

Waterschappen (Irrigation Agencies) Management in Vorstenlanden Surakarta and Yogyakarta, 1900-1942

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ABSTRACT

The purpose of this study is to track the introduction of the irrigation agency (*Waterschappen*) in the *Vorstenlanden* area Surakarta and Yogyakarta as well as effects on the relationship between farmers, farmers and plantation owners. In addition, this study aims to understand the patterns of institutional change and the water distribution system in the *Vorstenlanden* region and consequently on agriculture and plantation. State involvement in the problem of water distribution in the *Vorstenlanden* area causing a collision between a proportional system that has been done by the traditional farmers with absolute system applied state. As a result, irrigation conflicts arise between plantations because of the use of a watershed point for some plantations. Conflicts between plantations and farmers because of water scarcity due to the autonomy of the estate in the distribution of water to agricultural land and conflicts between farmers as water encroachment without the knowledge of other farmers.

Keywords: *Waterschappen, Vorstenlanden*, proportional system, absolute system, conflicts

INTRODUCTION

Vorstenlanden is a king territory covering an area of Surakarta Sunanate (*Kasunanan Surakarta*), Duchy of Mangkunegaran (*Kadipaten Mangkunegaran*), Yogyakarta Sultanate (*Kasultanan Yogyakarta*), and Duchy of Pakualaman (*Kadipaten Pakualaman*). Institutions that take care of irrigation in the *Vorstenlanden* region is *Waterschap Centraal Kantoor voor Vorstenlanden* and it is under the *Department van Verkeer en Waterstaat. Waterschap Centraal Kantoor voor Vorstenlanden*, or better known *Waterschappen*, based in Yogyakarta. The Institute is a technical institution and supervision of irrigation in Surakarta and Yogyakarta. Structurally, *Centraal*

Waterschaap Kantoor voor Vorstenlanden is a unit of irrigation from the Office of Inspector of the Bureau of Technical Administration Surakarta and Yogyakarta (*Technische Zelfbestuurdiensten in Vorstenlanden*) that serves as a technical advisor services agencies in the autonomous governments in Surakarta and Yogyakarta (MVO Helsdingen, 1929: 93).

Waterschapp Dengkeng and Bengawan in Surakarta and *Waterschapp* Opak Progo in Yogyakarta, responsible for structuring technical and administrative irrigation. *Waterschapp* as legal entities are expected to act neutral in resolving conflicts of interest between *onderneming* owners and farmers. This research tries to trace

the development of modern irrigation agency (*Waterschappen*) in the *Vorstenlanden* region Surakarta and Yogyakarta and consequences thereof. For a century, since the opening *Vorstenlanden* regions for plantation areas, the owners have enjoyed the right to use water resources for operational plantations purposes. Meanwhile, plantations and agricultural interests of the people who wear the same land for plantation crops and food crops, and also require the same water, has raised the issue of water distribution. That is because there is no application of the rules of fair and neutral irrigation for farmers, for the autonomous government and for plantations in the distribution of water for agricultural purposes (Rouffaer, 1921: 380).

The involvement of the state in matters of water distribution in the *Vorstenlanden* area have caused collision between a proportional system and absolute system. Proportional system have been long established by the traditional farmers based on the size of the area of land to be drained. Meanwhile, the absolute system applied state, the drainage of water on agricultural land are based on agronomic considerations such as the need for water on each plant. Absolute system have been based on the consideration of technical and agronomic standard, based on the condition of plants in an agricultural area. (Ravesteijn, 1998: 105.). At the turn of the 20th century began to change because of increased concern for the welfare of the indigenous population and the strong political influence of the sugar industry. Irrigation agencies converted into an independent organization with a technocratic ideology by linking irrigation with prosperity, progress, and civilization. Technocratic ideology is what eventually became a very important element in the policy of ethical politics.

Based on the above, the main issues that arises is why the modern irrigation once established institutions in the *Vorstenlanden* region it raises new issues of the institutional aspects and farmers relationships with farmers, farmer relations with plantation owners. The purpose of this study is to investigate the process of establishment of modern irrigation in the *Vorstenlanden* region and its consequences on relations between farmers, farmers and plantation owners, and the relationship between the owners of the plantation.

In addition, this study aims to understand the patterns of institutional change and the water distribution system in the *Vorstenlanden* region and consequently on agriculture and plantation sector. In order to answer the aforementioned research questions, I will analyse information gathered from primary and secondary sources. This study mostly uses the primary source in the form of archives. Information from archival sources will be sought from official sources of the colonial government, especially reports stored at Library and regional archives in Yogyakarta, Pakualaman, and Mangkunegaran. Secondary sources are obtained from national libraries in Jakarta and several libraries in Yogyakarta.

ORGANIZATIONAL AND OPERATIONAL AREA WATERSCHAP CENTRAAL KANTOOR VOOR VORSTENLANDEN

Waterschapp Centraal Kantoor voor Vorstenlanden founded in 1917. The operations area includes the *Waterschapp* Opak Progo (Yogyakarta), *Waterschapp* Dengkeng and *Waterschapp* Bengawan (Surakarta). Meanwhile, units of irrigation in the region of Yogyakarta (*Bestuur van Het Waterschapp Opak-Progo*) there is an Advisory Board (*Raad van Waterschapp Opak-Progo*) whose members consist of several agencies, among others planter (*Beheerder Onderneming*), Assistant Resident, municipal inspectors (*Controleur Binenlands Bestuur*), Regent, Head of subdistrict (Wedana), and the Head Office of land affairs. Irrigation Unit in Surakarta (*Waterschapp* Dengkeng and Bengawan) contained Irrigation Council whose members include elements of the duke as a representative of the autonomous governments, official representative of the residents, and representatives from the company's plantations. (Article 10 *Vorstenlandsche Waterschapp Ordonance* (VWO) in NI Gazette, No. 722 , 1922).

For the technical implementation is done by the Technical Office (*Technische Dienst*). The Technical Service employee is employed *Waterschapp Centraal Kantoor* personnel from the Technical Office. Meanwhile, under *Technische Dienst* there *Technische Amtenaren* which is the technical officers consisting of two natives. Under the *Technische Amtenaren* there are three sections:

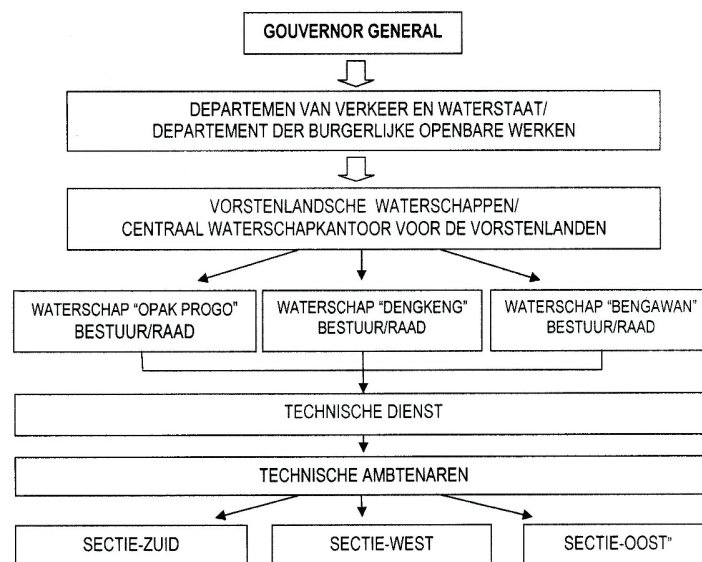
South Section (*Sectie Zuid*), West Section (*Sectie West*), and Eastern Section (*Sectie Oost*). Sections supervised some *onderneming*. Head section is held by indigenous and assisted in their duties by Irrigation Foreman (*Mandor Water Beheer*). Irrigation Foreman appointed by *Bestuur van het Waterschapp-Opak Progo* and given a salary and salary increases each year over the proposed Section Head with the approval of Chief Technical Office. Irrigation Foremen assisted in their duties by some employees maid (*Hulppersoneel*) consisting Staff foreman (*Hulpmandoer*), Doorman water (*Sluiwachter*), Guard Dam (*Damwachter*), and Guard Sijphon (*Sjiphonwaker*). In addition there is also a *Mantri Oeloe-Oeloe* (*Archive Waterschapp Opak-Progo 1929-1942, Collection number 2228 / H Bd. 1170*).

By hierarchical, *Waterschappen* based on the unity of irrigation sections and in *afdeeling* level headed by an engineer. Section chief in charge of irrigation orderlies (*mantri*) and under irrigation orderly contained foreman (*mandor*) positions. Section chief duties include organizing and planning the technical aspects such as

damming permanently. The task of irrigation orderly conduct supervision of foreman. Foreman and foreman assistant in charge of overseeing the irrigation channel. Foreman assistant is the lowest echelon in irrigation agencies. Across the regions Surakarta and Yogyakarta, the number of orderlies personnel about 50 people and the amount of irrigation foreman 300 (Joon, 1940: 5).

Technical and administrative arrangement of irrigation has been conducted in *Waterschapp Dengkeng* and *Bengawan* (Surakarta) and *Waterschapp Opak Progo* (Yogyakarta). All matters relating to the operation and maintenance of irrigation facilities, are handled by a semi-autonomous agency. The legal consequences of the establishment of semi-autonomous agency of irrigation is the revocation of the right to development and exploitation of irrigation facilities previously held by plantation owners (Joon, 1940: 2). Some of the irrigation department in the autonomous region *Vorstenlanden* melted. In Mangkunegaran, for example, in 1926 the irrigation department Karanganyar merged into *Waterschapp Bengawan*. Section of Sragen region

Figure 1
Organizational Structure Institute of irrigation in *Vorstenlanden*



Sources: *Inventaris Arsip Vorstenlandensche Waterschappen*, p. 16.

network operation (section of Karanganyar) and Solo (section of Colomadu) previously included *Kring Pepe* irrigation merged into the operating area of *Waterschapp Bengawan* (Angenent, 1933: 34).

Operational area of *Waterschapp Opak Progo* covers an area measuring 64,200 *bau* that includes 25 estates, mostly located in the Region of Yogyakarta. Scope of exploitation is *Afdeeling* of Yogyakarta, Kulon Progo and *Afdeeling* of Klaten in Surakarta. Borders of *Waterschapp Opak Progo* region covering northern regions, ranging from the Krasak river that disgorge at Merapi mountains until the estuary of Opak river in the Indian Ocean. On the Eastern border is the Opak river, in the southern part includes the Progo river, Krasak, and Serang. Meanwhile, the scope of work *Waterschapp Dengkeng* covering 64,200 *bau*, includes 27 estates. Scope exploitation of the northern regions, ranging from the mountains of Merapi, Kadipiro River basin and Pusur river, Brambang river, until the border *Afdeeling* of Klaten and Boyolali. The southern border areas ranging from Nglumbe river basin in Baderan to Brambang river. In the eastern area ranging from Bengawan river basin, Dengkeng, to the south of the border between the residency of Surakarta and Yogyakarta. While the western border up in the catchment Opak area (Angenent, 1933: 15).

Scope of work area *Waterschapp Bengawan* measuring 68,000 *bau*, including the two *onderneming*. Coverage of exploitation in the north began bordering near the village of Pepe river in Nganti, the border river flow Cemoro up towards the Bengawan Solo. In the eastern part until the Sawur river tipped over Lawu mountain peaks. In the southern part of the border streams start Jlantah river until bridge near Tlobo village until to Jatipuro. At the Eastern start of Baboon river (area Jatipuro) Bengawan river, the Gandul river, the border area south of the river flow Nglumbi in Baderan, until the border *Afdeeling* of Klaten and Boyolali. In the west to the border of the western part of the Pepe river flow.

Figure 2
Operational areas of irrigation Institutions in Vorstenlanden



Sources: Angenent, 1933.

DEVELOPMENT OF MODERN IRRIGATION AND INTERESTS OF PLANTATION INDUSTRIES

The development of irrigation semi-modern facilities in the *Vorstenlanden* had started almost simultaneously with the development of plantation sector. Private planters in Surakarta, for example, has allocated millions of guilders for the construction of irrigation facilities to support the operation and expansion of the plantation sector in Surakarta. (Joon, 1940: 4.) The criteria for selection was based on the availability of land for plantations adequate water supply and the possibility of increasing the area of land to be planted. Once that is done the construction of dams and water channels before starting the cultivation of the soil (Houben, 1994: 293). Meanwhile, until the year 1910, growers in Yogyakarta has built several irrigation facilities, which are then integrated into the modern irrigation system.

Figure 3
Means of *onderneming* Irrigation until 1910

No	<i>Onderneming</i>	Building Type	Building Name
1	Medari aqueduct	Aqueducts Channel	Sempoe II
2	Sendang Pitoe	Large Irrigation Channels	Channels Van der Wijk
3	Padokan	Dam Permanent	Dam Permanent Tandjong
4	Randoegunting	Dam	Dam Kringinan
5	Medari	Dam	Dam Kali Bedok

Sources: Adapted from J.J Tichelaar, *De Java Suikerindustrie en hare beteekenis voor Land en Volk* (Published by the Joint Syndicate of Sugar Factory Nederland Indie, nd), p. 9, 23, and 31.

In 1920 was constructed Larangan irrigation channels in Mangkunegaran. With the completion of the construction of irrigation facilities is very useful to prevent flooding of villages in the surrounding villages (MVO J. van der Marel, 1924: 78). In 1921 the dam was built in Jlantah river in Jombor, *Afdeeling* of Klaten and in 1922 built a dam in Bajran to spend f 67,000. In 1922 began the construction of Delingan reservoirs in Tirtomarto and execution completed in September 1922. The reservoir is very useful for irrigation facilities around the Tasikmadu Sugar Factory in *Afdeeling* of Karanganyar. The funds needed for the construction of the entire reservoir totaled f. 614,000. A quarter of the funds contributed by Mangkunegaran palace and 3/4 of contributions Tasikmadu Sugar Factory. Delingan reservoir in the form of a large water reservoir or reservoir by damming the upstream Jirak river. The dam is the extent of 500,000 cubic meters and contains 4,000,000 cubic meters of water discharge. With the construction of the irrigation water shortage can be overcome (A.K. Pringgodigdo, 1950: 196). With the Delingan construction of reservoirs, water supply in the dry and rainy season from the area around the reservoir can be increased by

12,000 *bau* (MVO J. van der Marel, 1924: 79) and 8515 ha of sugarcane area in Tasikmadu can be fed throughout the year.

In 1923 completed the construction of the main channel in the city of Solo, which cost up to f 86 237 which partly contributed by Mangkunegaran amount 29 387 Gulden (MVO van der Marel, 1924: 80). In 1924 began a program launched by the improvement of irrigation facilities in the Jetu area in *Afdeeling* of Karanganyar. The program aims to improve conditions for agricultural irrigation in the area, especially around the area of Tasikmadu sugarcane. The program in the improvement of receiver channel, floodgates, and the means of draining the main divider 1000 *bau*, helps supply and distribution in the region and surrounding territories Trani in Triagan *Afdeeling* of Karanganyar (MVO van der Marel, 1924: 80). The improvement of irrigation facilities spent of f 60,000 most of which are owned plantations and contributing Mangkunegaran Palace. In 1924 built irrigation facilities in Sugihan river, Wiroko river basin, in *Afdeeling* of Wonogiri with funds f 60,000. Irrigation facilities is a means of prime divisors of aqueducts Sugihan river. In 1926 built another irrigation facilities in Kalongan, Karanganyar, which is part of the general plan for the improvement of irrigation reservoir in Delingan. This development such as construction of Kalongan kanal along the 3000 meter, 5000 meter long secondary channel in Jogopaten, as well as the improvement of means of increasing water discharge from Singit river. In April 1926 completed the construction of Jombor reservoirs in Klaten. This reservoir is needed because the population in the Jombor area at the dry season is always a shortage of water, especially for agriculture (MVO van der Marel, 1924: 81).

In 1927 the dam was completed in Ngancar Baturetno. This reservoir has an intake capacity of 1,500,000 cubic meters and managed to irrigate the rice paddies of 4000 *bau*. The total construction cost of f 150,000 of which were borne by Mangkunegaran. In 1927 also resolved tapper channel reservoirs Batal in Wiroko *Afdeeling* of Wonogiri. Construction of irrigation system for irrigating the area 400 *bau* and spend f. 250,000. (Rijksblaad Mangkunegaran 1927: 35-40). For the purposes of plantation expansion

project in the north Klodran of the Pepe river built also Cengklik reservoir at a cost of f. 637,000. Construction of irrigation facilities is intended to supply water to the expansion of the plant and increase the milling capacity PG Tasikmadu (Rijksblaad Mangkunegaran 1927: 45-46) In 1927 also resolved tapper channel reservoirs in Wiroko *Afdeeling* of Wonogiri. Construction of irrigation system for irrigating the area 400 *bau* that spent f 250,000. (Rijksblaad Mangkunegaran 1927: 35 40.)

Implementation of *Nederlansche Waterschapp Vorstenlanden Ordonantie* in fact the same as the implementation of the principle of law for the lease of land (*Vorstenlandsche Grondhuurreglement*). Both set of legal certainty for European plantation activity. Aspects of soil and water as one component of the production process aimed at integrating plantation soils were scattered and cut pieces into a vast estate. The formation of a block plantations, easy management from the standpoint of management, irrigation, transport, lay of the land and reduce the cost of labor exploitation (Suhartono, 1992: 97). According to reports Helsdingen's resident, in 1929 has been converted appanages area of 93240 *bau* throughout Surakarta (MVO Helsdingen, 1929: 68). Another factor that supports the centralized location of the estate is the impact of agrarian reorganization. In the opinion of the Nieuwenhuijs's resident linkages between land reorganization and reorganization of the irrigation sector is a cornerstone of the implementation of comprehensive land reorganization program in the *Vorstenlanden* region (MvO Nieuwenhuijs., *Memori Serah Terima Jabatan Jawa Timur dan Tanah Kerajaan, Jakarta: ANRI, 1978, hlm. cclxii.*).

With the establishment of *Waterschapp* Opak Progo, Dengkeng and Bengawan, the role of the civil bureaucracy and the plantation owners in managing the distribution of water began to be reduced. It was due to the strengthening of the role and authority of the engineer in making the supply and distribution of water in the area of plantations in *Vorstenlanden* (Ravesteijn, 1998: 105). On the other hand, with the strengthening of the authority of the engineer in the control of the water supply is also accompanied by reduced government authority of the autonomous Yogyakarta Sultanate, duchy

of Pakualaman, Surakarta Sunanate and duchy of Mangkunegaran. Irrigation bureaucratic apparatus in Sindumarto, Mangkunegaran, for example, the number of personnel being phased including operational funds. After 1933 Mangkunegaran irrigation department merged with the Department of Public Works of Mangkunegaran. Previous institutions melting process begins with the integration of the operating area in Sindumerto, *Kring Waterschapp* Bengawan in 1927 (MVO Helsdingen, 1929: 102).

PROBLEMS OF IRRIGATION: GROWERS AND FARMERS

Autonomous right of *Onderneming* to manage the development and exploitation of irrigation facilities reserved leasing the land (Article 12 b *Vorstenlanden Grondhuurreglement, Staatblad Nederlands Indie* no. 20, 1918). The plantation company as a tenant has the right to determine the distribution of water for agriculture, industry, and the need others. As the excesses of the nature of an autonomous and privileges owned plantation companies and the absence of legal authority owned autonomous government in the regulation and management of the problem of irrigation, often leads to the issue of dividing the allocation of water among the entrepreneurs. One of the consequences of the problem is the conflict division and the use of a watershed in Klaten in 1919 by the three estates in Gedaren, Ngupit and Klaten. The occurrence of misappropriation of implementation of irrigation systems day and night also accomplished by plantation companies. The manipulation is done by flowing water into the plantation areas during the day and night by tapping the river. The actions of these plantations cause dissatisfaction among the population (Ritveld, 1927: 6).

The same thing also happened in Yogyakarta. Distribution Policy of water day and night which was implemented in 1841, continues to be applied when the institution was founded modern irrigation. Regulation of water sharing thoroughly and uniformly throughout Dutch East Indies is not implemented by the colonial government in the Yogyakarta area. This issue submitted for each area or region with an agreement between *onderneming* and local farmers. During the day,

water flowed in sugar cane crops and crop farmers in the dry state. At night, the water diverted from plantation crops to farmers' crops. In practice this system of day and night, it *onderneming* a lot of cheating. Often at night crop farmers who should get a share of the water but the water remained detained by *onderneming*. It is then often lead to theft of a water allocation and dispute among farmers to get water (Selosoemardjan, 1991: 226 227).

The occurrence of water shortages in the dry season is actually a natural thing, given the scarcity of water resources is a natural phenomenon that cannot be avoided. Water scarcity can be seen as a lack of quantity of natural resources but also as limited access to water itself (Downing and Gibson, 1974: X). However, as a result of limited access and differences in water requirements for growers and farmers that finally lead to a conflict of interest between farmers and plantations. In some cases, conflicts are caused by lack of water supply due to the dry season occurs between farmers with estates. In the dry season, especially in May and November, the water supply is divided between watering to plant sugarcane and pulses (Deventer, 1914: 205.) Rotation planting sugarcane, pulses and rice lasts almost all year round. Sugar cane crop was planted in early April that the next dry season water allocation prioritized for breeding seed cane. Often the day and night watering rules are not complied with by the grower (Rapport van Suikeir Enquette, 1928: 28). Farmers along the stream of Opak Progo, for example, in 1937 protests on the estates because a large part of the river water used to fill the tanks of immersion Rossela growers (Archive of *Vorstenlandsche Waterschappen*, BPAD DIY, inventory number: 43-46)

In the region of *Vorstenlanden*, from June to September, farmers grow crops such as beans and soy. In these months if there are farmers who grow Gadu rice in areas that should be planted with crops, the Irrigation Department will regard as crops plant and irrigation quota equal to crops as many as 1 1/2 parts water. In the rainy season, farmers will plant Dalem rice, 5-6 months old who usually start planting in January. Meanwhile, in the region of *Waterschapp* Opak Progo applied the rule that in the area of technical irrigation, the

dry season cultivation Gadu rice only allowed in certain areas. In connection with these regulations, the Head of *Waterschaap kantoor voor Centraal Vorstenlanden*, Ir. Numans, explained that the natives are not forbidden to plant Gadu rice in technical irrigated (*sawah ilen an*) in the dry season, but farmers are still planting rice must be prepared to accept the risk of water shortages, and will lead to crop failure. (Supomo, 1927: 88 89).

Irrigation conflict between the plantation which happened in Klaten in 1919 for having used one point watershed in Dengkeng by three estates in Gedaren, Ngupit and Ketandan. The conflict arises because the plantation owners did not reach agreement on a neutral point of water delivery. The conflict is also fueled by the autonomous nature of the estate to the ownership of water resources. As a result of the conflict, the three *onderneming* is continuing with the closure of access roads to plantations by their respective owners (Joon, 1940: 5). Irrigation conflict between farmers and plantation companies are also common, especially in the area of sugarcane plantations. Water manipulation practices done by sugarcane plantations have been detrimental to farmers and result in dissatisfaction among farmers (Rietveld, 1927: 4). Conflict between growers and farmers often arise because farmers do theft of water by making a hole in the trench ditch water distribution (MVO van Wijck, 1914: 77). On 10 March 1937, in the village of Kedungpring, *afdeeling* Kulon Progo, had been conflicts between farmers and farmers as a matter of water dues (Pakualaman Archives, code 014.5.1.2.3667).

CONCLUSIONS

With the establishment of *Waterschapp* then applied the principle of centralized management and irrigation institutions. Irrigation plantation, Sult anate, Pakualaman, Mangkunegaran, Kasu nanan and the agricultural community, integrated into a technical body. Legally, the legal consequences of the establishment of modern irrigation agency is revocation of the right to autonomy *onderneming* in irrigation management in their own areas. But in reality, *onderneming* retains the right of autonomous water management with take cover behind the Hire Act land in *Vorstenlanden* (*Vorstenlanden*

Gron dhuureglement).

State involvement in irrigation in *Vorstlanden*, through modern irrigation agencies, led to the collision of the proportional system which have been long established by the traditional farmers with absolute system which applied state. As a result, conflicts of interest arise between farmers and growers, farmers and plantation, plantation and the plantation. Irrigation conflict between plantation to appear because of the use of the watershed point for some plantations. The conflict arises because the plantation owners did not reach agreement on a neutral point of water delivery. The conflict is also fueled by the autonomous nature of the estate to the ownership of water resources is still maintained by the plantation.

Conflicts between farmers and the farmers also occur, especially in the area of sugarcane plantations. water manipulation practice performed by a sugar cane plantation has hurt many farmers and consequently appears discontent among farmers. In the conflict between growers and farmers often occur because farmers stealing water. Scarcity of water during the dry season also sparked conflict among farmers, especially in the area of sugarcane plantations. The conflict occurs because the seizure of water by farmers who turn makes aqueduct itself without being noticed by other farmers.

REFERENCES

- Arsip *Vorstenlandsche Waterschappen* (2013). BPAD DIY, No, Inventaris 43-46.
- Arsip *Waterschap Opak-Progo Gubernemen Jogjakarta 1929-1942*, Koleksi Kantor Arsip Propinsi DIY, No. 2228/H Bd. 1170
- Assainerringswerken* (1937). Arsip Pakualaman Code 014.51.2.3667.
- Pringgodigdo, A.K (1950). *Geschiedenis d e r Onderneming van het Mangkunegorosche Rijks*. s'Gravenhage: Martinus Nijhoff.
- Angenent, P.H. (1933). *De Vorstenlandche Waterschapp Ordonantie Toegelicht*. GroningenBatavia: P. Noordhoff N.V.
- Bijblad op het Staatblad van Nederlansch-Indie* (1936). Batavia: Landrukerij.
- Boomgard, Peter (ed.) (2007). *A World of Water: Rain, Rivers and Seas in Southeast Asian Histories*.

Leiden: KITLV.

- Effendi Pasndaran (2010) "Historical Perspective of Irrigation Management in Indonesia toward a New Wave of Development", Paper Presented at ICID – CIID Seminar on "History of Irrigation in Eastern Asia" 13 October, Yogyakarta, Indonesia
- Ersten, Mourits (2006). "Aspects of Irrigation Development in the Netherland East Indies", *The Journal for Transdisciplinary Research in Southern Africa*, vol. 2., no. 1.
- , (2010). *Locales of Happiness: Colonial Irrigation in the Netherlands East Indies and it is Remains, 1830-1980*. Amsterdam: VSSD.
- Houben, Vincent C. (1994). *Kraton and Kumpeni, Surakarta and Yogyakarta 1830 – 1870*, Leiden:KITLV Press.
- Joon, P.L.E. (1940). "Eenige Bijzonderheden aangaande Vorstenlandsche Waterschappen", *De Ingenieur in Nederlandsch Indie*, no. 7e January
- Kop Jan, at al. (2015). *Irrigation Revisited: An Anthology of Indonesia-Dutch Cooperation*. Delft: Eburon.
- Memori Serah Terima Jabatan Jawa Timur dan Tanah Kerajaan*. Nieuwenhuys G. V. Surakarta 15 Mei 1927 (Jakarta:ANRI,1978)
- Memorie van Overgave van Wijck Resident Soerakarta van 4 April 1914*. film 7 Koleksi Arsip Nasional Indonesia Jakarta.
- Muhlenfeld, *Monografi van Onderafdeeling Wonogiri* (Surakarta: Koleksi Perpustakaan Rekso Pustoko Mangkunegaran) no.863,
- MvO J.J. van Helsdingen, G. V Soerakarta van 10 Oktober 1929*. Yogyakarta: koleksi Perpustakaan Kantor Gubenerur DIY
- MvO Treur, G. V Soerakarta van 26 Januari 1937*. film 8, Jakarta: ANRI, 1937.
- MvO J.J van der Marel Resident Soerakarta van 13 Maret 1924*. film 7, Jakarta: ANRI 1924.
- Metzelaar, J. Th. (1948). "Irrigatie", dalam C.J.J. van Hall en C. van de Koppel, *De Landbouw in de Indische Archipel*. Ia. 's-Gravenhage: N.V. Uitgeverij
- Rapport van Suikeir Enquette* (1928). Surabaya: Soerabajasche Handelsblad.
- Ravesteijn, Wim., 1998 . "Irigasi dan Negara Kolonial 18321940" *Visi Irigasi Indonesia*, no. 14 March.

- (2002). "Dutch Engineering overseas: The Creation of Modern Irrigation System in Colonial Java", *Knowledge, Technology&Policy*, vol. 14.
- Rijksblad Soerakarta* 1917 N0. 39 (Yogyakarta: Koleksi Perpustakaan Kantor Gubenur DIY, 1917)
- Rijksblaad Mangkunegaran* 1927, (Yogyakarta: Koleksi Perpustakaan Kantor Gubemur DIY, 1927)
- Rietveld, J. Th. (1927). "De Inwengide Organisatie van de Vorstenlandsche Waterschappen", *De Waterstaat Ingenieur* no.7.
- Rouffaer, (1921). *Adatrechtbundell XIX Java en Madoera*, seri D ('sGravenhage: Martinus Nijhoff.
- Soemardjan, Selo (1991). *Perubahan Sosial di Yogyakarta*. Yogyakarta: Gadjah Mada University Press.
- Staatblad NI*, no 722 tahun 1922
- Staatsblad* 1918 no.469
- Suhartono (1992). *Apanage dan Bekel, Perubahan Sosial di Pedesaan Surakarta 1830/1920*, Yogyakarta: TiaraWacana.
- Soepomo.(1927). *De Reorganisatie van het Agrarische Stelsel in Het Gewest Surakarta*, s'Gravenhage: L.Gerretzen.