards, upper-class land only constitutes 4.37% of the total; medium-quality land 19.58%, lower land 43.14%, and the lowest land 32.91%.

Information 3: The records of "Preface to Yang Gong's Charity to Scholars"[10] carefully calculate the fourth-class land, one hectare and four Mu were donated to the school temple. The upper-class land measures twelve Mu, two fen, eight li, nine hao; the medium-quality land, twenty-nine Mu, eight fen, six li, five hao; the lower land, thirty-four Mu, three fen, five li, three hao; the lowest land, twenty-eight Mu, three fen, one li, five hao." Here, upper-class land constitutes 11.72%, medium-quality land 28.49%, lower land 32.77%, and lowest land 27.01%.

Information 4: "(Zhao Yuan County) consolidated the four-class garrisoned land from Dengzhou Wei. The mature and newly reclaimed upper-class land was 278.22.52 Mu; medium-quality land 1,784.82.82 Mu; lower land 994.56.16 Mu; and the lowest land 1,692.81.39 Mu." From the perspective of Dengzhou Wei, the proportions are 5.857% for upper-class land, 37.572% for medium-quality land, 20.936% for lower land, and 35.635% for lowest land. Given that Dengzhou Wei was established near the sea, with relatively more saline-alkali land, it is likely that the lowest land (saline-alkali land) proportion would be relatively high and upper-class land proportionally smaller. This distribution can serve as a reference ratio.

Based on these four pieces of information, considering the stability of geological characteristics, the proportion of the four grades of land in Zhao Yuan County can be roughly estimated based on Information 2 as a benchmark, and then adjusted by Information 1, Information 3, and Information 4, along with factors such as the conversion of Mu. If Information 2 is used as the initial state for estimation, the proportion of the four grades of land in Zhao Yuan County during the Qing Dynasty would be approximately 4.37% for upper-class land, 19.58% for medium-quality land, 43.14% for lower land, and 32.91% for lowest land.

Thus, the following set of four equations was established. [11] Let the four classes of land be represented as follows: upper-class land as x, medium-quality land as y, lower land as z, and lowest land as w. This leads to the following two equations:

$$x + y + z + w = 564199.263;\ (2)\ x + (y/1.3) + (z/1.7) + (w/2.4) = 393052.57 \quad (1)$$

If the initial state values of the proportion of each class of land are substituted into equation (1), the resulting values are upper-class land 24655.5078 Mu, medium-quality land 110470.216 Mu, lower land 243395.562 Mu, and lowest land 185677.977 Mu. Substituting these four values into equation (2) results in 330172.28 Mu, which is significantly less than 392052.57 Mu. This indicates that the proportions of upper and medium-quality lands are too low. For example, incorporating the distribution of the four classes of land from the school fields (Information 3) into equations (1) and (2) results in the value of equation (2) being 362065.789 Mu, which is noticeably closer than the deviation found using Information 2. This also illustrates that using modern land grade standards to measure ancient land grades indeed has significant errors and can only serve as a reference. From the above mathematical results, considering the variations in Information 2, 3, and 4, and taking into account the actual situation of only 2-2.5 dou per Mu yield in upper and medium-quality lands in Qing Dynasty Zhao Yuan County, it is appropriate to moderately stabilize or increase the proportion of x and y, maintain a reasonable proportion of z, and significantly reduce the proportion of w to effectively meet the requirements of equation (2).

Looking at the entire set of equations, the values of w and x have a significant impact on the overall solution, and their changes are synchronized; a high value of w implies a high value of x and vice versa. Given that the lowest land (w) in Zhao Yuan County has a significant proportion according to Information 2, 3, and 4, but if the proportion of w is too high, it cannot satisfy equation (2), and the proportion of upper-class land (x) cannot be too high either. [12]Combining the relevant data from Information 2, 3, and 4, a rough reference range can be derived: upper-class land 4.37–11.72%, medium-quality land 19.58–37.572%, lower land 20.936–43.14%, and lowest land 27.01– 35.635%. It is clear that the value of x cannot be too high, and even at its maximum reference range of 11.72, it should be slightly higher (since the value of w cannot be too high, and a too-low value of x would significantly increase the value of y and decrease z, leading to a large deviation from the reference

range). Taking 12% and 13% for x, the corresponding proportions for y, z, and w are 43.03%, 33.97%, 11%, and 39.8%, 37.2%, 10%, respectively. Since the proportions of x and w do not differ significantly, comparatively, when the proportion of x is 13%, the resulting proportions of y and z are more reasonable relative to the reference range. Therefore, the estimated land measurement values for the four classes of land in Zhao Yuan County are as follows: x, y, z, w proportions are 13%, 39.8%, 37.2%, 10%, respectively; upper-class land x = 73345.9 Mu; medium-quality land y = 224551.307 Mu; lower land z = 209882.126 Mu; and lowest land w = 56419.926 Mu.

3. Conclusion

Based on the research process of the mu system in Zhaoyuan County, Dengzhou Prefecture, Shandong Province during the Qing Dynasty, we can roughly conclude that the Mu system in Zhaoyuan County of Dengzhou Prefecture generally adhered to the official measurement requirements. This indicates that it is overly simplistic and inaccurate to make general estimates based on partial macro-historical descriptions without empirical evidence. Meanwhile, this paper shows that we can overcome the constraints of partial records that suggest overall issues with land measurements by studying the historical records of each prefecture and county, Empirical research, based on relatively precise and reliable sources, helps eliminate uncertainties caused by vague descriptions in some historical records, forming a bottom-up, feasible research approach.

While county chronicle research methods yield limited conclusions from direct historical records, a more reliable outcome is achievable through exhaustive examination of the records. This involves tax information analysis, yield per Mu analysis, neighboring county comparisons, and correlative information analysis, followed by logical reasoning. Even with potential errors, these results are within a reasonable margin for the overall data. Even with clear textual records in certain counties, there can still be issues that require analysis in conjunction with other historical materials.

In summary, through the research method of examining county chronicles in Zhaoyuan County, Dengzhou Prefecture, we conclude that Zhaoyuan County followed a system of 240-step Mu. This leads to the finding that the Zhe-mu situation in Zhaoyuan County is consistent with that of the incorporated Dengzhou Wei, which is classified as four different grades of grain-producing land. Specifically, the highest- grade land was based on the actual Mu without folding; middle-grade land was folded such that three parts of it equaled one actual Mu; lower-grade land was folded so that seven parts of it equaled one actual Mu; the lowest-grade land was folded such that two and four-tenths of it equaled one actual Mu. Although specific to Zhaoyuan County, this basic research logic and paradigm are applicable more broadly.

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