Special Feature

Making Land Legible: Digital Reconstruction and the Logic of Land-Tax Adjustment in Joseon *Yang'an*

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Introduction

"We have written the history of these lands without knowing where they were located." This sentence captures a defining condition of late Joseon land-history research in Korean historiography over the past several decades. The Joseon state justified its authority over land and people through the ideology of "royal land and royal subjects" (*wangto wangmin* 王土·王民), which asserted that no land under heaven fell outside the king's domain and no person upon that land stood outside the king's subjecthood. On this foundation, the state sought stable revenues by continuously registering and managing both population and land. Population was recorded through household registers compiled every three years, while land was legally mandated to be surveyed every twenty years.[1]

In practice, however, nationwide land surveys, *yangjeon* 量田, required enormous time and resources. Surveys were therefore often conducted at intervals far exceeding the prescribed twenty-year cycle. From the seventeenth century onward, state-led surveys were undertaken only sporadically—in 1634, 1720, and 1898—leaving an increasingly wide gap between them. During the eighteenth and nineteenth centuries, locally initiated surveys were carried out outside any regularized cycle, thereby partially offsetting the absence of state-led surveys. The results were compiled into registers known as *yang'an* 量案, many of which have survived to the present.

The *yang'an* constitute the most concentrated documentary record of how the Joseon state perceived, classified, apprehended, and taxed land. Yet despite their volume and detail, these registers contain not a single cadastral map, nor is there evidence that separate cartographic materials were produced for their use. This absence stands in marked contrast to China's *yulin tuce* 魚鱗圖冊, commonly glossed as "fish-scale registers," and Japan's *kenchichō* 檢地帳, which often included schematic maps indicating parcel locations or were accompanied by supplementary cartographic materials.

Within the *yang'an*, locational information for each parcel is limited to the

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1 The original text is as follows: "All land is divided into six grades. Every twenty years it is remeasured and registered, and the completed register is kept in the relevant central, provincial, and county offices" 凡田, 分六等, 每二十年改量成籍, 藏於本曹·本道·本邑 (*The National Code* [*Gyeongguk daejeon* 經國大典], Hojeon 戶典, "Yangjeon" 量田).

direction of movement during the survey—one of the four cardinal directions—and the four-side boundary descriptions, *sapyo* 四標. While such information may have sufficed for land administration and tax assessment at the time, it offers modern researchers only fragmentary clues—insufficient to reconstruct the actual spatial location of individual parcels with confidence. The difficulty of determining where the countless parcels recorded in the *yang'an* were physically situated has therefore operated as a structural constraint on *yang'an*-based research as a whole.

Despite this limitation, scholarship that quantified and statistically analyzed the textual data contained in the *yang'an* played a foundational role in the formation of Korean economic history. In particular, a series of studies by Kim Yongseop (1960a, 1960b, 1963, 1964) in the 1960s laid the intellectual groundwork for what later became known as the "intrinsic development" thesis and the "sprouts of capitalism" thesis. Proceeding from the premise that land-related information in the *yang'an* reflected contemporary reality with reasonable fidelity, Kim's analyses identified numerous cases in which individuals of low social status appeared to possess extensive holdings, as well as substantial numbers of wealthy farmers whose lands exceeded the scale that a single household could cultivate. These patterns were taken to exemplify "managerial rich farmers" and taken as evidence of incipient capitalist development.

This interpretation subsequently converged with the broader explanatory framework of the "development of a commodity-money economy" in late Joseon and solidified into a dominant narrative in modern Korean historiography. Down to the present, this paradigm has exerted wide-ranging influence across economic, political, intellectual, social, and everyday life historiography, extending even to women's history. Because subsequent debates and research agendas have accumulated on the basis of these earlier findings, fundamentally questioning the initial *yang'an* studies would entail a comprehensive reexamination of more than half a century of Joseon-period historiography.

From the late 1980s onward, however, Kim Yongseop's interpretations faced sustained criticism, most prominently from Lee Yeonghoon (1988). By cross-checking the *yag'an* with other historical sources, Lee (1990, 1992) demonstrated that the "owner name" (*jumyeong* 主名) recorded in the registers may not represent the actual landholder. This finding underscored the limitations of relying on *yang'an* data alone to reconstruct concrete patterns

of landownership. The ensuing critiques expanded into broader debates over inflation and agricultural productivity in late Joseon, eventually contributing to what came to be known as the "nineteenth-century crisis" thesis and later the "colonial modernization" thesis.

Although these paradigms reached sharply divergent conclusions about late Joseon society, they shared a common methodological foundation. Both relied on the same source, the *yang'an,* and employed essentially the same procedure: converting textual information into numerical data for statistical analysis. In this process, land was treated as an abstract object of calculation, while its geographical context was systematically bracketed. Research thus proceeded for decades without being able to specify where, in physical space, the land under analysis had actually been located. Because critiques and counter-critiques unfolded within a shared methodological framework, subsequent exchanges—however sharply argued—tended to remain confined to the same analytical premises rather than fundamentally reconfiguring them.

Efforts to recover the spatial information embedded in the *yang'an* were not entirely absent. In 1997, Miyajima Hiroshi 宮嶋博史 (1997) demonstrated the possibility of a fundamentally different approach. Using recorded parcel shapes—such as squares, rectangles, and right triangles—together with length, width, and area measurements, he transferred these figures onto graph paper at a fixed scale and physically cut them out to produce parcel models. By comparing these reconstructed forms with colonial-period cadastral maps, while taking into account survey direction and *sapyo* boundary information, he inferred the likely locations of parcels recorded in the *yang'an*. It was, in effect, an attempt to reassemble a portion of the earth's surface by hand, piece by piece. The study yielded meaningful insights precisely because of its methodological departure from earlier work. Yet the approach demanded extraordinary time and labor, and its limited flexibility during analysis prevented it from becoming a sustainable research method.

A more substantive possibility for overcoming these limitations began to open with the expansion of digital humanities. As research moved beyond the phase of "humanities computing," in which computers were used as active research tools, and digital humanities established itself as a recognizable scholarly current, new modes of source interpretation began to emerge within Korean historiography as well. Among these developments is JigsawMap, a visualization tool for textual information in the *yang'an*, whose development process I

participated in.

Initiated around 2010, JigsawMap visualizes the information recorded in the *yang'an*, enabling the arrangement and rearrangement of parcels, supporting the reconstruction of land surfaces, and facilitating the construction of virtual cadastral maps. Rather than merely quantifying *yang'an* data, it restructures that information in a way that brings administrative context and the period's epistemic framework into view together. In this respect, it departs from earlier approaches.

Instead of focusing solely on increasing analytical precision, this methodology employs digital tools in a manner that foregrounds the context in which records were produced and the internal logic by which they operated. In the renewed wave of attention to digital humanities accompanying the rise of AI, the significance and role of such an approach invite careful reconsideration. Approaches premised on spatial codification and quantification risk, paradoxically, simplifying the relational and procedural character of historical records or reducing the epistemic frameworks embedded within them to modern conceptual categories. Research that utilizes digital tools should therefore begin not with the question of what can be calculated more accurately, but with how patterns and discrepancies that remain difficult to detect through conventional research methods can be rendered visible.

From this perspective, this article examines the structuring logic of Joseon *yang'an* at the parcel level. By aligning the Gwangmu *yang'an* 光武量案—the final comprehensive compilation of the dynasty—with colonial-period land registers, it traces how individual parcels were apprehended and reconfigured under distinct administrative regimes. This comparison makes it possible to clarify how the aims and orientations of land surveys evolved over time.

Furthermore, by demonstrating how this analysis differs from conventional ledger-level quantitative approaches, the article proposes a way of reading spatial information from textual sources without becoming absorbed into coordinate-based mapping. In doing so, it aims to contribute to a reassessment of historical logics that have not been fully illuminated under established modes of interpretation.

Visualizing Spatial Logic in Joseon Land Registers

Before proceeding further, it is necessary to clarify the primary source under analysis, the *yang'an*. In order to levy and collect taxes on land, the Joseon state surveyed taxable land and organized the results into registers. Although records indicate that land surveys and the compilation of *yang'an* were conducted from the early years of the dynasty, the registers that survive today date largely from the seventeenth century onward. Among them, the Gyeongja *yang'an* 庚子量案 compiled in 1719–1720, the Gwangmu *yang'an* of 1899–1904, and the *eup-yang'an* 邑量案 compiled by local administrations in the intervening period have served as the principal corpus for scholarly research. The following figures present representative examples.

Figure 1. Gyeongja *Yang'an* of Namhae-hyeon, Gyeongsang-do (1720)
Source: *Namhae-hyeon Gyeongja gaeryang jeonan* 南海縣庚子改量田案 (Kyujanggak Institute for Korean Studies, Seoul National University [奎14717])

Figure 2. *Eup-yang'an* of Namsang-dong, Eonyang-hyeon, Gyeongsang-do (1871)
Source: *Gyeongsang-do Eonyang-hyeon Namsam-dong jeondap yang'an* 慶尙道彦陽縣南三洞田畓量案 (Kyujanggak Institute for Korean Studies, Seoul National University [奎15008])

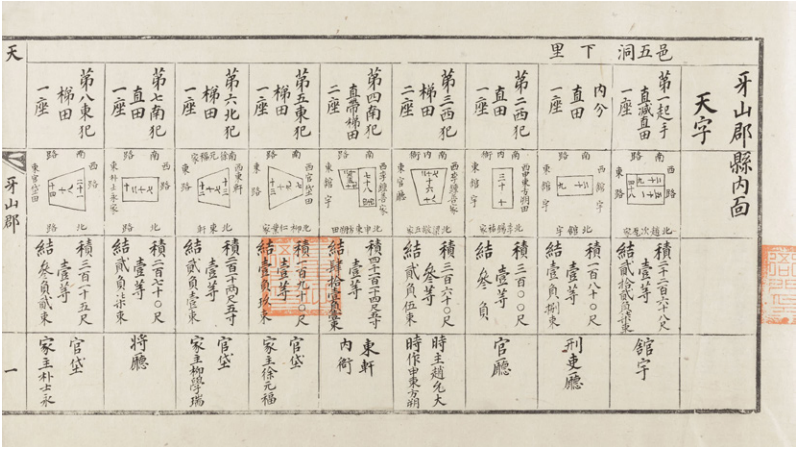


Figure 3. Gwangmu *Yang'an* of Asan-gun, Chungcheong-do (1900)
Source: *Chungcheongnam-do Asan-gun yang'an* 忠淸南道牙山郡量案 (Kyujanggak Institute for Korean Studies, Seoul National University [奎17664])

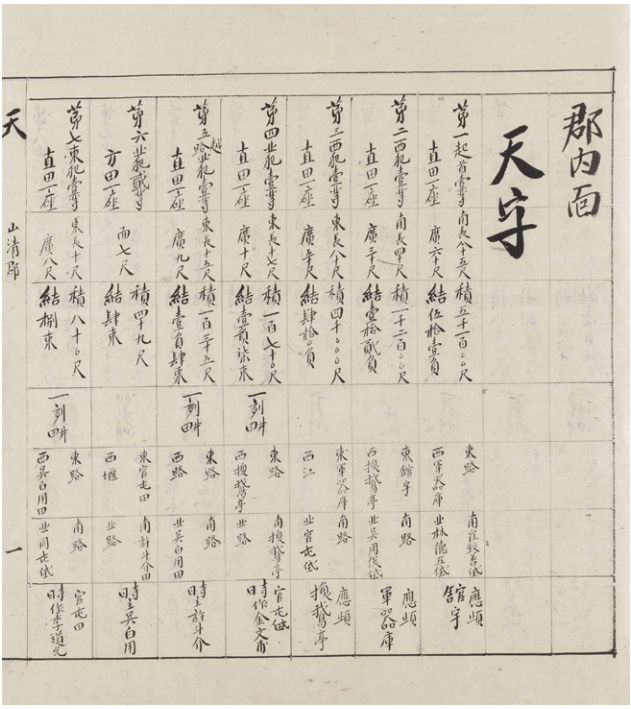


Figure 4. Gwangmu *Yang'an* of Sancheong-gun, Gyeongsang-do (1904)
Source: *Gyeongsangnam-do Sancheong-gun yang'an* 慶尙南道山淸郡量案 (Kyujanggak Institute for Korean Studies, Seoul National University [奎17689])

Although the physical format of the registers varies somewhat by period and region, the recorded categories are largely consistent. Each vertical line corresponds to a single parcel. Entries begin with the survey sequence number, the direction of survey progression, the assigned grade (from first to sixth), the geometric shape (one of five types: square, rectangle, isosceles triangle, right triangle, or trapezoid), and the land category (paddy field, dry field, or residential plot). These are followed by recorded length and width, from which area is calculated. On the basis of area and grade, the tax-assessment unit, *gyeolbu* 結負, is calculated. Information on the four cardinal boundaries (*sapyo*)—east, west, south, and north—is also recorded, along with the name of the person responsible for tax payment.

In early Gwangmu *yang'an*, as illustrated in Figure 3, simplified geometric diagrams were inserted to indicate parcel shape and to assist in recording *sapyo* and dimensions. These figures were highly schematic and bore little resemblance to actual parcel configurations. In later registers, such as Figure 4, even these

diagrams disappeared. With the exception of this brief phase of diagrammatic insertion, Joseon *yang'an* recorded information concerning parcel shape, size, and even location entirely in textual form.

The idea of visualizing textual information in the *yang'an*, rearranging parcels within the registers, and constructing a virtual cadastral map capable of identifying actual locations began to be realized in earnest only in the 2010s. At Seoul National University, an interdisciplinary collaboration between the Department of Korean History and the Department of Computer Science initiated the development of dedicated software. I participated in this project, contributing to planning meetings, alpha and beta testing, and successive version revisions. After approximately three years of research and development, the team completed a tool capable of visualizing land-related textual information, reconstructing a virtual cadastral surface, and linking registers compiled at different points in time for parcel-level analysis. Because the process resembled assembling a jigsaw puzzle, the tool was named JigsawMap.[2]

Compared with manual reconstruction, JigsawMap reduces required time by several orders of magnitude while substantially improving accuracy and usability. The tool employs a node–link diagram model: each parcel recorded in the *yang'an* is represented as a node, and nodes are connected according to survey sequence. By repositioning nodes using survey direction and *sapyo*, a virtual configuration of parcels such as that shown in Figure 5 can be generated.[3] In this way, registers transmitted for centuries without any cadastral map became amenable to cadastral visualization only in the 2010s.

When such virtual configurations are compared sequentially with modern cadastral maps, it becomes possible to identify the physical locations corresponding to individual nodes. In Korea, nationwide cadastral maps were produced during the colonial land survey project of the 1910s. Because these maps were compiled within a relatively short temporal distance from the Gwangmu *yang'an*, they provide a suitable basis for comparison. Figure 6 presents the result of overlaying the two datasets. This makes it possible, for the first time, to move beyond aggregated ledger-level statistics and to

2 The project description can be found on the website of the Human–Computer Interaction Lab (HCIL), Department of Computer Science and Engineering, Seoul National University (http://hcil.snu.ac.kr/research/jigsawmap).

3 For a detailed explanation of JigsawMap's operating principles and usage, see S. Kim 2022.

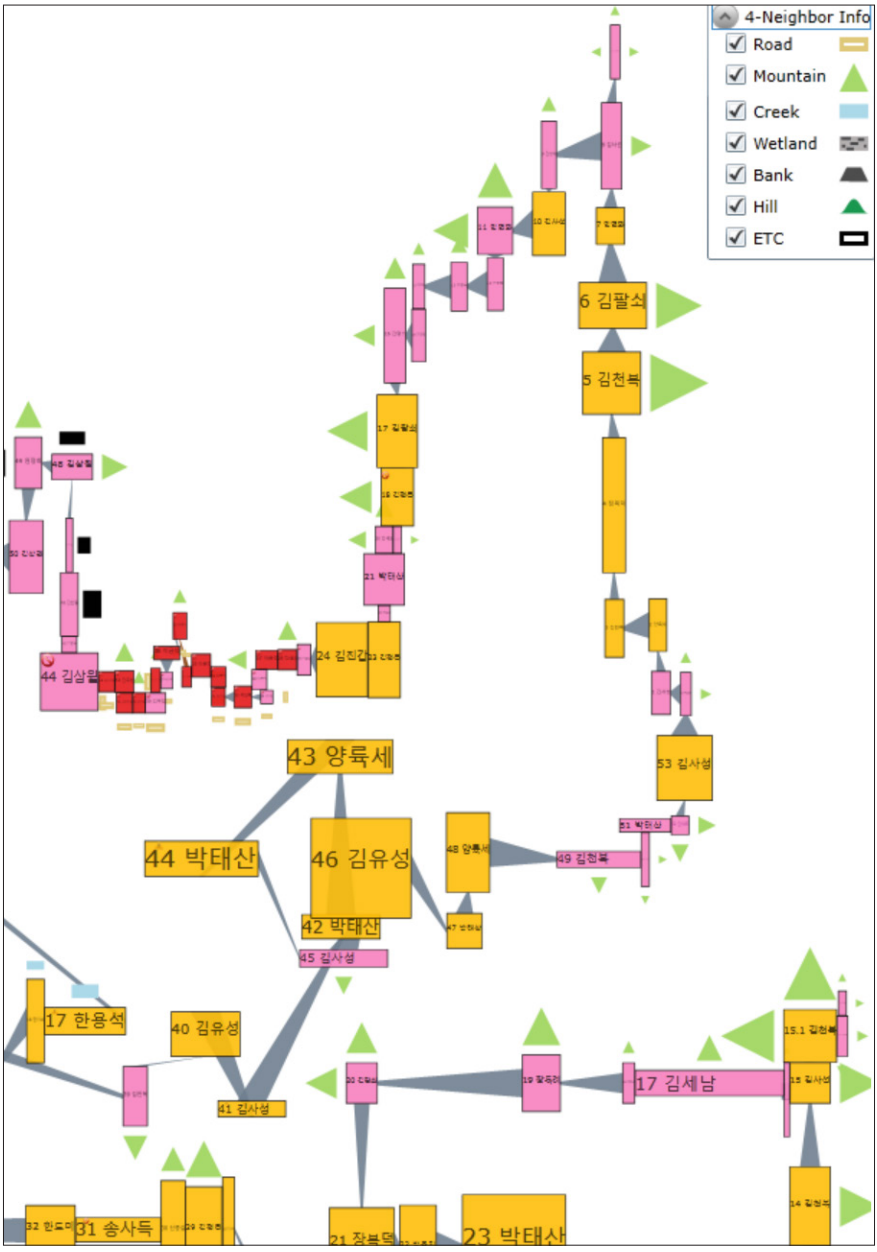


Figure 5. Visualization of a Gwangmu *yang'an* Using a Node–link Diagram
Note: Yellow denotes paddy fields; pink, dry fields; and red, residential plots.

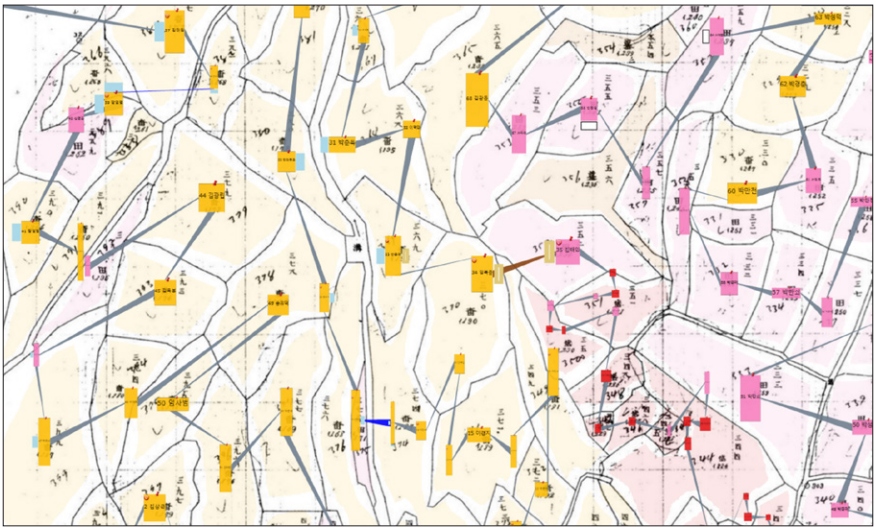


Figure 6. Overlay Comparison of the Gwangmu *Yang'an* (Square Nodes) and Colonial Cadastral Map Layers (The Gyeonggi-do, Yeoju-gun, and Osan-ri Case)[4]

conduct comparisons at the level of individual parcels. Location, area, grade, land category, and names associated with each parcel can thus be examined systematically in relation to one another.

Although research on the *yang'an* intensified from the 1960s onward, it was not until the development and scholarly dissemination of JigsawMap in the 2010s that researchers could determine where the land under analysis had actually been located. While registers compiled without maps may not have posed serious problems for contemporary administration, they imposed a fundamental constraint on modern scholarship: textual information had to be interpreted without verification of the physical reality of individual parcels. Without knowing concrete spatial locations, it was difficult even to assess the extent to which recorded area, grade, or tax quota reflected conditions on the ground. Once locations could be identified, the direction of *yang'an* research shifted fundamentally.

4 When matching *yang'an* nodes to cadastral parcels, JigsawMap displays each node as if it were pinned at the center of the corresponding parcel (or parcels). For this reason, as seen in Figure 6, some cadastral parcels may appear not to have an attached node. In fact, however, this results from multiple matching, whereby the node is simply fixed to one of the associated parcels, and most parcels are corresponded between the two registers. For detailed matching procedures and policies for handling multiple matches, see K. Kim 2018.

Area Adjustment Revealed through Parcel-Level Analysis

With the introduction of JigsawMap, conventional approaches that aggregated figures in the *yang'an* at the ledger level and statistically processed them require fundamental reconsideration. It is now possible not only to identify the locations of parcels recorded in the *yang'an*, but also to assess the extent to which register entries tracked historical realities. Parcel-level analysis also makes it possible to trace how tax burdens on specific plots changed over time, who bore responsibility for those burdens, and how relations of obligation and entitlement operated in practice.

The following analysis examines area recording in the Gwangmu *yang'an* through parcel-by-parcel comparison with colonial-period land registers. The area selected comprises two villages in Yeoju-gun, Gyeonggi-do. The Yeoju Gwangmu *yang'an* was compiled in 1901. Eleven years later, in 1912, the colonial authorities produced land-survey registers, *toji josabu* 土地調査簿, and cadastral maps (*jijeok wondo* 地籍原圖), for the same area. Using JigsawMap, I compare the two sets of registers at the parcel level.[5]

The first-examined village is Osan-ri in Ganam-myeon (formerly Osan-dong, Sogae-myeon). Ganam-myeon was a typical plains area in which the total area of paddy fields exceeded that of dry fields by more than twofold. As of 1912, it had the highest proportion of paddy land among the ten *myeon* of Yeoju-gun. Osan-ri is known as a long-established settlement of the Miryang Bak and Icheon Seo lineages.

The Osan-ri land-survey register contains 493 parcels. Parcel-by-parcel comparison with the Gwangmu *yang'an* makes it possible to match these with entries corresponding to 慶49–璧4 and 陰27–事42. While some parcels correspond one-to-one across the two registers, many cases require one-to-many or many-to-many correspondences. After accounting for parcel subdivision and consolidation for analytical purposes, 538 matched parcel pairs were identified.

Previous JigsawMap-based studies have consistently noted that the rate at

5 In Korea, land registers and survey documents created during the land survey project of the 1910s continued to be used in administrative practice until the 1970s, and cadastral maps remain foundational to contemporary cadastral mapping practices. This suggests that both the areas and grades recorded in the colonial land-survey registers and the cadastral maps themselves largely reflected conditions at the time of investigation.

Table 1. Ratio of Area between the Gwangmu *Yang'an* and the Colonial Land Register in Osan-ri

Range of area ratio (*yang'an*/colonial land register)	Land category (*yang'an*)						Total	
	Paddy field		Dry field		Residential plot			
x < 0.5	32	(10.9)	86	(41.4)	33	(91.7)	151	(28.1)
0.5 ≤ x < 0.6	42	(14.3)	47	(22.6)	1	(2.8)	90	(16.7)
0.6 ≤ x < 0.7	52	(17.7)	37	(17.8)	1	(2.8)	90	(16.7)
0.7 ≤ x < 0.8	48	(16.3)	23	(11.1)			71	(13.2)
0.8 ≤ x < 0.9	62	(21.1)	9	(4.3)			71	(13.2)
0.9 ≤ x < 1.0	25	(8.5)	1	(0.5)	1	(2.8)	27	(5.0)
1.0 ≤ x < 1.1	13	(4.4)	4	(1.9)			17	(3.2)
1.1 ≤ x < 1.2	10	(3.4)	1	(0.5)			11	(2.0)
1.2 ≤ x < 1.3	3	(1.0)					3	(0.6)
1.3 ≤ x < 1.4	3	(1.0)					3	(0.6)
1.4 ≤ x < 1.5	3	(1.0)					3	(0.6)
1.5 ≤ x < 1.6	1	(0.3)					1	(0.2)
Total	294	(100)	208	(100)	36	(100)	538	(100)

Notes: 1. The area recorded in the colonial land register is treated as 1.
2. Proportions are rounded to the second decimal place.
3. 1 *yangjeon* measuring unit (*yangjeon cheok* 量田尺) is converted to 100 cm.
Unit: number of parcel pairs (proportions in parentheses)

which actual area was captured in the Gwangmu survey varied by land category. Even when parcels had identical actual areas, the area recorded in the Gwangmu *yang'an* differed depending on whether the land was classified as paddy field, dry field, or residential plot (S. Kim 2014, 2021; K. Kim 2018). The same tendency appears in Osan-ri.

Table 1 presents the ratio between the area recorded in the Gwangmu *yang'an*[6] and that recorded in the colonial land register for Osan-ri, with the colonial register area treated as 1. Interpreted as the area-capture rate of the Gwangmu survey, this ratio reveals a clear disparity between paddy fields and dry fields. In 41.4 percent of dry-field parcels, the area recorded in the Gwangmu *yang'an* was less than half of the actual area. By contrast, paddy fields were most commonly recorded at approximately 80–90 percent of actual area. Residential plots—more precisely, kitchen gardens—were overwhelmingly recorded at less

6 The *yang'an* employed grade-specific conversion ratios between land area and the tax-assessment unit; area values are calculated accordingly.

than half of actual area.

This pattern reflects an effort to differentiate tax burdens among paddy fields, dry fields, and residential plots through adjustments in area-capture rates. As the late Joseon period progressed, the center of taxation shifted from population to land. Following the implementation of the Daedong Law 大同法, not only the land tax but also various corvée obligations and miscellaneous levies were assessed on the basis of land. The state calculated the land-tax unit, *gyeolbu*, by applying standardized formulas to survey-based area and grade and assessed multiple forms of taxation on a per-*gyeol* basis.

Importantly, the formula for calculating *gyeolbu* was applied uniformly across land categories. Institutionally, Joseon did not establish different tax rates for paddy and dry fields, nor did it operate separate grading systems by land category. All land was evaluated on a six-grade scale, and tax liability was derived by applying grade-based conversion formulas to measured areas. In practice, however, productivity differed substantially between paddy and dry fields (K. Kim 2011), and the market value of their outputs could differ by more than twofold.[7]

In other words, parcels of equal area and identical grade could differ markedly in productivity and value, yet under the single *gyeolbu* formula they were subject to the same nominal assessment unit. In modern historiography, this feature has often been interpreted as evidence of the so-called "disorder of land administration (*jeonjeong* 田政)." From a contemporary perspective, a tax system is generally regarded as "fair" when tax liabilities are differentially assessed and imposed according to clear criteria based on land category or productivity. Measured against such standards, the use of a single assessment formula to levy taxes on lands that differed in type and use appeared "unequal." In this view, the structural limitations of the *gyeolbu* system were understood as having contributed to social disorder in the late Joseon period, and this interpretation has long represented the dominant position in the scholarship.

Parcel-level analysis, however, reveals a more complex relationship between institutional design and administrative practice. Although the formal system did not differentiate area measurement, grade assignment, or *gyeolbu* calculation by land category, adjustments were made during on-site survey work. Differences

7 *The Comprehensive National Code* (*Daejeon tongpyeon* 大典通編), Hojeon 戶典, "Changgo" 倉庫; Hojeon 戶典, "Jingchae" 徵債.

in area-capture rates make these adjustments especially clear. The smaller the recorded area, the lower the resulting *gyeolbu* value, effectively reducing burdens on dry fields and kitchen gardens relative to paddy fields.[8]

These findings require a fundamental reconsideration of earlier quantitative statistical analyses. Because areas recorded in the *yang'an* already reflect prior adjustments, attempts to calculate average landholding size or identify large landowners on that basis are methodologically untenable from the outset.

A more productive line of inquiry is to examine how individuals who resided long-term within a village and owned substantial land were recorded in the *yang'an*. Since it is well established that the *yang'an* do not record landowners' actual names, this study calculates ownership scale on the basis of colonial land registers and then examines how parcels owned by the two largest landholders were recorded in the Gwangmu *yang'an*.

As of 1912, the largest landholder in Osan-ri was Bak Chihyeong 朴穉衡. He owned 62,588 *pyeong* 坪, a traditional Korean unit of area (approximately 3.3 m^2 per *pyeong*), across Ganam-myeon, amounting to roughly 0.8 percent of the myeon's total area, and was a prominent landlord. No parcels attributable to him have been confirmed elsewhere in Yeoju-gun beyond Ganam-myeon. The second-largest landholder, Seo Sanggi 徐商騎, owned 16,598 *pyeong*, most of which were concentrated in Osan-ri and confined within Ganam-myeon. Both individuals are confirmed residents of Osan-ri and are presumed to belong to the long-established Miryang Bak and Icheon Seo lineages.

Table 2 summarizes the extent to which parcels owned by these two individuals were adjusted in area when recorded in the Gwangmu *yang'an*. Although the number of parcels analyzed is not large, comparison with the overall area-capture rates for Osan-ri in Table 1 reveals a consistent pattern. The paddy fields owned by these two landholders were recorded at relatively more reduced areas than those owned by other villagers, indicating that the *gyeolbu* values assigned to their parcels were lower than those of neighboring plots.

To determine whether similar patterns can be observed elsewhere, the

8 JigsawMap-based work has also identified category-based differences in grade assignment. Although patterns vary by period and region, adjustments in both area and grade appear in the Gwangmu survey, in nineteenth-century local surveys, and in the eighteenth-century Gyeongja survey. These adjustments enabled differentiation of burdens within a formally uniform computational framework (S. Kim 2021).

Table 2. Ratio of Area between the Gwangmu *Yang'an* and the Colonial Land Register for the Two Largest Landowners in Osan-ri

Range of area ratio (*yang'an*/ colonial land register)	Park Chihyeong's parcels						Seo Sanggi's parcels					
	Paddy field		Dry field		Residential plot		Paddy field		Dry field		Residential plot	
x < 0.5	6	(20.0)	5	(26.3)	5	(83.3)			4	(50.0)	12	(100)
0.5 ≤ x < 0.6	8	(26.7)	6	(31.6)			2	(25.0)	2	(25.0)		
0.6 ≤ x < 0.7	3	(10.0)	5	(26.3)			4	(50.0)	1	(12.5)		
0.7 ≤ x < 0.8	4	(13.3)	2	(10.5)			2	(25.0)	1	(12.5)		
0.8 ≤ x < 0.9	6	(20.0)	1	(5.3)								
0.9 ≤ x < 1.0	3	(10.0)			1	(16.7)						
Total	30	(100)	19	(100)	6	(100)	8	(100)	8	(100)	12	(100)

Notes: 1. The area recorded in the colonial land register is treated as 1.
2. Proportions are rounded to the second decimal place.
3. 1 *yangjeon* measuring unit is converted to 100 cm.

Unit: number of parcel pairs (proportions in parentheses)

analysis is extended to Baekja-ri in Sanbuk-myeon (formerly Baekja-dong, Geumsa-myeon). Whereas Ganam-myeon, to which Osan-ri belonged, was located in a plains area, Sanbuk-myeon lies at the northernmost edge of Yeoju-gun and is characterized by rugged terrain connected to the Baekdudaegan mountain range. Approximately 67 percent of its total area consists of forest, resulting in a higher proportion of dry fields than paddy fields. Baekja-ri is known as a long-established settlement of the Jeonju Yi lineage.

The 1912 land register records 318 parcels in Baekja-ri, corresponding to entries 伊108–時3 in the Gwangmu *yang'an*. Parcel-by-parcel comparison of the two registers yielded 298 matched pairs. The area-capture rates by land category in Baekja-ri during the Gwangmu survey are presented in Table 3.

Comparison with the Osan-ri results in Table 1 indicates that differences in topographical conditions and land composition shaped survey outcomes. In Baekja-ri, both paddy and dry fields were recorded at substantially more reduced proportions of their actual area than in Osan-ri, and the magnitude of reduction was greater. Only 1.2 percent of paddy fields were recorded at 90 percent or more of actual area, while approximately 78 percent of dry fields were recorded at less than 60 percent of actual area. This suggests that *yangjeon* did not merely adjust *gyeolbu* burdens by land category within villages; it also reflected differences in taxable capacity between villages. Compared to the Osan-

Table 3. Ratio of Area between the Gwangmu *Yang'an* and the Colonial Land Register in Baekja-ri

Range of area ratio (*yang'an*/colonial land register)	Land category (*yang'an*)						Total	
	Paddy field		Dry field		Residential plot			
x < 0.5	39	(23.4)	46	(44.7)	19	(67.9)	104	(34.9)
0.5 ≤ x < 0.6	29	(17.4)	34	(33.0)	4	(14.3)	67	(22.5)
0.6 ≤ x < 0.7	37	(22.2)	9	(8.7)	5	(17.9)	51	(17.1)
0.7 ≤ x < 0.8	48	(28.7)	5	(4.8)			53	(17.8)
0.8 ≤ x < 0.9	12	(7.2)	6	(5.8)			18	(6.0)
0.9 ≤ x < 1.0								
1.0 ≤ x < 1.1	1	(0.6)	3	(2.9)			4	(1.3)
1.1 ≤ x < 1.2	1	(0.6)					1	(0.3)
1.2 ≤ x < 1.3								
1.3 ≤ x < 1.4								
1.4 ≤ x < 1.5								
1.5 ≤ x < 1.6								
Total	167	(100)	103	(100)	28	(100)	298	(100)

Notes: 1. The area recorded in the colonial land register is treated as 1.
2. Proportions are rounded to the second decimal place.
3. 1 *yangjeon* measuring unit is converted to 100 cm.

Unit: number of parcel pairs (proportions in parentheses)

ri case, Baekja-ri bore lower *gyeolbu* burdens per unit of actual area across land categories.

As of 1912, approximately half of the parcels in Baekja-ri were owned by members of the Yi lineage. They held 153 of the 318 parcels (48.1 percent), totaling 101,466 *pyeong* out of 234,201 *pyeong* (43.3 percent of the total land area).[9] Unlike Osan-ri, Baekja-ri shows a pronounced presence of absentee landlords. Particularly noteworthy is Min Gyusik 閔奎植, a resident of Gyeongseong-bu and the son of Min Yeong-hwi 閔泳徽 (1852–1935), a central political figure of the period and a member of the powerful Yeoheung Min clan. In Baekja-ri alone, Min Gyusik owned 38 parcels (11.9 percent) totaling 46,031 *pyeong* (19.7 percent), making him the largest landholder there. Min Pyeongsik 閔平植, Min Yeong-hwi's daughter, also held approximately 4,500 *pyeong* in

9 Figures include all land categories, including forest and miscellaneous land.

Table 4. Ratio of Area between the Gwangmu *Yang'an* and the Colonial Land Register for the Four Largest Landowners in Baekja-ri

Range of area ratio (*yang'an*/ colonial land register)	Yi Geon-du's/Yi Geon-ik's/Yi Geon-yeong's parcels (resident landholders)						Min Gyusik's parcels (absentee landholder)					
	Paddy field		Dry field		Residential plot		Paddy field		Dry field		Residential plot	
x < 0.5	6	(35.3)	17	(51.5)	6	(54.5)	5	(14.3)	1	(11.1)	5	(100)
0.5 ≤ x < 0.6	6	(35.3)	13	(39.4)	2	(18.2)	2	(5.7)	1	(11.1)		
0.6 ≤ x < 0.7	2	(11.8)	3	(9.1)	3	(27.3)	6	(17.1)	2	(22.2)		
0.7 ≤ x < 0.8	3	(17.6)					17	(48.6)	3	(33.3)		
0.8 ≤ x < 0.9							4	(11.4)	2	(22.2)		
0.9 ≤ x < 1.0												
1.0 ≤ x < 1.1												
1.1 ≤ x < 1.2							1	(2.9)				
Total	17	(100)	33	(100)	11	(100)	35	(100)	9	(100)	5	(100)

Notes: 1. The area recorded in the colonial land register is treated as 1.
2. Proportions are rounded to the second decimal place.
3. 1 *yangjeon* measuring unit is converted to 100 cm.

Unit: number of parcel pairs (proportions in parentheses)

Baekja-ri.[10] How, then, were the *gyeolbu* burdens of these politically influential landholders assessed in Baekja-ri?

Table 4 summarizes how the four largest landholders in Baekja-ri were recorded in the Gwangmu *yang'an* as of 1912. After Min Gyusik, the next largest holders were Yi Geon-ik (26 parcels), Yi Geon-du (24 parcels), and Yi Geon-yeong (22 parcels), all resident landlords of the Jeonju Yi lineage. By grouping the parcels owned by these three resident landlords and comparing them with those of Min Gyusik, this section examines whether residence status or proximity to central political power affected recording practices in the *yang'an*.

Comparison with the village-wide pattern in Table 3 shows that the three Yi resident-landlords generally display lower area-capture rates than other parcels in the village, a tendency especially pronounced for paddy fields. Baekja-ri already recorded paddy fields at reduced proportions relative to Osan-ri, and the paddy parcels owned by these Yi landlords were subject to even greater

10 According to the colonial land survey registers, Min Gyusik and Min Pyeongsik held land only in Geumsa-myeon among the ten *myeon* of Yeoju-gun. Geumsa-myeon comprised a total of 6,790 parcels with an area of 4,422,250 *pyeong*. Of these, Min Gyusik owned 169 parcels totaling 170,298 *pyeong*, while Min Pyeongsik owned 36 parcels totaling 29,431 *pyeong*.

reductions. This indicates that the *gyeolbu* units assigned to their parcels were comparatively low.

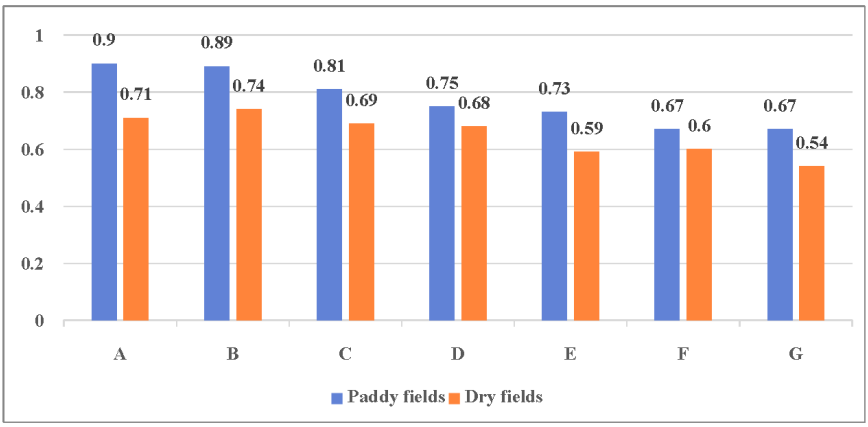
By contrast, for Min Gyusik, there is little evidence that his *gyeolbu* burden was systematically minimized in the *yang'an*, despite his connection to one of the most powerful political families of the period. Compared with the overall Gwangmu land survey pattern for Baekja-ri, his parcels show relatively high area-capture rates for both paddy and dry fields. If anything, the resulting *gyeolbu* assessments appear to have been set at levels equal to or even higher than those of neighboring parcels.

With respect to grade assignment—another component in *gyeolbu* calculation—no clear distinction emerges between resident and absentee landlords. This suggests that, in conducting the Gwangmu land survey in Baekja-ri, survey authorities sought to lower the village's overall *gyeolbu* burden in consideration of its topography relative to plains areas, and that they did so primarily through area reduction rather than grade adjustment. At this point, the influence of resident landlords exceeded that of absentee landlords who possessed nationwide political power but did not reside in the village.

Taken together, these results indicate that the areas and *gyeolbu* values recorded in the Gwangmu *yang'an* did not simply reproduce conditions as they stood. They were adjusted values shaped by topography, land category, village-level productive capacity, and the residence status of landholders. As the cases of Osan-ri and Baekja-ri illustrate, surveys conducted under the *gyeolbu* system publicly foregrounded a uniform computational formula while, in practice, fine-tuning burdens across land categories, between villages, and among different types of landholders through calibrated modulation of area-capture rates. Land taxation in Joseon thus operated at a level distinct from its formal institutional standard.

Patterns of *Gyeolbu* Burden Adjustment in the *Yang'an*

By using JigsawMap to visualize the textual locational information recorded in the *yang'an* and to compare it systematically with colonial-period cadastral maps, it becomes possible to confirm that the *yang'an* did not reproduce physical reality as it stood. From today's perspective, this appears unacceptable. In modern society, if one's property were recorded in an official state land register as even



Graph 1. Average Rates of Area Recognition by Land Category in the Gwangmu *Yang'an* for Seven Villages

Notes: 1. Values are rounded to the third decimal place.
2. The villages are as follows.
A: Sinjang-ri, Hansan-gun, Chungcheongnam-do
B: Mameong-ri, Hansan-gun, Chungcheongnam-do
C: Changeo-ri, Hansan-gun, Chungcheongnam-do
D: Wolam-dong, Gwangju-bu, Gyeonggi-do
E: Inwang-ri, Gyeongju-gun, Gyeongsangbuk-do
F: Gyo-ri, Gyeongju-gun, Gyeongsangbuk-do
G: Gujeong-dong, Gyeongju-gun, Gyeongsangbuk-do

Source: S. Kim 2020, 2021

slightly smaller than its actual size, people would regard this as a serious error and would immediately request correction. The modern state, moreover, treats the exhaustive identification, precise demarcation, and systematic management of every portion of its territory as a fundamental administrative imperative.

In Joseon society, however, perceptions of land operated according to a different logic. In land surveys conducted from the Gyeongja *yangjeon* onward, recorded areas were generally smaller than their actual extent. This was neither a regional anomaly nor an exceptional occurrence; it appears consistently across a broad range of counties nationwide. The degree and pattern of reduction, however, varied by land category, region, and period. To present this tendency more concretely, this section summarizes the results of the Gwangmu land survey, for which the most extensive body of parcel-based analyses has accumulated.

Graph 1 presents, for seven villages in Chungcheongnam-do, Gyeonggi-do, and Gyeongsangbuk-do, the ratio of area recorded in the *yang'an* during the

Gwangmu survey, disaggregated by land category. As in the Yeoju analysis, the area recorded in the colonial land register is treated as 1, and the corresponding area recorded in the *yang'an* is expressed as a ratio. The graph reports mean values at the village level.

What stands out immediately is that, in every village, the *yang'an* recorded areas smaller than actual size. The highest mean area-capture rate appears in Village A's paddy fields at 0.9, yet this even represents a reduction of roughly 10 percent. Differences by land category are equally clear. Across all villages, dry fields were recorded at substantially more reduced proportions than paddy fields. Both the general tendency toward reduction and the systematic pattern of reducing dry-field areas more than paddy-field areas are also observable in *yang'an* compiled prior to the Gwangmu land survey (S. Kim 2021). This pattern suggests an intention to differentiate effective tax burdens by reflecting productivity differentials between paddy and dry fields within Joseon's land-tax framework.

At the same time, grade assignment points in the same direction. Paddy fields consistently received higher grades than dry fields and therefore fell under conversion formulas that generated heavier land-tax burdens (S. Kim 2014). In other words, rather than measuring every parcel with complete precision, assigning grades by a strictly uniform standard, and then applying multiple complex formulas prepared in advance, survey practice appears to have calibrated effective burdens by adjusting both area and grade according to land category. This strategy made it possible to determine tax liability more flexibly during the survey process while taking local cultivation conditions and regional environments into account.

Within this framework, the regional differences in Graph 1 are especially significant. Villages A–C are located in Chungcheongnam-do along the west coast; Village D lies in Gyeonggi-do adjacent to Seoul; and Villages E–G belong to Gyeongsangbuk-do in the southeastern peninsula. Whereas villages in Chungcheongnam-do display relatively high area-capture rates, those in Gyeongsangbuk-do show comparatively low rates. These differences can be read as recalibration in response to interprovincial disparities in transport burdens.

During the Joseon dynasty, local offices were responsible not only for tax collection but also for remitting taxes to the capital. In areas such as Chungcheong-do, where maritime shipment to Seoul was possible, transport costs were relatively low. In contrast, in areas such as Gyeongsang-do, where taxes

had to be carried inland across rugged mountain ranges, transport costs could exceed twice the value of the taxes being conveyed.[11] It is therefore reasonable to infer that assessment standards were set lower in Gyeongsangbuk-do and relatively higher in Chungcheong-do so that effective burdens—including transport costs—would be more comparable across regions. One way to accomplish this was to reduce recorded land areas at different ratios by region, thereby adjusting the total land-based tax burden produced through calculation.

In Gyeonggi-do, where Village D was located, transport costs were lowest because of proximity to Seoul. Corvée obligations, however, were far more concentrated than in other provinces. Royal processions passed through the region more frequently, generating related service obligations, and when labor was required in the capital, residents of Gyeonggi-do were often mobilized. These conditions help explain why area-capture rates appear to have been calibrated so that land-tax burdens were lower than in Chungcheongnam-do but higher than in Gyeongsangbuk-do.

Such adjustments presupposed a degree of agreement and negotiation between the state and local society. For landholding cultivators, the smaller and less fertile their land was recorded in registers, the lighter their land-tax burden became. From the state's perspective, rather than investing enormous time and resources to capture reality exactly as it was—and thereby provoking conflict—authorities appear to have sought stable revenues at an appropriate level while partially accommodating local demands through systematic adjustments by land category and region.

Meanwhile, in the case of Village F (Gyo-ri in Gyeongju-gun, Gyeongsangbuk-do), it is possible to examine not only the Gwangmu *yang'an* but also evidence of tax collection from a period long preceding the Gwangmu land survey. This is made possible by the survival of the *gyeolsu yeonmyeongbu* 結數連名簿, a twentieth-century compilation that preserves transcribed records of land-tax collection from the late nineteenth century.

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11 Owing to its geographical conditions, Gyeongsang-do incurred significantly higher transportation costs in conveying taxes to Seoul than other provinces. This problem had been noted consistently since the early Joseon period. See, for example, *The Veritable Records of the Joseon Dynasty* (*Joseon wangjo sillok*), King Taejong, Year 3 (1403), Month 6, Day 6; *The Veritable Records of the Joseon Dynasty*, King Seongjong, Year 19 (1488), Intercalary Month 1, Day 13; *The Records of the Border Defense Council* (*Bibyeonsa deungnok*), King Hyojong, Accession Year (1649), Month 11, Day 22; *The Records of the Border Defense Council*, King Sukjong, Year 45 (1719), Month 5, Day 18.

A parcel-level comparison between the *yeonmyeongbu* and the Gwangmu *yang'an* indicates that, in the late Joseon period, the state increasingly sought to equalize land-tax burdens among cultivated parcels within a single village. The following two figures visualize how land-tax burden per unit area changed over time for individual parcels in Village F.

Figure 7 reports parcel-by-parcel land-tax burden per unit area in late nineteenth-century Village F on the basis of the *yeonmyeongbu*. Particularly striking are the white parcels for which no land tax is recorded as having been collected. Earlier scholarship has often interpreted such parcels as fallow land (*jinjeon* 陳田). Once parcels are spatially reconstructed, however, many of these white parcels are shown to lie in the midst of actively cultivated farmland. Given late nineteenth-century conditions, when arable land was scarce relative to population, it is difficult to regard these parcels as genuinely abandoned. A more plausible interpretation is that they represent land intentionally excluded from

Figure 7. Distribution of Land-tax Burden (*gyeol*) per 100 *Pyeong* in Village F in the Late Nineteenth Century, Based on the *Gyeolsu yeonmyeongbu*
Source: S. Kim 2020, 161

Figure 8. Distribution of Land-tax Burden (*gyeol*) per 100 *Pyeong* in Village F in 1903, Based on the Gwangmu *Yang'an*
Source: S. Kim 2020, 160

official tax registration and concealed within local administrative practice—namely, *eun-nugyeol* 隱漏結.

By contrast, in the 1903 Gwangmu *yang'an*, all of these parcels were recorded as taxable land. As shown in Figure 8, no untaxed white parcels remain.[12] The comparison between the *gyeolsu yeonmyeongbu* and the Gwangmu *yang'an* thus suggests that the central government of the Korean Empire sought to incorporate parcels that had previously escaped effective fiscal extraction into a more systematic framework of state oversight.

Comparing the two figures shows that disparities in land-tax burden per unit area among adjacent cultivated parcels narrowed over time. Figure 7, which

12 The two uncolored parcels in the upper left reflect an administrative boundary change and no longer belonged to Village F in 1903.

reflects late nineteenth-century conditions, displays pronounced tonal variation that produces a mottled distribution, indicating substantial differences in tax burden between neighboring parcels. In the 1903 configuration shown in Figure 8, by contrast, parcels with comparable cultivation conditions were assessed at relatively even levels. This pattern suggests both a strengthening of the state's capacity to regulate local landholding and the application of more consistent taxation standards to lands with similar agricultural environments.

This shift did not entail a sharp increase in village-level land-tax revenue. Compared with the late nineteenth century, more than half of the parcels bore lower tax burdens after the Gwangmu *yangjeon*. The decline was particularly pronounced for dry fields, whose burdens fell much more sharply than those of paddy fields. As discussed above, this outcome was achieved through land-category-based modulation of area-capture rates. By recording parcel areas at different reduced ratios according to land category in order to compensate for productivity differentials, the state lowered tax liabilities for roughly half of cultivated parcels. The resulting shortfall was offset by incorporating into the tax base parcels that had previously been omitted from registers.

In sum, the objective of the final survey was not simply to expand total land-tax revenue. It was to incorporate comprehensively lands that had remained outside central oversight and to recalibrate tax liabilities in light of differences in land category and region, thereby redistributing land-tax burdens on a more nationally balanced basis.

Conclusion

Joseon's fiscal regime was not structured to achieve error-free assessment or maximal extraction. It operated, instead, according to an administrative ideal in which taxes and levies were flexibly adjusted in response to contingent conditions, with the aim of maintaining an overall balance of burden. By contemporary standards, the *yang'an* may appear incomplete and seemingly outdated as a land register; methods of area measurement, grade assignment, and tax calculation varied across localities, and the principles underlying these variations are often difficult to discern.

Yet these characteristics should not be reduced to weak state capacity or deficient measurement. They point, rather, to a different governing logic. The

operative value in Joseon tax administration was not precision but balance. Local offices did not seek to compute taxes mechanically in pursuit of absolute and uniform equality. They pursued a relative equilibrium by flexibly adjusting recorded areas and grades, calibrating burdens in light of local conditions.

The difficulty is that this administrative rationality is not readily legible when the *yang'an* are read as text alone. The registers preserve only limited clues for identifying the physical location of individual parcels and rarely indicate how closely recorded areas or grades corresponded to conditions on the ground. Nevertheless, for more than half a century Korean historiography constructed major interpretive frameworks—most notably the "sprouts of capitalism" thesis and "colonial modernization" arguments—through quantitative readings that aggregated *yang'an* data at the ledger level. These debates proceeded under a structural constraint; they could not specify with confidence where the land under analysis was actually located. When land is treated as an abstract unit of calculation detached from spatial context, both the evidentiary foundation of statistical inference and the interpretive horizon of the debate narrow accordingly.

JigsawMap represents a methodological breakthrough at precisely this juncture. By visualizing information recorded in the *yang'an* and reconstructing a hypothetical cadastral configuration, it becomes possible to align registers compiled at different moments at the level of individual parcels. This parcel-based alignment makes it possible to trace empirically how particular tracts of land were perceived, classified, and administratively reorganized as governing regimes and survey practices evolved. The analyses in this study show that practices such as area reduction, grade adjustment, and calibration of *gyeolbu* burdens were not random distortions or clerical irregularities. They were patterned administrative choices shaped by spatial conditions, land categories, transport constraints, and local social contexts. Once parcels are re-situated in space and tracked across documentary layers, the *yang'an* appear less as deficient records of "facts" and more as artifacts of fiscal governance—media through which the state and local society negotiated how taxable land would be represented.

In particular, JigsawMap should not be understood merely as a digital instrument for increasing computational precision or enhancing analytical efficiency. It operates through a human-in-the-loop structure in which the researcher's interpretive judgment continuously intervenes, combining computational capacity with the analytical vision of the historian. The outcome

is not simply an aggregate of numerical data. It is an interpretive space in which the epistemic assumptions that shaped the production and use of the sources can be provisionally reconstructed: what counted as land; how boundaries were operationalized; how equivalences were produced across heterogeneous terrains; and how fairness was pursued through calibrated adjustment rather than exact measurement.

From this perspective, digital humanities methodologies function as instruments of epistemological reorientation. They recover the context in which documents were produced and mobilized, and they render visible patterns and inconsistencies that remain obscured under conventional modes of reading. For that reason, a JigsawMap-based approach to the *yang'an* should not be confined to Joseon as a bounded historical setting. It offers a transferable framework for addressing a broader historical problem: how territorial knowledge becomes administratively operative; how categories of land, burden, and obligation are stabilized through bureaucratic procedure; and how the gap between record and reality is managed, negotiated, or strategically sustained. By moving analytically from text back into space—without collapsing the past into a modern coordinate regime—this paper proposes one way to rethink Korean historical sources through a digital methodology that is simultaneously reconstructive and interpretive.

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Abstract

This paper clarifies the operating logic of the late Joseon land tax system through parcel-level analysis of historical land registers. Since the 1960s, Korean historiography has relied on quantitative, ledger-level analysis of these materials to explain socio-economic change in late Joseon society. Yet most such studies were conducted without identifying the physical location of the parcels recorded in the registers. Land was therefore treated as an abstract unit of calculation rather than a spatially situated entity, largely because no cadastral maps accompanied the textual records. To overcome this limitation, the study employs JigsawMap, a digital tool for reconstructing cadastral space from textual land records and enabling parcel-level comparison across periods. By spatially aligning parcels across documentary layers, JigsawMap makes it possible to trace how recorded areas and assessment values were adjusted in response to land category, topography, landholder residency, and regional transport burdens. These patterns reflect not administrative disorder or technical imprecision but a fiscal logic that prioritized calibrated balance over exact measurement. By redirecting analysis from text back into space, this study demonstrates how digital reconstruction can refine empirical inquiry while illuminating the rationality embedded in Joseon administrative practice.

Keywords: land register, *gyeolbu*, land taxation, fiscal balance, digital history

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