

An Exploration of Food Insecurity, Poverty, Livelihood and Local Food Potentials in Kulon Progo Regency, Indonesia

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Received: 28 February 2018 / Accepted: 26 May 2018 / Published: 07 June 2018

Abstract. Kulon Progo has been struggled to cope with the issues of poverty and food insecurity. The provincial and local governments pay a lot of attention to tackling these deprivation problems. The BKPP DIY developed a composite index which concluded that poverty is the primary cause of the deprivation. Therefore, this paper aims to explore the rural deprivation in Kulon Progo by assessing its aspects including poverty, food insecurity conditions, livelihoods, and local food potentials. Several methods, including typology, livelihood calculation, and resource possibility mapping are introduced for the preliminary analysis of this deprivation. The findings show that in Kulon Progo, (1) most of the deprived areas are located in the typology of upland region, (2) based on its of five assets, in general, the livelihood condition in Kulon Progo needs an improvement on financial, natural, and physical capitals, and (3) presenting the local food clusters based on its local food plantation area and production, so that these findings could give alternatives for the decision makers to develop the rural (deprived) areas.

Keywords: food insecurity village, poverty, livelihood, local food potentials.

Abstrak. Kabupaten Kulon Progo menghadapi permasalahan kemiskinan dan kerawanan pangan. Berbagai upaya untuk mengatasi dua permasalahan tersebut terus dilakukan oleh pemerintah provinsi maupun kabupaten. Salah satu upaya yang dilakukan adalah dengan menyusun indeks komposit desa rawan pangan. Kemiskinan diyakini sebagai penyebab utama masalah tersebut. Sehingga paper ini bertujuan untuk mengesplorasi permasalahan tersebut dengan cara mendalami fenomena kemiskinan, kerawanan pangan, penghidupan, dan potensi pangan lokal yang tersedia di Kabupaten Kulon Progo. Berbagai metode digunakan untuk menjawab permasalahan tersebut, antara lain dengan menyusun tipologi, penghitungan potensi penghidupan, dan memetakan potensi sumberdaya sebagai upaya untuk identifikasi awal berbagai permasalahan yang ada. Penelitian ini menemukan bahwa (1) sebagian besar desa rawan, baik rawan kemiskinan dan/atau rawan pangan berada di tipologi daerah atas, (2) menurut kajian penghidupan, dari lima aset penghidupan yang dianalisis, secara umum, Kabupaten Kulon Progo memerlukan perhatian khusus kepada modal finansial, alamiah, dan fisikal, (3) penyajian kluster potensi pangan lokal hasil identifikasi dari penelitian ini, diharapkan dapat ditindaklanjuti oleh pemerintah daerah dalam rangka mengatasi permasalahan kemiskinan dan kerawanan pangan.

Kata Kunci: desa rawan pangan, kemiskinan, penghidupan, potensi pangan lokal.

1. Introduction

Poverty and food insecurity are two interacting aspects that potentially disrupt the livelihood of people, especially in developing countries. A Nobel Prize-winning economist, Amartya Sen explains that the poverty can be defined in the two terms: "consumption" and "poverty line" (Sen, 1982, p. 9). Moreover, according to Sen (1982, p. 11), the poverty should be defined as "identification" and "aggregation" for explanation. The identification concept pays attention to the group of poor people, while the aggregation concept refers simply to a composite of what poverty is. Poverty is a never-ending complex issue, and so many scholars have been interested in discussing it. One notable aspect explains poverty as the concept of deprivation (Noble et al., 2006; Sen, 1982). According to Noble et al. (2006, p. 172), the poverty is related to the conditions that people cannot fulfil financial demands, while the deprivation is caused by other factors such as "lack of resources". A previous research by Pereira et al. (2014, p. 340) argues that well-managed "household's assets" are needed to enhance the food security. Similarly, concerning assets rooted in the livelihood literature, Ellis (2000, p. 10) define "a livelihood comprises the assets (natural, physical, human, financial and social capital), the activities, and the access to these (mediated by institutions and social relations) that together determine the living gained by the individual or household".

Indonesia is one of developing countries which is some of its areas are prone to poverty and food insecurity, especially in Yogyakarta Special Province. According to various digital and paper-based mass-media reports, until 2016 twenty villages in Yogyakarta Special Province have been recorded as the category of severe on food insecurity (Bisnis.com, 2016; Sindo, 2016; Solopos.com, 2016). Kulon Progo, as part of Yogyakarta Special Province, faces the most severe condition of food insecurity compared to other regencies within this area in 2015. The Yogyakarta Special Province for Food Security Agency and Extension (Badan Ketahanan Pangan dan Penyuluhan/BKPP DIY) officially published the classification of food insecurity villages. For measuring food insecurity, the BKPP DIY uses three indicators for each village: local food production, purchasing power parity, and access to food (Bisnis.com, 2016). Furthermore, a food insecurity village, characterised by these three aspects including declining in purchasing power, lack access to gain food, and low production of local food (Bisnis.com, 2016).

Food insecurity is easily defined as the opposite concept of food security. Food insecurity cannot be separated from the matters of poverty, livelihood, and resources (Borch & Kjærnes, 2016; Carlson *et al.*, 1999; Eroğlu, 2013; Frongillo, 1999; Hadley & Crooks, 2012; Mooney & Hunt, 2009; Rose, 1999; Tomlinson, 2013). It potentially leads to hunger and malnutrition if not well-managed

(Borch & Kjærnes, 2016; Carlson *et al.*, 1999; Frongillo, 1999; Rose, 1999). To tackle the hunger problem due to food insecurity, Mooney & Hunt (2009, p. 477) suggest improving the quantity side and point out the importance of "access" particularly on how poor people could attain food. Mooney & Hunt's statement is supported by Pereira *et al.* (2014) who explain that for poor people the income limitation is an obstacle for accessing food.

Food insecurity emerges as a national issue in the Indonesian context. The Central Government has increasingly paid more attention to this issue and then stipulated the Law of Food (Law No. 18) in 2012. It was in 2005 when the Central Government published its first initiative policy document which paid attention to food insecurity issue. The Central Government, which was represented by Dewan Ketahanan Pangan worked altogether with World Food Programme to produce its first policy document, Food Insecurity Map (DKP et al., 2009). This program continued from 2009 to 2015 when the Central Government published Food Security and Vulnerability Atlas or FSVA (DKP et al., 2009; DKP et al., 2015). The maps help the decision makers and users to identify the food insecurity regions by the composite index (DKP et al., 2009).

Due to its problem of the statistical unit, the FSVA document only present the information at the national, provincial, and Regency/ municipality levels. There is no information in this document if stakeholders or users are willing to seek for analysis at the village level. Indeed, for example, there are two studies, which explain food insecurity conditions in the rural area (Hapsari & Rudiarto, 2017; Subejo et al., 2017). These studies explain accurately on how the importance to adopt the FSVA method as a mean for the decision makers to alleviate food insecurity. It also gives some reliable answer for village-level under-researched gaps by other data as a complementary, which has not been demonstrated by previous FSVA studies. The provincial or regency government also gives such information. For example, in Yogyakarta Special Province, the BKPP DIY regularly publishes an annual report that contains information of food insecurity villages.



Figure 1. Food Insecurity Villages of Yogyakarta Special Province, 2015.

In addition, several previous studies on livelihood have been conducted in the Yogyakarta Special Province context (Baiquni, 2008; Rijanta, 2008; Sutanto, 2008; Widyatmoko, 2008; Gunardo, 2004), enriched with some studies from the other developing countries (Kristjanson et al., 2005; Magombeyi et al., 2016). The studies in Yogyakarta Special Province explain how rural households have coped with Indonesia's financial crisis in 1998. On the other hand, different perspectives of livelihood are offered in the spatial context rather than in the household or individual context. Some previous articles discuss livelihood in the regional settings. For example, a study of Kenya's experience offers how to map livelihood at a sub-district level (Kristjanson et al., 2005). Another survey in Africa presents an effort on how to conduct a spatial analysis by mapping four components: food insecurity, poverty, livelihood and water resources (Magombeyi et al., 2016). However, the study of poverty, food insecurity, livelihood and local food potentials in spatial perspective is limited.

This article presents the discussion for food insecurity village from a different dimension to address the limitations by analysing these published village data at the regional level and adopting the concepts of local food centres and local food crops introduced in the previous study (Subejo*et al.*, 2017). Therefore, the primary aim of this paper is to present a description of the geographies of rural deprivation in Kulon Progo Regency. Spatial analyses were used to map the poverty, food insecurity, livelihood and local food potentials in this area.

2. Research Method

2.1. Research Design

The research is taken place in Kulon Progo Regency (Figure 1) that locates in the west part of Yogyakarta Special Province, Indonesia, and which is divided into 12 sub-districts (*Kecamatan*) and subdivided into 88 villages (*Desa*). According to the BPS Kulon Progo (BPS, 2008), Kulon Progo Regency is divided into three parts from north to south. The north part consists of the sub-districts of Girimulyo, Nanggulan, Kalibawang, and Samigaluh. Sub-districts as Sentolo, Pengasih, and Kokap locate in the middle section. Temon, Wates, Panjatan, Galur, and Lendah are in the south part. These geographical parts have their specific characteristics: upland areas in the north region, transitional and hilly areas in the middle section, and lowland areas in the south part, respectively (BPS, 2008). This paper uses three geographical terminologies: upland, transitional, and lowland regions to explain the geographic profiles.

This paper employs an exploratory research design presented in Figure 2. This flowchart shows the process that is conducted in this paper starting from defining research questions, then reviewing previous works of literature, next presenting the research questions. It is followed by offering its research methods and results. The next step is a discussion, and finally, this paper is closed with conclusions.

2.2. Data Used and Data Processing

This research utilises secondary data which are published by the government and non-government institutions (BKPP DIY and SMERU, respectively). In detail, the data concerning the food insecurity and the local food potential are derived from the BKPP DIY (BKPP, 2015), while the operational definition of poverty and livelihood comes from SMERU (SMERU, 2014). In particular, this research analyses 1) food insecurity; 2) the number of poor people based on the national poverty line; 3) livelihoods with five asset components; and 4) local food potentials (Table 1, the details scoring and weighting is provided in Appendix 1).

Firstly, the data on poverty and local food production are processed by Microsoft Excel and QGIS 2.18 software. A classification gives a meaning for the values or constructed index (Noble *et al.*, 2006). Natural Breaks (Jenks) method that leads to specific/classification of the village poverty levels and local food potentials is chosen for this research. According to Brewer and Pickle (2002, p. 663), Natural Breaks is selected due to its ability "to minimise variation within classes". Helped by QGIS software, the calculation leads to a threecategory classification: high, medium, and low rating. Indonesia's Law of Food (Law No. 18) is used to identify the production of the local food. Based on this, local food is defined as food that is consumed by local people based on the local production potentials and the local wisdom or indigenous knowledge. For the local food production and potential, this paper focusses 10 kinds of tuber: cassava (ubi kayu), sweet potato (*ubi jalar*), edible canna (*ganyong*), arrowroot (garut), prasina (gadung), birch rim yam (gembili), pumpkin (labu), tuber (uwi), breadfruit (sukun), and lastly elephant's foot (suweg).

The classification of food insecurity villages has been conducted by the BKPP DIY (BKPP, 2015). This classification is resulted from developing the food insecurity index, graded by the points on food availability, access and utilisation. To measure the food availability, the BKPP uses three-year average production outputs of rice, maize, cassava, and sweet potato. The reason for the BKPP DIY to choose these crops is based on the argument that the primary source of human energy comes from cereals and tubers (BKPP, 2015). The BKPP DIY (2015) states that "more than 50% of food consumption in Indonesia is from grains on the calorie basis" (translated by the author from Bahasa). Further, to construct the access parameter, the BKPP DIY employs Pre-Welfare Households (Keluarga Pra-Sejahtera) and Welfare Households level 1 (Sejahtera I) which are supported by the time-series data of Monthly-price, Farmers' Terms of Trade Indices (Nilai Tukar Petani), and Human Development Index (Indeks Pembangunan Manusia). Lastly, the food utilisation is explained by the level of children-underfive underweight (prevalensi gizi kurang pada balita). The three measures are combined to construct the composite index by the BKPP DIY. Therefore, it is supported by previous researchers on deprivation suggestion, that the best way to measure deprivation is to use by using a composite index (Messer et al., 2006; Noble et al., 2006).



Figure 2. Research Design Flow Chart.

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No	Component	Indicators	Data Source
1	Poverty	The number of people below the national poverty line	<u>SMERU, 2014</u>
2	Food Insecurity	Food Insecurity Villages Category (Class)	<u>BKPP, 2015</u>
3	Livelihood	 Natural Capital Physical Capital Human Capital Financial Capital Social Capital Notes: Detail of these indicators present in appendix 1 	<u>SMERU, 2014</u>
4	Local Food	Plantation Area and Production of Ten of Local Food Crops	<u>BKPP, 2015</u>

11 11	Table. 1. Po	overty, Food	Insecurity,	Local Food	and	Livelihood	Data
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In particular, following the suggestion from previous researchers then this paper offers a combination approach for constructing the deprivation typology (Glaeser, 2016; Messer et al., 2006; Noble et al., 2006). Combination of poverty and food security construction is also suggested by other scholars (Magombeyi et al., 2016), with their 'tandem' terminology. The poverty component is derived from the number of poor people below the national poverty line, containing three classes: high, medium, and low. In another word, the food insecurity component includes three classes of the food insecurity village: severe, alert, and secure, derived from the BKPP DIY report (2015). The BKPP DIY's typology of food insecurity villages was adopted to categorise the poverty: 'severe' to 'high', 'alert' to 'medium', and 'secure' to 'low' categories. Finally, LISA approach was used to construct a 'new typology' (Anselin, 1995). Anselin's idea presents a categorical approach by providing a quadrant analysis of low-low, low-high, highlow, and high-high categorisation. However, this paper needs to present nine cells that are consisted of three classes for each component. Therefore, the 'new typology' was modified into low-low, low-medium, medium-low, mediummedium, high-low, high-medium, low-medium, medium-high, and high-high. Scenario planning discipline employs this nine cells classification or 3x3 matrix (Ringland, 1998).

The process of livelihood counting and graphing is supported by the MS-Excel macrotoolkit Livelihoods Toolbox (beta), which is provided by the International Federation of Red Cross and Red Crescent, available at http:// www.livelihoodstoolbox.org. Following the guideline of this tool, it is essential to use the values for inputting that is weighted on raw scores based on the community or household perspectives. However, in this paper, the weight for each indicator is given by the researcher (please see notes in Appendix 1 for the explanation), considering the importance of every index for the regional settings. Finally, the box and whisker plot were drawn by using Microsoft Excel based on Rowell's tutorial (Rowell, 2012).

3. Results and Discussion

3.1. Village Typology of Severe Conditions

The typology of all the villages in Kulon Progo is constructed from the two dimensions of poverty and food insecurity, each of which includes three categories of 'low', 'medium', and 'high'. The calculation leads to 9 classifications (Figure 3 and Table 2). There are nine typologies and then be categorised into two distinct groups: un-severe and severe groups. Furthermore, this distinction has four categories: 1) un-severe; 2) severe on poverty; 3) severe on food, and 4) critical on both (poverty and food). In general, most of the villages in Kulon Progo are un-severe villages (68 villages). The rest of communities, 20 of 88 villages, are severe villages (Table 3). Eleven villages have a problem of poverty. Meanwhile, seven villages have to struggle with food insecurity. Finally, two communities are facing both issues: poverty and food insecurity.



Figure 3. Typological Map of Poverty and Food Insecurity Villages in Kulon Progo.

No	Typology (Poverty and Food Insecurity Villages)	Number of Villages	Category			
1	Low-Low	41	Un-severe			
2	Low-Medium	1	Un-severe			
3	Medium-Low	25	Un-severe			
4	Medium-Medium	1	Un-severe			
5	High-Low	9	Severe on Poverty			
6	High-Medium	2	Severe on Poverty			
7	Low-High	1	Severe on Food			
8	Medium-High	6	Severe on Food			
9	High-High	2	Critical on Both (Poverty and Food)			

Table 2.	The	number	of	village	Typo	loaies	in	Kulon	Progo
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No.	Village Name	Geographical Zones (*)	Typology (Poverty Figure and Food Insecurity)	Category
1	Gotakan	Lowland	High – Low	Severe on Poverty
2	Sidorejo	Lowland	High – Low	Severe on Poverty
3	Ngentakrejo	Lowland	High – Low	Severe on Poverty
4	Sentolo	Transitional	High – Low	Severe on Poverty
5	Karangsari	Transitional	High - Low	Severe on Poverty
6	Jatimulyo	Upland	High – Low	Severe on Poverty
7	Donomulyo	Upland	High – Low	Severe on Poverty
8	Banjarharjo	Upland	High – Low	Severe on Poverty
9	Kebonharjo	Upland	High – Low	Severe on Poverty
10	Bendungan	Lowland	High – Medium	Severe on Poverty
11	Pengasih	Transitional	High – Medium	Severe on Poverty
12	Sidoharjo	Upland	Low - High	Severe on Food
13	Giripeni	Lowland	Medium-High	Severe on Food
14	Wates	Lowland	Medium-High	Severe on Food
15	Tuksono	Transitional	Medium-High	Severe on Food
16	Hargowilis	Upland	Medium-High	Severe on Food
17	Hargotirto	Upland	Medium-High	Severe on Food
18	Ngargosari	Upland	Medium-High	Severe on Food
19	Giripurwo	Upland	High – High	Critical on Both Poverty and Food
20	Purwoharjo	Upland	High - High	Critical on Both Poverty and Food

Table 3. Villages in severe condition in Kulon Progo.

(*) Geographical Zones are categorised by Kulon Progo BPS (2008).

The severe categories of the typology are then related to the geographical zones (Table 3). Firstly, the evidence shows that the poverty-severe villages are located in all geographical zones: upland, transitional, and lowland area. Secondly, the severe food insecurity communities are found mostly in the upland area. Thirdly, two villages that are embedded in both severe conditions: poverty and food, are located in the upland area. In short, based on this explanation, most of the severe villages (poverty, food, and both categories) are generally located in the upland area. 71



Figure 4. Characteristics of Capital Assets of Livelihoods in Kulon Progo. Note for Figure 4a: L-P: Lowland-Physical Assets; T-P: Transitional-Physical Assets; U-P: Upland-Physical Assets; L-S: Lowland-Social Assets; T-S: Transitional-Social Assets; U-S: Upland-Social Assets; L-N: Lowland-Natural Assets; T-N: Transitional-Natural Assets; U-N: Upland-Natural Assets; L-H: Lowland-Human Assets; T-H: Transitional-Human Assets; U-H: Upland-Human Assets; L-F: Lowland-Financial Assets; T-F: Transitional-Financial Assets; U-F: Upland-Financial Assets. Note for Figure 4b – 4f: A:Low-Low, B: Low-Medium, C: Low-High, D: Medium-Low, E: Medium-Medium, F: Medium-High, G: High-Low, H: High-Medium, I: High-High.

3.2. Capital Assets of Livelihoods

This part presents the five capital assets of livelihood based on their geographical variations related to the proposed typology (Figure 4). The figure shows that the social asset shows the highest value compared to others, followed by the human asset. Next, the natural asset is on the third rank, followed by the physical assets and lastly, the financial asset stand for the last position. Meanwhile, geographically, a comparison is given to the lowland, the transitional, and the upland regions. There is an unequal distribution of the physical, human, and financial assets. A significant gap of uneven distribution is found in the upland area for the physical asset. Meanwhile, in the transitional region, there are only a few gaps. Lastly, the financial asset tends to be a problem in the transitional and the upland areas because of its unequal distribution.

The geographic difference of livelihood assets is shown in Figure 4a. In this figure, there is an evident difference in the values among five livelihood assets in Kulon Progo (Figure 4a). Moreover, the physical livelihood asset in Kulon Progo shows various values according to the typologies (Figure 4b). In general, there are no differences among communities that are grouped into un-severe areas: low-low, low-medium, medium-low, and mediummedium, an unequal distribution being found only in the medium-medium typology. For the second group of poverty typology: highlow and high-medium, there seem no uneven distributions. Meanwhile, for the third group, the food insecurity villages, there is an unequal distribution. For the last group is severe group of both typologies: high-high. For this severe group, there is no difference between the villages. Furthermore, for the social livelihood, there are no differences among the nine typologies (Figure 4c). For the un-severe group, nevertheless, it is found that there is a significant gap for the values of two types of regions: lowlow and medium-low. While the values of the natural livelihood asset tend to decrease following the severity of poverty and food insecurity (Figure 4d). In general, the natural asset seems to affect the critical groups. It is more likely to change the rural food insecurity villages than the poverty group. In Kulon Progo, relatively no problem can be pointed on the condition of the human livelihood asset, except for the poverty and food un-secured village group: high-medium and medium-high (Figure 4e). There are some significant values in these types of community. In short, the human capital affects the poverty group. Last, the financial capital asset has a lower average value, an interval range extending around 30-60 in average (Figure 4f). In general, the number of financial institutions are relatively limited, it leads to unequal distribution of the financial asset and less availability of these financial services.

3.3. Local Food Production and Potential

To answer the question of which regions have local food potentials is given in this part. In this paper, the local food potential is operationally defined as production amount and plantation areas of local food crops. The argument that is offered for the reason is (1) the output has relations to how every community produces a variety of local food crops, and (2) the plantation area reflects the future availability of local food crops, mainly for the variety of tubers that need more extended time for being collected. It is known that more than six months are necessary to harvest some tubers.

This part tries to identify spatial specialisation and concentration of local food production at the regional level. As seen in Figure 5, Kulon Progo potentially has various local food crops (see Appendix 2). The distribution of these local food crops is varied based on the geographical division of labour. In general, the high potential of local food-planting villages is seen in every geographic region. However, the areas of the plantation are varied. Some communities have large plantation areas compare to others. For example, in the upland area, the high potential of local food crops regarding plantation areas mainly concentrate in the west part. In this cluster, potentially crops such as sweet potato, edible canna and elephant's foot have been planted. In the middle or transitional zone, the concentration of highly planted food crops is also seen in the western part. Several varieties of local food crops potentially are found in this cluster, including cassava and elephant's foot. Finally, in the lowland region, the concentration of local food crops is mostly found in two clumps: middle and east parts. In the part cluster, the highly potential local food crops are sweet potato, edible canna, and pumpkin. Meanwhile, in the eastern group, the potentially main product are cassava, arrowroot, prasina, birch rim yam, pumpkin, tuber, breadfruit and elephant's foot. In short, in the future starting from the year of harvesting, these clusters have a prospect for providing local food products in Kulon Progo.



Legend

Legend	Source	6			
 Geographical Zone Boundary: Typology of Poverty and Food Insecurity Village: Low - Low Low - Medium Low - High Medium - Low Medium - Medium 	1. Wila 2. Data Indo pove 3. Peta se-D Satu Peny 4. Rese Keg Loka Peny	yah Kerj Peta Kerja Peta Kerja Paerah Is an Kerja yuluhan earcher iatan Pe al 2012, yuluhan	a Stati emiskir 014, SM Smeru Panga stimew a Bada Propin calcula nyusur Badan Daeral	stik, BPS nan dan MERU: a .or.id In dan G a Yogyal n Ketaha si DIY ation fror nan Data Ketahan n Istimew	3, 2010 Penghidupan ccessed from iizi Tingkat Desa karta Tahun 2015 anan Pangan dan n Laporan abase Pangan nan Pangan dan wa Yogyakarta
Medium - High	0	2.5	5	7.5	10 km
High - Medium					
High - High					

Figure 5. Local Food Plantation Area based on its Geographical Variations and Typology.



Legend

 Geographical Zone Boundary: Typology of Poverty and Food Insecurity Village:
 Low - Low
 Low - Medium
 Low - High

- Medium Low Medium - Medium Medium - High High - Low High - Medium
- High High

- Source:
- Wilayah Kerja Statistik, BPS, 2010
 Data Peta Kemiskinan dan Penghidupan Indonesia 2014, SMERU: accessed from novertyman smeru or id
- Indonesia 2014, SMEHU: accessed from povertymap.smeru.or.id
 Peta Rawan Pangan dan Gizi Tingkat Desa se-Daerah Istimewa Yogyakarta Tahun 2015 Satuan Kerja Badan Ketahanan Pangan dan Penyuluhan Propinsi DIY
 Researcher calculation from Laporan Kesiatan Penyusunan Database Pangan
- Researcher calculation from Laporan Kegiatan Penyusunan Database Pangan Lokal 2012, Badan Ketahanan Pangan dan Penyuluhan Daerah Istimewa Yogyakarta



Figure 6. Local Food Production based on its Geographical Variations and Typology.

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Figure 7. Visualisation of Local Food Potentials Clusters in Kulon Progo.

It is merely to be said that production reflects a regional capacity. The classification of local food crops production can be identified in Figure 6 (see Appendix 3 for detail). The high output of local food can be found in each of the three geographical regions. In the upland area, for instance, the highly producing villages of local food crops are located in the west and the middle parts. In these two clusters such crops as edible canna, prasina, breadfruit and elephant's foot are much produced in the western group, while the middle cluster has produced cassava, sweet potato, edible canna, and prasina. In the transitional region of Kulon Progo, cassava is the leading local food crop that is much produced in the western part. Finally, there are two production clusters of local food in the lowland region of Kulon Progo, namely western and east cluster. In the west group, there is the only pumpkin that is mainly produced. Meanwhile, in the eastern part, various local food crops are much provided, including cassava, arrowroot, birch rim yam, tuber, and breadfruit.

The illustration of the spatial concentration of local food potential (Figure 7) is derived from the local food maps (Figure 5 and 6). I reconstruct the local food maps by dividing each geographical zone into three imaginaries boundaries: west-part, middle-part, and eastpart. As seen in Figure 7A, four villages with the highest local plantation area locate in the upland area. There are three villages in the transitional zone with the high local food potential. For the lowland area, the concentration of local food plantation is found in the middle part and the east part consisting of five and two villages respectively. Figure 7B shows the concentration of local food potentials based on the production dimension. The highest local food production is found in three cells of the western parts across all the geographical zones. There are two villages in the upland zone, two villages in the transitional region, and one village in the lowland zone with their highest potential of local food production. In contrast, there is only a village with the highest local food production potential in the middle part of the upland cell. Finally, two communities have the highest local food production potential that fills in the east part of the lowland cell.

3.4. Discussion

The primary purpose of this paper is presenting an explanation of the spatial dimension of poverty, food insecurity, livelihood assets, and local food potentials looking at their regional differentiation, concentration, and specialisation. For the first discussion of this paper, a focus is placed on explaining the first research question: to what extent are rural communities deprived concerning the poverty and food insecurity conditions? Results of this research demonstrate that geographically, the deprived regions on poverty and food insecurity are located in the upland area.

Typologically, there are two groups of un-severe and severe villages in the conditions of poverty and food security. In general, the finding shows that most of the oppressed communities are located in the upland area (see Table 3). This finding is in line with Riggs's conclusion in his previous study in Laos (Rigg, 2006). He states that lack of needed infrastructures and unavailability of resources is the leading causes of poverty. In general, the upland areas, which is commonly far away from the local growth poles, potential face what Sen (1982, p. 1) calls as "structure of ownership". Explanation from Qudrat-I Elahi (2006, p. 543), the structure of ownership consists of four dimensions: "trade-based entitlement, production-based entitlement, own-labour entitlement, and inheritance and transfer entitlement". Later, Qudrat-I Elahi (2006, p. 543) discusses the four entitlement into two groups: "ownership possibilities" and "trade possibilities". Therefore, to improve the severe community condition, these two possibilities should be designed. On the one hand, providing ownership possibilities will reduce the food insecurity. On the other hand, the trade of possibilities will decrease the poverty. Several efforts are needed to reinforce the two possibilities, as developing and maintaining new infrastructures and to strengthen the community livelihood assets are several propose choices to reduce inequality between the un-severe and severe village typologies.

The second discussion relates to the second research question: whether are there any differences in the livelihood conditions according to the rural deprivation? Citing from Ellis's statement that livelihood is closely related to "poverty and rural development" (Ellis,

2000, p. 7), to support the rural development, this paper gives an additional explanation on the spatial patterns of livelihood assets and their relations to the future recommendation for the decision-makers. Additionally, considering the local context of Kulon Progo regency (see Figure 4), the physical, natural and financial livelihood assets in Kulon Progo tend to be more severe in the upland area.

А discussion of deprivation and livelihood hopefully will end up on the policy mainly related to the matter of local food. The argument is constructed from the evidence that almost all the villages potentially have local food productions. The previous research also supports this argument that the domestic product has a significant role in improving local people's welfare (Shackleton et al, 2008). Some options could be built from the previous research in Kutai Kartanegara (Subejo et al., 2017). There are at least two suggestions from their paper, first the importance to set up a regional food system, and the second suggestion is to maximise the local food availability. According to the results of this research, these two options could be adopted in the case of Kulon Progo by designing two choices, firstly planning a local food centre that is stipulated in the chapter IV article 12 and the 6th subsection of Indonesian Law of Food and secondly persuading inhabitants of each village to start regularly consuming local food products in addition to daily rice consumption.

The last discussion concerns the previous research question: how are local food potentials related to the rural deprivation? In sum, a constructed typology is divided into four groups, namely un-severe, poverty severe, food severe, and both (poverty and food) severe. The finding shows that the deprived communities are mostly located in the upland areas. Livelihood conditions in Kulon Progo show that the financial, the physical, and the natural conditions need more concerns by all the stakeholders.

Local food potentials in Kulon Progo also encourage the decision makers to develop the local food centre and/or the local people to consume local food crops for daily consumption.

As seen in Figure 7, the geographies in Kulon Progo have potential local food clusters to be developed, constructing the connection between these centres and the whole regions. This figure (Figure 7A and B) potentially could be used as the entry point to design a policy. By paying attention to the Figure 5, 6 and 7A and B, it can be seen that still there is such kind of "overlapping situation" where the most severe villages have no support by the highest local food potentials. In Figure 6, the village with the highest local food production, for example, locates in between of the most severe villages. Therefore the most severe villages need support on how to improve their infrastructure transportation connection and improve the social mechanism so these options will these villages "structure of ownership". So it will lead to the multiplier effect of the most severe villages.

The potential clusters (the nine cells of geographical zones and imaginary boundaries) could have a role to support the present local spirit of Kulon Progo such as Bela Beli Kulon Progo. The findings of this paper should be followedup by giving the scale of priorities, firstly to both critical poverty and food insecurity villages, then to the severe poverty or food insecurity villages. The identified cluster of local food production is supposed to contribute to reducing poverty and food insecurity conditions in the villages of Kulon Progo. Finally, the identified groups have options to be utilised for daily consumption and/or for sale of value-added products. The possibilities of daily consumption could reduce the food insecurity issue, on the one hand; the value-added products could tackle the poverty issue on the other.

4. Conclusions

To conclude, this paper shows the unequal geographical distribution of poverty and food insecurity based on the statistical data of the villages. The regional profiles of the rural deprivation in Kulon Progo are presented incorporating the distributions of the oppressive villages and their livelihood conditions. Finally, the local food potentials also are spatially shown in order to identify the concentration and specialisation of local food plantations or productions related to the policy recommendation.

This paper has several limitations that come from using relatively old data. So, the information in this paper could not express today's situations. For example, after six years since the significant data of this paper were published, there is transformation reflecting the regional performance of Kulon Progo regency and the villages. If there had been an updated publication regarding the local food potential database monitoring the regional production could show a better profile regarding the rural deprivation. Therefore, future issues for example related to the connection of local and regional food system should be explored in advance. This under-researched issues will give detail information on proposed local food centres and their relations in the more comprehensive geographical context. Another remaining question about how to encourage production of local food in non-central places, making ties among poverty, food insecurity, livelihood and local food potentials is exciting to be examined for the next research.

Acknowledgements

I would like to acknowledge the Indonesia Endowment Fund for Education (LPDP) Ministry of Finance, the Republic of Indonesia that is funding my research through BUDI LN Scholarship scheme under cooperation between RISTEKDIKTI and LPDP, my supervisors Professor Makoto Takahashi and Associate Professor Masaya Iga for valuable ideas, feedbacks and discussion so that I could improve and finished this paper. I would also like to say thanks to BKPP DIY and SMERU that provided and gave permission for me to use their data. I want to give credit to International Federation of Red Cross and Red Crescent (www.livelihoodstoolbox.org) for providing livelihood template that is very useful to process the livelihood data. I would like to say thank to GADM (https://gadm.org) for giving the electronic map for academic research purposes. I would like to thank two anonymous reviewers for the valuable comments, correction, and suggestions.

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No	Indicators of Livelihood Assets	Weight	Score								
1	Physical Capital										
1.1.	Number of Primary School	3	0 = 0 1 = Low Rank 2 = Medium Rank 3 = High Rank								
1.2.	Number of Junior High School	3	0 = 0 1 = Low Rank 2 = Medium Rank 3 = High Rank								
1.3.	Number of Senior High School	3	0 = 0 1 = Low Rank 2 = Medium Rank 3 = High Rank								
1.4.	Number of Polindes (Village-Health Pos: a self-managed health facility by the community which has aim on mother and children health)	3	0 = 0 1 = Low Rank 2 = Medium Rank 3 = High Rank								
1.5.	Number of Posyandu (Integrated Health Pos: a local health service for the neighbourhood and supported by health officers)	3	0 = 0 1 = Low Rank 2 = Medium Rank 3 = High Rank								
1.6.	Number of Puskesmas (Community Health Center: a health centre that has provided by the government, usually serve at a sub-district level)	3	0 = 0 1 = Low Rank 2 = Medium Rank 3 = High Rank								
1.7.	Number of Pharmacy	3	0 = 0 1 = Low Rank 2 = Medium Rank 3 = High Rank								
1.8.	Availability of Public Transportation	3	0= No 3= Yes								

No	Indicators of Livelihood Assets	Weight Score				
1.9.	Village Road Can be Traversed for the Whole Year	3	0= No 3= Yes			
1.10.	Availability of Cellular Signal	3	0= No 3= Yes			
1.11.	Availability of Internet Café	1	3= No 0= Yes			
1.12.	Market Existence	3	0= No 3= Yes			
1.13.	Availability of Shopping Centre	1	3= No 0= Yes			
1.14.	Availability of Gas as Cooking Fuel	3	0= No 3= Yes			
2	Social Capital					
2.1.	The existence of Social Conflict	3	3= No 0= Yes			
2.2.	Number of Street Children Gathering	1	3= No 0= Yes			
3	Natural Capital					
3.1.	Ever Experiencing Natural Disasters: Landslide	3	3= No 0= Yes			
3.2.	Ever Experiencing Natural Disasters: Flood	3	3= No 0= Yes			
3.3.	Ever Experiencing Natural Disasters: Flash Flood	3	3= No 0= Yes			
3.4.	Ever Experiencing Natural Disasters: Forest Fire	3	3= No 0= Yes			
3.5.	Ever Experiencing Natural Disasters: Drought	3	3= No 0= Yes			
3.6.	Availability Safe Drinking Water Source	3	0= No 3= Yes			
3.7.	Ever Experiencing Pollution: Water	3	3= No 0= Yes			
3.8.	Ever Experiencing Pollution: Soil	3	3= No 0= Yes			
3.9.	Ever Experiencing Pollution: Air	3	3= No 0= Yes			
4	Human Capital					
4.1.	Migrant Workers Recruitment Agency	1	3= No 0= Yes			
4.2.	Number of Disabled People	3	0 = 0 1 = High Rank 2 = Medium Rank 3 = Low Rank			
4.3.	Agriculture as Main Working Sector	3	3 = Agriculture 0 = Others			

No	Indicators of Livelihood Assets	Weight	Score
5	Financial Capital		
5.1.	Availability of Banking Office	3	0= No 3= Yes
5.2.	Availability of Cooperative	3	0= No 3= Yes
5.3.	Availability of Credit Facilities	3	0= No 3= Yes

Notes:

According to www.livelihoodstoolbox.org, weight should be given according to its degree of importance, a score from 1 to reflect the low significance of the asset(s) up to 3 that reflects the most important. Meanwhile, score shows its access and ownership and has a variation for its score: 0 = low to 3 = high. However, in this paper, I conduct two modifications. Firstly, due to its weighted value is given by implementing my subjective value and theoretical considerations rather than based on rank that is provided by local government or local people from their Focus Group Discussion. Secondly, I modify the score value because the livelihood data are grouped into two types: binary and numerical. For the binary data type, I give merely score 0 for No and 3 for Yes, except for some indicators that logically reflect good or bad condition or impact. For example, I stand for the disaster indicators are given 0 for Yes and 3 for No. Meanwhile, for the numerical data, I operate a calculation of the same interval technique. This technique measures the maximum value subtracted from the minimum value and then divided into 3 class. I give score 1 for data that including in low-rank interval, 2 for the average rank interval, and 3 for the high-rank range. A guideline from previous research paper mention that ratings are assigned based on its previous literature review explanations and author judgements (Hapsari & Rudiarto, 2017). An exception for a zero value for a particular variable, although it is grouped into the lowclass interval, I decided to give 0 for this zero valued indicator.

Village	Geographical Zone	Туре	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Jangkaran	Lowland	L-L	L	М	М	L	L	L	М	L	М	L
Sindutan	Lowland	L-L	L	L	М	L	М	L	L	L	L	L
Palihan	Lowland	L-L	L	L	М	L	L	L	L	L	L	L
Glagah	Lowland	L-L	L	М	N/A	L	L	L	М	L	L	L
Kalidengen	Lowland	L-L	L	L	М	L	L	L	L	L	L	L
Plumbon	Lowland	L-L	L	L	М	L	L	L	L	L	L	L
Kedundang	Lowland	L-L	L	L	М	L	L	L	L	L	L	L
Demen	Lowland	L-L	L	L	М	L	L	L	L	L	L	L
Kulur	Lowland	L-L	L	М	М	L	М	L	L	L	L	L
Kaligintung	Lowland	L-L	L	М	М	L	М	L	L	L	L	L
Temon Wetan	Lowland	L-L	L	L	N/A	L	М	L	L	L	L	L
Temon Kulon	Lowland	L-L	L	L	М	L	М	L	L	L	L	М
Kebonrejo	Lowland	L-L	L	L	М	L	L	L	L	L	L	L
Janten	Lowland	L-L	L	L	М	L	L	L	L	L	L	L
Karang Wuluh	Lowland	L-L	L	L	М	L	L	L	L	L	L	L
Karangwuni	Lowland	M-L	L	L	М	М	L	L	L	L	М	L
Sogan	Lowland	L-L	L	L	L	М	L	L	L	L	М	L

Appendix 2. Local Food Plantation Area Potential.

Village	Geographical Zone	Туре	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Kulwaru	Lowland	L-L	L	М	М	М	L	М	L	М	L	L
Ngestiharjo	Lowland	M-L	L	L	М	М	М	L	L	М	М	L
Triharjo	Lowland	M-L	L	L	М	М	М	L	L	L	М	L
Bendungan	Lowland	H-M	L	L	М	М	М	М	L	М	М	L
Giripeni	Lowland	M-H	L	М	М	L	М	L	L	М	М	L
Wates	Lowland	M-H	L	L	L	L	L	L	L	L	М	L
Garongan	Lowland	L-L	L	Η	L	L	L	L	Н	L	М	L
Pleret	Lowland	L-L	L	Н	L	L	L	L	М	L	М	L
Bugel	Lowland	L-L	L	Η	L	L	L	L	М	L	М	L
Kanoman	Lowland	L-L	L	L	Н	L	L	L	L	L	М	L
Depok	Lowland	L-L	L	L	L	L	L	L	L	М	М	L
Bojong	Lowland	L-L	L	М	М	L	L	L	L	М	М	М
Tayuban	Lowland	M-L	L	М	М	L	М	L	L	М	М	L
Gotakan	Lowland	H-L	L	L	М	L	М	L	L	L	М	М
Panjatan	Lowland	L-L	L	L	L	L	М	L	L	М	М	М
Cerme	Lowland	L-L	L	L	L	L	L	L	Н	М	М	L
Krembangan	Lowland	L-L	L	L	L	L	L	L	L	L	М	L
Karangsewu	Lowland	L-L	L	М	М	М	М	L	М	М	М	L
Banaran	Lowland	M-L	L	М	М	М	М	L	М	М	М	М
Kranggan	Lowland	L-L	L	М	М	L	М	L	L	М	М	L
Nomporejo	Lowland	M-L	L	М	М	L	М	L	L	М	М	М
Brosot	Lowland	M-L	L	L	М	L	L	L	L	L	М	М
Pandowan	Lowland	L-L	L	М	М	L	М	L	L	М	М	L
Tirtorahavu	Lowland	M-L	L	L	М	М	М	L	М	М	М	L
Wahyuharjo	Lowland	L-L	N/A									
Bumirejo	Lowland	L-L	L	L	М	L	L	L	L	М	L	М
Jatirejo	Lowland	L-L	L	L	М	М	М	М	L	М	М	М
Sidorejo	Lowland	H-L	Н	М	М	Н	Н	Н	Н	Н	Н	Н
Gulurejo	Lowland	M-L	L	L	М	Н	М	М	L	Н	Н	М
Ngentakrejo	Lowland	H-L	L	L	L	М	L	L	L	L	L	L
Demangrejo	Transitional	L-L	N/A									
Srikayangan	Transitional	M-L	L	L	L	L	L	L	L	L	L	L
Tuksono	Transitional	M-H	L	L	L	L	L	L	L	L	L	L
Salamrejo	Transitional	L-L	L	L	L	L	L	L	L	L	L	L
Sukoreno	Transitional	L-L	N/A									
Kaliagung	Transitional	M-L	L	L	L	L	L	L	L	L	L	L
Sentolo	Transitional	H-L	N/A									
Banguncipto	Transitional	M-L	L	L	L	L	L	L	L	L	L	L
Tawangsari	Transitional	L-L	N/A									
Karangsari	Transitional	H-L	L	L	L	L	L	L	L	L	L	L
Kedungsari	Transitional	M-L	L	L	L	L	L	L	L	L	L	L
Margosari	Transitional	M-L	L	L	L	L	L	L	L	L	L	L
Pengasih	Transitional	H-M	N/A									
Sendangsari	Transitional	L-L	L	L	L	L	L	L	L	L	L	L
Sidomulvo	Transitional	M-L	L	L	L	L	L	L	L	L	L	L
, Hargomulyo	Transitional	M-L	Н	L	М	М	М	М	L	М	М	М

Village	Geographical Zone	Туре	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Hargorejo	Transitional	L-L	Н	L	М	М	М	М	L	М	М	Η
Hargowilis	Transitional	M-H	Н	L	М	М	М	L	L	М	L	М
Kalirejo	Transitional	M-M	М	L	М	L	М	L	L	М	L	М
Hargotirto	Transitional	M-H	М	L	М	L	М	L	L	М	L	М
Jatimulyo	Transitional	H-L	М	L	М	L	L	L	L	М	N/A	М
Giripurwo	Transitional	H-H	L	L	L	L	L	L	L	L	L	L
Pendoworejo	Upland	M-L	М	М	М	М	М	L	L	L	N/A	М
Purwosari	Upland	M-L	М	Η	М	L	N/A	N/A	L	М	N/A	М
Banyuroto	Upland	M-L	L	L	L	L	L	L	L	L	L	L
Donomulyo	Upland	H-L	L	L	L	L	L	L	L	L	L	L
Wijimulyo	Upland	L-L	L	L	L	L	L	L	L	L	L	L
Tanjungharjo	Upland	M-L	L	L	L	L	L	L	L	L	L	L
Jatisarono	Upland	L-L	N/A									
Kembang	Upland	L-L	L	L	L	L	L	L	L	L	L	L
Banjararum	Upland	M-L	L	L	L	L	L	L	L	L	L	L
Banjarasri	Upland	L-L	L	L	L	L	L	L	L	L	L	L
Banjarharjo	Upland	H-L	L	L	L	L	L	L	L	L	L	L
Banjaroya	Upland	M-L	L	L	L	L	L	L	L	L	L	L
Kebonharjo	Upland	H-L	М	L	N/A							
Banjarsari	Upland	M-L	М	М	Η	М	М	М	L	М	М	Η
Purwoharjo	Upland	H-H	М	L	М	М	М	L	L	L	М	М
Sidoharjo	Upland	L-H	N/A									
Gerbosari	Upland	M-L	L	М	М	М	М	М	М	М	М	Η
Ngargosari	Upland	M-H	L	М	L	L	L	L	L	L	L	L
Pagerharjo	Upland	L-M	L	М	М	М	М	М	М	М	М	Н

Note:

- 1. Sign of the colour show the class difference among local food production, darker color shows higher class. Meanwhile, N/A = No Data, L = Low, M = Medium, H = High. This visualisation adopt the idea of heat map result (Toddenroth, et al., 2014), but I tabulate manually for the presentation.
- The name of local food crops: (1) cassava/ubi kayu; (2) sweet potato/ubi jalar; (3) edible canna/ ganyong; (4) arrowroot/garut; (5) prasina/gadung; (6) birch rim yam/gembili; (7) pumpkin/ labu kuning; (8) tuber/uwi; (9) bread fruit/ sukun; (10) elephant's foot/suweg.

P.F. S. S.												
Village	Geographical Zone	Туре	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Jangkaran	Lowland	L-L	L	L	М	L	L	L	Η	L	М	L
Sindutan	Lowland	L-L	L	L	L	L	L	L	М	L	L	L
Palihan	Lowland	L-L	L	L	L	L	L	L	L	L	L	L
Glagah	Lowland	L-L	N/A	L	N/A	L	L	L	L	L	L	L
Kalidengen	Lowland	L-L	L	L	L	L	L	L	М	L	L	L
Plumbon	Lowland	L-L	L	L	L	L	L	L	М	L	L	L
Kedundang	Lowland	L-L	L	L	L	L	L	L	L	L	L	L
Demen	Lowland	L-L	L	L	L	L	L	L	М	L	L	L
Kulur	Lowland	L-L	L	L	L	L	М	L	L	L	L	L
Kaligintung	Lowland	L-L	L	L	L	L	L	L	М	L	L	L
Temon Wetan	Lowland	L-L	L	L	N/A	L	L	L	L	L	L	L

Appendix 3. Local Food Production Potential.

ISSN: 0852-0682, EISSN: 2460-3945

Zone A Contraction Contraction Contraction	(10)
Temon Kulon Lowland L-L L L L L L L L L L L L	L
Kebonrejo Lowland L-L L L L L L L L L L L L	L
Janten Lowland L-L L L L L L L M L L	L
Karang Wuluh Lowland L-L L L L L L L L M L I	L
Karangwuni Lowland M-L L L L L L L L L M	L
Sogan Lowland L-L L L L M L L L L I	L
Kulwaru Lowland L-L L M L M L L L M I	L
Ngestiharjo Lowland M-L L L M L L L L M	L
Triharjo Lowland M-L L L M M L L L L M	L
Bendungan Lowland H-M L L L L L L L L M	L
Giripeni Lowland M-H L M M L L L L M I	L
Wates Lowland M-H L L L M L L L M	L
Garongan Lowland L-L L L L L L L M L I	L
Pleret Lowland L-L L L L L L L L L L L	L
Bugel Lowland L-L L L L L L L L L L L	L
Kanoman Lowland L-L L L L L L L L L L L	L
Depok Lowland L-L L L L L L L L L L L	L
Bojong Lowland L-L L L L L L L L L L L	L
Tayuban Lowland M-L L L L L L L L L L	L
Gotakan Lowland H-L L L L L L L L L L	L
Panjatan Lowland L-L L L L L L L L L L L	L
Cerme Lowland L-L L L L L L L L L L	L
Krembangan Lowland L-L L L L L L L L L L L	L
Karangsewu Lowland L-L L M M L L L M M N	L
Banaran Lowland M-L L M M L L L M L M	L
Kranggan Lowland L-L L M M L L L L L N	М
Nomporejo Lowland M-L L M M L M L M L M	L
Brosot Lowland M-L L L M L L L L N	L
Pandowan Lowland L-L L M L L L L L L I	L
Tirtorahavu Lowland M-L L L M L M L M M M	L
Wahyuharjo Lowland L-L N/A N/A N/A N/A N/A N/A N/A N/A N/A	A N/A
Bumirejo Lowland L-L L L L L L L L M I	М
Jatirejo Lowland L-L L L M M L L N/A L I	L
Sidorejo Lowland H-L H L L H M H H M	М
Gulureio Lowland M-L M L L H M H L H	L
Ngentakrejo Lowland H-L L L L L L L L L L L	L
Demangrejo Transitional L-L N/A N/A N/A N/A N/A N/A N/A N/A N/A	A N/A
Srikavangan Transitional M-L L L L L L L L L L	L
Tuksono Transitional M-H L L L L L L L L L	L
Salamreio Transitional L-L L L L L L L L L L	L
Sukoreno Transitional L-L N/A N/A N/A N/A N/A N/A N/A N/A N/A	A N/A
Kaliagung Transitional M-L L L L L L L L L L	L
Sentolo Transitional H-L N/A N/A N/A N/A N/A N/A N/A N/A N/A	N/A
Banguncipto Transitional M-L L L L L L L L L L L	L
Tawangsari Transitional L-L N/A N/A N/A N/A N/A N/A N/A N/A N/A	N/A
Karangsari Transitional H-L L L L L L L L L L	L

Village	Geographical Zone	Туре	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Kedungsari	Transitional	M-L	L	L	L	L	L	L	L	L	L	L
Margosari	Transitional	M-L	L	L	L	L	L	L	L	L	L	L
Pengasih	Transitional	H-M	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Sendangsari	Transitional	L-L	L	L	L	L	L	L	L	L	L	L
Sidomulyo	Transitional	M-L	L	L	L	L	L	L	L	L	L	L
Hargomulyo	Transitional	M-L	Η	L	М	М	М	L	L	М	L	L
Hargorejo	Transitional	L-L	L	L	М	М	М	L	L	М	L	L
Hargowilis	Transitional	M-H	Η	L	М	L	М	L	L	М	L	L
Kalirejo	Transitional	M-M	М	L	М	L	L	L	L	М	L	L
Hargotirto	Transitional	M-H	М	L	М	L	L	L	L	L	L	L
Jatimulyo	Transitional	H-L	L	L	М	L	L	L	L	М	М	L
Giripurwo	Transitional	H-H	L	N/A	L	L	L	L	L	L	L	L
Pendoworejo	Upland	M-L	L	Η	Н	М	Η	М	L	М	М	L
Purwosari	Upland	M-L	М	М	Η	L	Η	М	L	Η	М	М
Banyuroto	Upland	M-L	L	L	L	L	L	L	L	L	L	L
Donomulyo	Upland	H-L	L	L	L	L	L	L	L	L	L	L
Wijimulyo	Upland	L-L	L	L	L	L	L	L	L	L	L	L
Tanjungharjo	Upland	M-L	L	L	L	L	L	L	L	L	L	L
Jatisarono	Upland	L-L	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Kembang	Upland	L-L	L	L	L	L	L	L	L	L	L	L
Banjararum	Upland	M-L	L	L	L	L	L	L	L	L	L	L
Banjarasri	Upland	L-L	L	L	L	L	L	L	L	L	L	L
Banjarharjo	Upland	H-L	L	L	L	L	L	L	L	L	L	L
Banjaroya	Upland	M-L	L	L	L	L	L	L	L	L	L	L
Kebonharjo	Upland	H-L	L	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Banjarsari	Upland	M-L	L	L	L	N/A	N/A	N/A	L	N/A	N/A	N/A
Purwoharjo	Upland	H-H	L	L	L	L	L	L	L	N/A	L	N/A
Sidoharjo	Upland	L-H	L	L	М	М	М	L	М	L	М	L
Gerbosari	Upland	M-L	L	L	М	L	М	L	М	М	L	L
Ngargosari	Upland	M-H	L	L	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Pagerharjo	Upland	L-M	L	L	L	L	L	L	L	L	Η	Η
					Note:							

1. Sign of the colour show the class difference among local food production, darker color shows higher class. Meanwhile, N/A = No Data, L = Low, M = Medium, H = High. This visualisation adopt the idea of heat map result (Toddenroth, et al., 2014), but I tabulate manually for the presentation

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