19. Flow of sweetpotato vine cutting planting materials among farmers in East Java

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Abstract

The current national yield average of sweetpotato is 9.5 t/ha, which is much lower than that of its potential yield of up to 40 t/ha. The low quality of the vine cuttings as planting materials was considered as an important cause of low yields. Basic information on the current state and distribution flow of vine cuttings is important to improve planting materials quality. The study aimed to obtain basic information on the preferred varieties and flow of planting materials in a sweetpotato-producing center in East Java, Indonesia.

Field surveys were done from November 2001 to February 2002 in nine districts (Malang, Blitar, Mojokerto, Magetan, Ngawi, Banyuwangi, Bangkalan, Sampang, and Sumenep), covering 16 subdistricts and 47 villages. Results indicated that in each subdistrict/district, farmers have their own popular and preferred local cultivars. Most got their vine cuttings from the previous crop of their own or their neighbor's or that of a fellow farmer's in the same subdistrict or in the same district but different subdistrict. Longer movements of the planting materials were only recorded in subdistrict Tumpang (Malang), obtained from subdistrict Pacet (Mojokerto). Very few farmers prepared their planting materials rejuvenated through root sprouts.

Introduction

In Indonesia, sweetpotato is grown in very diverse environments and in wide agroecological zones. This crop can be found from the lower altitude of 10 m asl up to almost 2,500 m asl. In most cases, the most important requirement for high productivity is soil with a light texture, is well-drained, and has sufficient moisture during the crop's growing period.

The national yield average of sweetpotato is 9.5 t/ha, which is much lower than its potential yield of up to 40 t/ha. Quality of the planting materials was considered as an important constraint in sweetpotato production. Therefore, improving the production and distribution of planting materials was considered as the main research issue (Dimyati and Manwan 1992). In Indonesia, it is common practice for farmers to repeatedly use vines as planting materials over several generations without practicing rejuvenation. This might induce degenerative effects that can significantly lower the yield.

This study aimed to describe the present flow of sweetpotato planting materials at several sweetpotato-producing centers in East Java.

Methodology

Surveys on sweetpotato seed flows were carried out during the rainy season (November 2001 to February 2002), covering nine districts representing sweetpotato-producing areas in East Java, namely: Malang, Blitar, Mojokerto, Magetan, Ngawi, Banyuwangi, Sampang, Bangkalan, and Sumenep (Figure 1). In each district, one to three subdistricts (*kecamatan*) which had the

largest area planted to sweetpotato were selected. The total subdistricts surveyed were 16, covering 47 villages (Table 1). In each district, 10 to 30 farmers were interviewed.

Farmer interviews were done in the field as well as in farmers' houses. The interviews sought to determine the extent of sweetpotato plantings, status of land ownership, cropping patterns, sweetpotato varieties, sources of vine cuttings as planting materials, fertilizer application, plant protection, and marketing methods for sweetpotato. While interviews were being done, geographic positions of each location were also recorded using the Global Positioning System (GPS).

Results and Discussion

Malang district

In this district, sweetpotato is mostly grown in subdistricts Pakis and Tumpang, located at approximately 600 m asl. Soil type in Pakis consists of Inceptisol, Oxisol, and Mollisol. Soil humidity in the area is ustic characterized by a long dry regime extending over four consecutive months a year (Legowo et al. 1997). According to the Oldeman criteria, subdistrict Pakis belongs to C3, D3, and D4 climatic types. Annual average soil temperature is more than 22° C (isohyperthermic).

The area is undulating to mountainous (Figure 2), with total harvested sweetpotato area of 545 ha. In Pakis, sweetpotato is mostly planted in the villages of Sumberkradenan, Sumberpasir, and Jambonpakis.

Soil type in subdistrict Tumpang is Entisol and Oxisol. Its soil humidity is classified as ustic, its soil temperature mostly isothermic (annual average is 15-22^{0}C) and a bit isohyperthermic. The area is mostly undulating to mountainous (Figure 2). Total harvested area of sweetpotato is approximately 282 ha, mostly in the sweetpotato-growing villages of Wringinsongo, Tumpang, and Jero.

In subdistrict Jabung, sweetpotato is grown in village Kenongo. Soil types are mostly Oxisol and Entisol. Soil humidity is either udic (median dry period with 3-4 consecutive dry months a year) or ustic. Soil temperatures are isohyperthermic and isothermic. The area is mostly undulating to mountainous.

In Pakis, Tumpang, and Jabung, sweetpotato is usually planted in the lowlands after rice. The cropping pattern is either rice-sweetpotato-fallow or rice-sweetpotato-maize. Cultivars IR-Melati and Paong are considered as the most popular varieties and are widely planted by farmers. Farmers obtained their vine cutting materials either from the local crops from Pacet. None of the farmers practice rejuvenation of planting materials by root sprout.

In subdistricts Pakis and Tumpang, most farmers only applied urea at 25-50 kg/ha. A few farmers applied phosphate (25-50 kg/ha), but no farmers used potassium. Sweetpotato weevil and scab diseases were considered as the important constraints in sweetpotato production. Leaf-feeding insects are sometimes considered as important pests. However, farmers have not used any pesticide to control them. Farmers did not recognize the presence of viral diseases, although it has often been observed in the field during survey.

Most farmers in these subdistricts sell their crops through the *tebasan* system, where the standing crop is sold to a wholesaler and the wholesaler conducts the harvest. Only few farmers harvest by themselves and sell the roots to the local market or a wholesaler. Farmers from this district also sent their sweetpotato produce for the sauce industry in Surabaya. Average yield obtained by farmers is 19 t/ha.

Blitar district

In this district, sweetpotato is mostly grown in subdistrict Srengat although it is also planted in subdistricts Kanigoro and Talun (Figure 3). Srengat is approximately 80-120 m asl. with flat to undulating terrain. The soil type is Entisol, which is of young volcanic origin. It has a predominantly sandy texture. Soil humidity is ustic, and annual soil temperature is isohyperthermic. Talun and Kanigoro are of the same agroecological zone. Soil type is Entisol, soil humidity is ustic and annual soil temperature is isohyperthermic. The area is undulating.

Sweetpotato is planted only once a year, following the cropping pattern rice-sweetpotato-other secondary crops. Sweetpotato is planted during the early dry season, making use of the residual soil moisture after rice. In such condition, sweetpotato is monoculturally grown with or without minimum irrigation, and with inadequate fertilizer. Most of the farmers applied nitrogen at the rates of 15-30 kg N/ha in the form of ammonium sulfate or urea. They also applied a very small amount of phosphate (50 kg TSP/ha). None of the farmers interviewed used pesticide to control sweetpotato weevil or scab disease, although they realized that these can reduce sweetpotato yields significantly. Farmers did not recognize the presence of viral diseases.

Most of the farmers in Blitar kept local clones, mainly Genjah Rante and Samarinda. These local cultivars are very popular to the farmers. Genjah Rante is highly productive (20-30 t/ha), has a red skin and sweet, yellow flesh with powdery texture. Samarinda has reddish skin, whitish-purple flesh, and is sweeter but less productive than Genjah Rante. In Srengat, farmers got their sweetpotato cuttings from their neighbors or were prepared in small nurseries in each homegarden. Few farmers took their planting materials from crops planted in the upland areas. One farmer grew sweetpotato using apical cuttings from a sprouting nursery.

Mojokerto district

The central sweetpotato-producing area in this district is subdistrict Pacet. It is located approximately 700 m asl, where terrain is undulating. The sandy loam soil classified as Andisol and Entisol. Soil in a small portion of the area is Alfisol. Based on its soil humidity the area is classified as udic, while soil temperature is isohyperthermic (Figure 4). Total harvested area for sweetpotato is approximately 750 ha, mostly in Pacet, Pandanarum, Warugunung, and Petak villages. In all the villages, sweetpotato is grown year-round although most of the crop is planted in the lowlands after rice. Some are planted in the uplands. The cropping patterns are: sweetpotato-rice-sweetpotato, sweetpotato-rice-maize, and maize-rice-sweetpotato. Farmers commonly plant the local cultivar IR-Melati in Mojokerto. IR-Melati has red skin and white flesh. Other local cultivars planted are Senggreng, Paong, and Bestak. Most farmers obtained their vine cuttings from the local crops in Pacet. Some got cuttings from Malang. Only few farmers prepared planting materials in their own nurseries. Farmers usually applied fertilizers for their crops (50-100 kg/ha Urea, 50-75 kg/ha SP36, and 25-50 kg/ha KCl), but did not use chemical control measures for pest (sweetpotato weevil) or disease (scab disease) problems. Moreover, farmers did not recognize viral diseases. The average yield obtained by farmers was approximately 28 t/ha. Most the farmers sold the crops by the *tebasan* system.

Magetan district

The district is located at about 700 m asl, and its soil is sandy clay-loam where sweetpotato is grown year-round. It is mostly grown in subdistrict Panekan. Soil types in the area are Oxisol, Andisol, and Alfisol. Soil humidity regime is udic and soil temperature is classified as isohyperthermic. The area is undulating to mountainous (Figure 5). The total area planted to sweetpotato in Panekan is 1,403 ha, distributed in villages of Turi, Mulangsari, Banjarejo, Sidowayah, and Panekan.

The main cropping pattern is rice-rice-sweetpotato. However, when water is inadequate for growing rice, the cropping pattern is rice-sweetpotato-sweetpotato. Growers in Magetan prefer sweetpotato with white flesh and white skin rather than the red or yellow ones. The local cultivar Kamplong putih has a good eating quality with a medium-high yield potential. Other cultivars grown by farmers are No.72, Sundo, and Kates. Kates is basically CN 1108-13, which originated from the Asian Vegetable Research and Development Center (AVRDC) in Taiwan and was introduced to Magetan in 1988. According to the farmers, Kates is both a high-yielding and an early-maturing variety, so it performs well when planted as a second sweetpotato crop after the first sweetpotato crop is harvested. Usually farmers obtain vine cuttings from the local crops. Farmers usually applied 50-100 kg/ha Urea and 25-50 kg/ha SP36. No farmers used potassium (KCl) or pesticides because these were expensive. The average yield obtained by farmers was 21.3 t/ha.

Ngawi district

In this district, sweetpotato is mainly grown in subdistrict Kendal located at 385 m asl, with sandy loam soil of types Andisol and Alfisol. Soil humidity is classified as udic and annual soil temperature is isohyperthermic. The area is undulating to mountainous (Figure 6). Total sweetpotato-harvested area is 410 ha. Sweetpotato is usually grown once a year in the lowlands following the cropping pattern rice-sweetpotato. Local cultivars No.72 and Sundo are widely planted by farmers. Other local cultivars are Kates and Dlampar. Farmers usually fertilized with Urea at 50-200 kg/ha, and phosphate (SP36) at 50-100 kg/ha. Most farmers did not apply any pesticide, while only a few used Furadan to control insect pests in the soil. *Boleng* (sweetpotato weevil) and *keriting* (scab disease) are known as important constraints in sweetpotato production. Farmers did not recognize viral diseases.

Most farmers sold their crops by the *tebasan* system. Only few farmers harvested by themselves and sold their products to the market. The average yield obtained by farmers was approximately 11 t/ha. Most farmers obtained their vine cuttings from local crops.

Banyuwangi district

In this district, sweetpotato is mostly grown in subdistricts Kalibaru and Srono (Figure 7). Kalibaru is located at approximately 425 m asl. In 2001, total harvested area for sweetpotato was 380 ha, with an average yield of 21.7 t/ha. Soil type in Kalibaru is Entisol. Soil humidity is classified as udic. According to the Oldeman criteria, the area belongs to B2, C2, and D2 climatic types. Some of the areas are classified as isohyperthermic and isothermic. The area is undulating to mountainous.

Farmers commonly grow the local cultivar Kedu, which has red skin, white flesh, a good texture, and a sweet taste. Another cultivar planted is Paong, which has a reddish orange skin, orange watery flesh that is a little bit sweet, Some farmers obtained their vine cuttings

from their neighbors, while some grew their own planting materials along the rice border ridges or in the uplands (*tegalan*), along the railroad. Sweetpotato is usually planted after the second crop of rice is harvested, following the cropping pattern rice-rice-sweetpotato. Farmers commonly applied urea at 150-200 kg/ha. Besides applying urea, some farmers also used 100 kg/ha of ZA or 100 kg/ha of KCl. Most farmers sold their sweetpotato by the *tebasan system*. The average yield obtained by farmers varied from 12 to 22 t/ha depending on their crop management intensities. In Kalibaru, sweetpotato is considered as a commercial cash crop, where farmers' produce supply the the sauce industry in Surabaya.

Subdistrict Srono is located at 55-65 m asl. Soil types are Inceptisol and Oxisol. Based on its soil humidity regime, the area is ustic and is classified as C3, D3, and E. Soil temperature is isohyperthermic. The area is flat and is dominated by lowlands.

In this subdistrict, sweetpotato is grown following the cropping pattern rice-rice-sweetpotato. According to farmers, the best time to grow sweetpotato is in June/July. The local cultivar Rachman is widely grown by farmers for its high productivity. Rachman produces big roots with yellowish-orange skin and orange flesh. Some farmers obtained their vine cuttings from their neighbors or from other subdistricts like Sempu. Other farmers planted their planting materialsalong rice border ridges. Farmers applied Urea at 200 kg/ha, 35-45 days after planting. Some farmers also added 100 kg/ha of ZA or 2 t/ha organic manure. Farmers preferred to sell their crops by the *tebasan* system. Yield average obtained by farmers was approximately 22 t/ha.

Bangkalan d**istrict**

In Bangkalan, sweetpotato is commonly grown in subdistricts Burneh, Geger, Kokop, and Modung (Figure 8). In 1999, total harvested area for sweetpotato was approximately 1,650 ha with an average yield of 8.76 t/ha.

Burneh is located 8.5 m asl, with maximum and minimum temperatures of 32° and 25° C, respectively. Soil type in Burneh consists of Alfisol, Entisol, Vertisol, Inceptisol, and Mollisol. Its soil humidity is both udic and ustic. Its soil temperature is classified as isohypothermic ($> 22^0$C). Burneh is flat to undulating.

Burneh's total area of irrigated wetland is 3,432 ha, its rainfed wetland is 1, 916 ha, and its rainfed dryland is 2,265 ha. Sweetpotato is commonly grown in the lowlands following rice or maize harvest. The cropping patterns are rice-maize-sweetpotato and rice-sweetpotato-maize. Sweetpotato is also grown upland during the late rainy season after upland rice or maize harvest.

In Burneh, farmers grew at least three sweetpotato cultivars. Jeltikas is favored by farmers for its high productivity. Jeltik has red skin color and white flesh. Farmers also plant Kunyik kuning which has yellowish-orange skin and yellow flesh.

Most farmers did not produce their own vine cuttings. Since farmers cannot grow any crop during the dry season, they usually get their sweetpotato planting materials from other subdistricts, mostly from Socah. Moreover, during the dry season, farmers use the land as pasture for their cows rather than for growing crops. In general, sweetpotato is cultivated with minimum input. Inorganic fertilizer is applied to rice and maize, but never for sweetpotato. Farmers usually apply organic manure for their sweetpotato crop. They have never managed pests using pesticides, although they realize that some diseases such as *keriting* (presumably scab disease) and *omo boleng* (weevil) do infect their crops.

Farmers harvested their crops by themselves, saving some of the produce for their own use and selling the rest at the local market. Some, however, sold their produce by the *tebasan* system. Average yield obtained by farmers varied from 10 to 12 t/ha.

Sampang district

In Sampang, sweetpotato is commonly grown in three subdistricts (Figure 10). In the year 2000, total harvested areas in these subdistricts were 849 ha, 694 ha, and 525 ha in Rogatal, Tambelangan, and Kedungdung, respectively. The soil type of these areas is mostly dominated by Alfisol. Other soil types are Inceptisol and Entisol. Soil humidity is ustic and according to the Oldeman criteria, the area belongs climatic to types C3, D3, and E. The annual average soil temperature is classified as isohyperthermic.The area is flat to undulating, dominated by upland conditions.

In the district's lowlands, the cropping pattern is either rice-rice-maize/legume and rice-maize-legumes/sweetpotato, while in the uplands, it is upland rice followed by secondary crops (maize/legume/sweetpotato) only. Total harvested area of sweetpotato was 3,489 ha with yield average of 7.5- 8.9 t/ha.

In subdistrict Kedungdung, local cultivars Kolik merah and Kunyik kuning are widely grown by farmers. In subdistricts Rogatal and Tambelangan, some farmers also grow Jeltik and Kunyik kuning aside from Kolik merah. Cultivar Jeltik has a red skin and white flesh. Most farmers obtained vine cuttings that serve as planting materials from other villages in the same district or the district nearest to them. Only a few farmers prepared their own seedlings by planting sweetpotato along rice border ridges or near wells. Most farmers still managed sweetpotato with poor agronomic practices. They applied organic manure only and no pesticides were used to control pests and diseases.

Most farmers harvested by themselves and sold the roots in the local market. Farmers saved some roots for their own consumption while some sold their roots through the *tebasan* system. Average yield obtained by farmers varied from 15 to 18 t/ha.

Sumenep district

In Sumenep, sweetpotato is mostly grown in subdistrict Lenteng (Figure 9). Soil type of the subdistrict consists of Inceptisol, Alfisol, and Oxisol. Soil humidity is ustic. The soil temperature is isohyperthermic ($> 22^0$C). The area is flat to undulating. Lenteng has irrigated wetlands, rainfed wetlands and rainfed dry lands.

In the district's lowland, the common cropping pattern is rice (planted in January to April), followed by tobacco (May to August), and then maize or sweetpotato (September to December). If rainfall is limited, they do not grow any crops in the third season, letting the land to fallow. In upland conditions, maize as the staple food, is grown in the wet season (October to January), followed by another maize or sweetpotato/legumes (February to April), and then tobacco (May to August). Sweetpotato or legumes are often intercropped with maize. Farmers dominantly grow Kolik merah for its skin and flesh color. Kolik merah is similar to Jeltik.

Farmers usually obtained their vine cuttings from other villages of the same subdistrict and from other subdistricts such as Elok laoik, Lenteng timur, Lokdaya, or Jambu. Sweetpotato is cultivated with minimum inputs. Farmers never apply any inorganic fertilizer to their crops, but they apply some amount of organic manure for sweetpotato. Pesticide has never been applied. Some farmers harvested their crops by themselves and sold the roots to the local market. However, some farmers preferred to sell by the *tebasan* system. Yield obtained

by farmers varied from 17 to 18 t/ha.

Discussion

Field observations and information obtained from the farmers revealed that there are local cultivars preferred by farmers in each village/district. In some cases, farmers gave different names for the same local cultivars. For example, the cultivar Kates in Ngawi and Magetan may be the same as cultivar Slonot in Mojokerto. Farmers generally preferred to grow the local varieties, for easy marketing. Local cultivars usually taste good and have good cooking quality. The physical appearance (skin and flesh colors, shape and size of tuber) is also used as criteria for consumer acceptance. However, the criteria may differ across locations. Oblong-shaped tubers with red skin and yellow flesh are preferred in Blitar, while in Magetan, they prefer sweetpotato tubers with white skin and white flesh.

Data also indicated that most of the farmers obtained their vine cuttings from plants of the previous crops. Sweetpotato is propagated only by vegetative means. According to farmers, they prefer to use apical cuttings of young vines, but they often used older parts of the vines when young vines were limited. According to Jana (1982), apical cuttings taken from mature plants are preferred by farmers in Kenya and Tanzania. When planting materials are in short supply, the middle or even the basal part of vine may be used.

Only few farmers used vine cuttings obtained from the sweetpotato nursery, originating from selected roots. This may lead to degeneration. De Silva and Premathilake (1996) and Premathilake and de Silva (1996) reported the advantage of using vine cuttings obtained directly from root sprouts over the use of recurrent vine cuttings, although the effect also depended on the varieties.

According to Clark and Moyer (1988), the decline in productivity resulting from the repeated use of vines for sweetpotato planting possibly causes mutation, admixtures, and accumulation of pests and diseases. Alcazar et al. (1997) reported that infested planting materials contributed greatly to the increase in weevil population since 95 percent of sweetpotato weevil eggs are laid in the first 35 cm of the stem. The use of tip cuttings for planting is recommended as this is relatively free of weevil eggs. Weevils prefer the stems for laying their eggs on.

All the farmers interviewed did not recognize viral diseases, although plants with symptoms of viral infection were often observed in the field. Clark and Moyer (1988) reported that viral diseases are probably the most poorly understood diseases of sweetpotato. According to Lenne (1991), at least 16 apparently different viruses have been reported to infect sweetpotato worldwide. In Indonesia, survey and NCM-ELISA test of leaf samples taken from sweetpotato production centers in Central Java and East Java revealed the presence of seven viral pathogens, i.e. sweetpotato feathery mottle virus (SPFMV), sweetpotato mild mottle virus (SPMMV), sweetpotato latent virus (SPLV), sweetpotato chlorotic fleck virus (SPCFV), sweetpotato chlorotic stunt virus (SPCSV), virus C-6, and C-8. Among these, SPFMV is the most dominant virus (Machmud et al, 1997; Machmud and Rusmadi, 1999). Since viruses systemically infect and are distributed in all plant parts, they can be easily transmitted through vegetative propagation. A microshoot tip tissue culture can eliminate the presence of viruses in the plants derived from tissue culture.

Data on seed (vine cuttings) movement indicated that some farmers obtained planting materials from their own crops maintained in small plots near houses. Some farmers obtained materials from the previous crops of neighbors (same village) or from other villages in the

subdistrict. Longer movements of the vine cuttings were recorded from farmers in Pacet, Mojokerto that used planting materials from Malang. On other hand, some farmers in Tumpang, Malang also obtained their vine cuttings from Pacet, Mojokerto. Since there are no precautions and treatments for vine cuttings such as insecticide (for weevil) and fungicide (especially for scab disease), pests and diseases can be transported by the vine cuttings when these are moved from one location to another.

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Table 1. Districts, subdistricts/villages for survey on sweetpotato seed flow in East Java province, November 2001 -February 2002

District	Sub-district	Village
Malang	Pakis	Sumber kradenan
		Sumberpasir
		Jambonpakis
	Tumpang	Tumpang
		Wringinsongo
		Jero
	Jabung	Kenongo
Blitar	Srengat	Wonorejo
		Karanggayam
		Togogan
	Kanigoro	Manding
	Talun	Kaweron
		Jeblok
		Kendalrejo
Mojokerto	Pacet	Pacet
		Pandanarum
		Warugunung
		Petak
Magetan	Panekan	Turi
		Sidowayah
		Banjarrejo
		Mulangsari
Ngawi	Kendal	Kendal
		Sidoprejo
Banyuwangi	Srono	Sukomaju
		Sukonatar
		Wonosobo
		Bogorejo
	Kalibaru	Kalibaru wetan
		Kajanharjo
		Kebunrejo
Bangkalan	Burneh	Burneh
		Sobeh
Sampang	Rogatal	Gunungrancah
		Pandiyangan
		Jelgung
		Tragih
		Torjun
		Sawah tengah
	Tambelangan	Tambelangan
		Karanganyar
	Kedungdung	Gunungeleh
		Pasarenan
		Betapora Barat
Sumenep	Lenteng	Lak laok daya
		Lenteng Timur
		Jambu

Appendix 1. GPS coordinates of locations for survey on sweetpotato seed flow in East Java

No. District	Subdistrict	Village	GPS		Trip/Alt
1. Malang	Jabung	Kenongo	S 07 59 023	E 112 45 665	129/621
	Pakis	Sumber Kradenan	S 07 58 478	E 112 42 314	126/621
	Pakis	Sumber Kradenan	S 07 58 474	E 112 39 317	123/621
	Pakis	Sumber Kradenan	S 07 58 418	E 112 42 658	123/621
	Pakis	Sumber Kradenan	S 07 57 542	E 112 42 802	123/621
	Pakis	Sumber Kradenan	S 07 57 543	E 112 44 769	123/621
	Pakis	Sumber Pasir	S 07 58 542	E 112 42 801	123/621
	Pakis	Sumber Pasir	S 07 58 475	E 112 44 470	123/621
	Pakis	Sumber Pasir	S 07 59 492	E 112 39 319	123/621
	Pakis	Pakis	S 07 53 418	E 112 43 437	123/621
	Pakis	Jambon	S 07 58 397	E 112 43 646	123/621
	Tumpang	Wringin Songo	S 07 59 910	E 112 45 259	123/615
	Tumpang	Jeru	S 07 59 414	E 112 45 542	123/615
2. Blitar	Srengat	Karanggayam	S 08 03 559	E 112 03 207	123/615
	Srengat	Karanggayan	S 08 03 560	E 112 03 207	123/616
	Srengat	Karanggayam	S 08 03 559	E 112 03 210	123/616
	Srengat	Karanggayam	S 08 03 559	E 112 03 209	123/616
	Srengat	Dermojayan	S 08 09 559	E 112 03 207	123/616
	Srengat	Dermojayan	S 08 09 568	E 112 03 204	123/616
	Srengat	Dermojayan	S 08 04 955	E 112 02 192	123/616
	Srengat	Srengat	S 08 04 955	E 112 05 213	123/616
	Srengat	Srengat	S 08 04 896	E 112 03 204	123/616
	Srengat	Srengat	S 08 04 869	E 112 03 204	123/616
	Srengat	Togogan	S 08 04 869	E 112 03 204	123/616
	Srengat	Togogan	S 08 04 874	E 112 03 254	123/616
	Srengat	Togogan	S 08 04 873	E 112 03 255	123/622
	Srengat	Togogan	S 08 03 559	E 112 03 207	123/614
	Talun	Kendalrejo	S 08 07 491	E 112 16 930	123/238
	Talun	Kendalrejo	S 08 07 652	E 112 15 251	123/235
	Talun	Jeblok	S 08 07 659	E 112 14 247	123/238
	Talun	Jeblok	S 08 07 659	E 112 15 253	123/237
	Talun	Jeblok	S 08 05 560	E 112 15 252	123/235
	Talun	Kaweron	S 08 05 560	E 112 16 254	127/267
	Talun	Duren	S 08 05 560	E 112 15 254	127/267
	Garum	Gangsri	S 08 05 257	E 112 13 533	133/258
	Garum	Tingal	S 08 05 259	E 112 13 533	133/258
	Garum	Tingal	S 08 05 257	E 112 03 533	132/258
	Garum	Tingal	S 08 05 257	E 112 13 533	133/258
	Kanigoro	Manding Bangle	S 08 06 257	E 112 03 533	133/256
3. Mojokerto	Pacet	Pandan Arum	S 07 30 108 /	E 112 31 965	213/321
	Pacet	Pandan Arum	S 07 30 113 /	E 112 31 957	213/321
	Pacet	Pandan Arum	S 07 36 106 /	E 112 31 954	213/321
	Pacet	Pandan Arum	S 07 36 098 /	E 112 31 953	213/321
	Pacet	Pandan Arum	S 07 30 097 /	E 112 31 965	213/321
	Pacet	Waru gunung	S 07 37 458 /	E 112 32 001	216/321
	Pacet	Waru gunung	S 07 37 458 /	E 112 32 001	219/329
	Pacet	Waru gunung	S 07 37 458 /	E 112 32 001	219/312
	Pacet	Waru gunung	S 07 35 457 /	E 112 32 042	213/325
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	Panekan	Panekan	S 07 38 092	E 111 19 429	279/553
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	Panekan	Panekan	S 07 38 086	E 111 19 439	292/542
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	Kali Baru	Kajan harjo	S 08.03.418	E 112.37.532	437
	Kali Baru	Kajan harjo	S 08.03.418	E 112.37.521	432
	Kali Baru	Kajan harjo	S 08.03.418	E 112.37.532	429
	Kali Baru	Kajan harjo	S 08.03.418	E 112.37.524	432
	Kali Baru	K.Baruwetan	S 08.03.418	E 112.37.525	428
	Kali Baru	K.Baruwetan	S 08.03.418	E 112.37.521	439
	Kali Baru	K.Baruwetan	S 08.03.418	E 112.37.521	439
	Kali Baru	K.Baruwetan	S 08.03.418	E 112.37.522	426
	Kali Baru	K.Baruwetan	S 08.03.418	E 112.37.522	426
	Kali Baru	K.Baruwetan	S 08.03.418	E 112.37.524	429
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