



Figure 59. Progress of sawah platform improvement between 2010 (left) and 2016 (right) which appeared in Google image near Site 8 in Suru area of of the Rima River floodplain shown in Figure 50. The area is about 10 ha. The scale marker is 100 m. In 2009, 90 % land have no sawah system and 10% rudimentary sawah system. In 2016, 100% land is covered with sawah system (mean sawah plot size is 100m²).

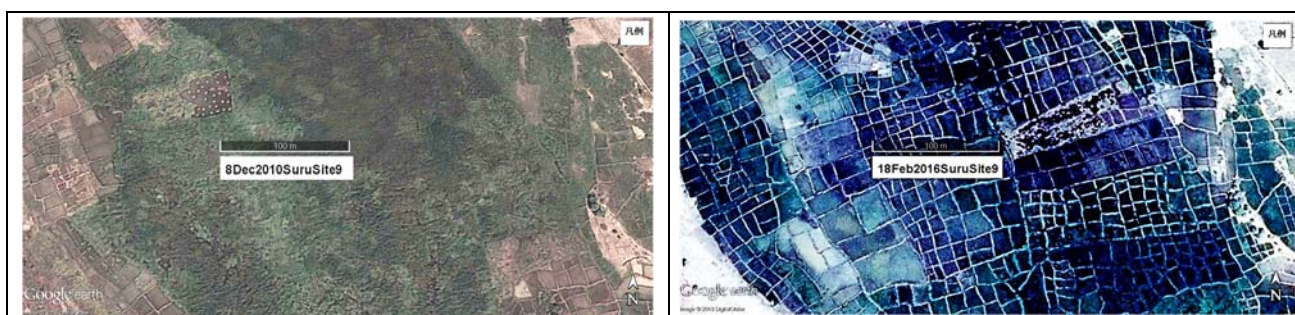


Figure 60. Progress of sawah platform improvement between 2010 (left) and 2016 (right) which appeared in Google image near Site 9 in Suru area of of the Rima River floodplain shown in Figure 50. The area is about 10 ha. The scale marker is 100 m. In 2009, 90 % land have no sawah system and 10% rudimentary sawah system. In 2016, 90% land is covered with sawah system (mean sawah plot size is 250m²).



Figure 61. Progress of sawah platform improvement between 2010 (left) and 2016 (right) which appeared in Google image near Site 10 in Suru area of of the Rima River floodplain shown in Figure 50. The area is about 10 ha. The scale marker is 100 m. In 2009, 90 % land have no sawah system and 10% rudimentary sawah system. In 2016, 90% land is covered with sawah system (mean sawah plot size is 180m²).

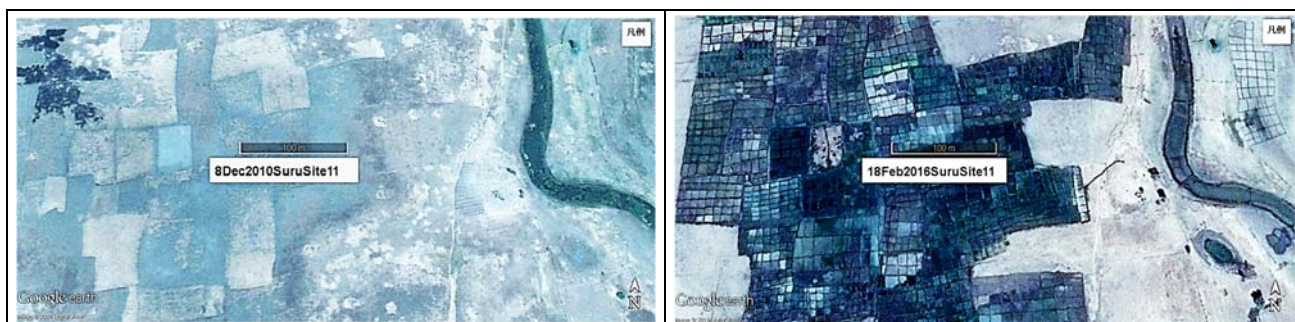


Figure 62. Progress of sawah platform improvement between 2010 (left) and 2016 (right) which appeared in Google image near Site 11. As shown in Figure 50, this site is located on the west bank opposite the Sangelu which is the eastern bank of the Rima River floodplain. The area is about 10 ha. The scale marker is 100 m. In 2009, 100 % land have no sawah system. In 2016, 60% land is covered with sawah system (mean sawah plot size is 80m²).



Figure 63. Progress of sawah platform improvement between 2010 (left) and 2016 (right) which appeared in Google image near Site 12 in Suru area of the Rima River floodplain shown in Figure 50. The area is about 10 ha. The scale marker is 100 m. In 2009, 95 % land have no sawah system and 5% rudimentary sawah system. In 2016, 80% land is covered with sawah system (mean sawah plot size is 150m²).

7-2. The Rima River flood plain from the downstream of Suru to the confluence of the Niger River: 20,000 ha

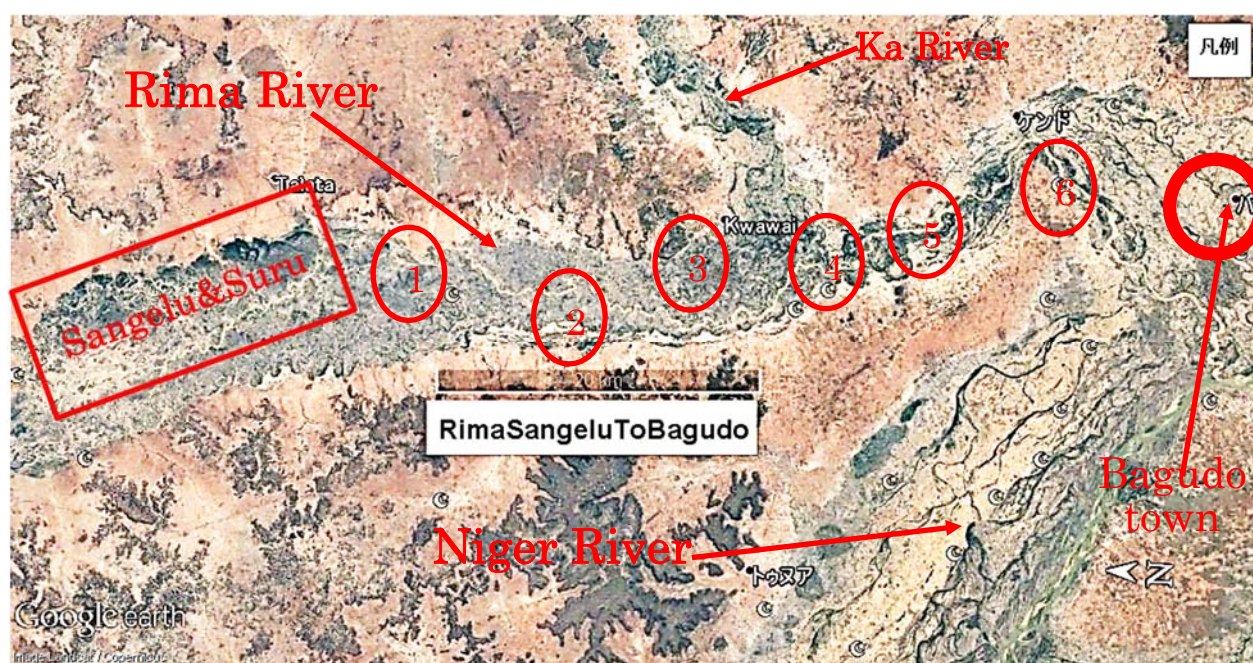


Figure 64. Rima river floodplain from Sangelu and Suru to the Bagudo junction of the Niger River. The scale marker length in the figure is 20 km. The area of the Rima River flood plain in this picture is about 35,000 ha excluding the vicinity of Sangelu and Suru area which are enclosed by a square. The area of 35,000ha is also excluding the area of the flood plains of both Ka river and the Niger river. The following Figure 65-70 shows progress of sawah system platform development and improvement between 2010/2011/2012 and 2016.

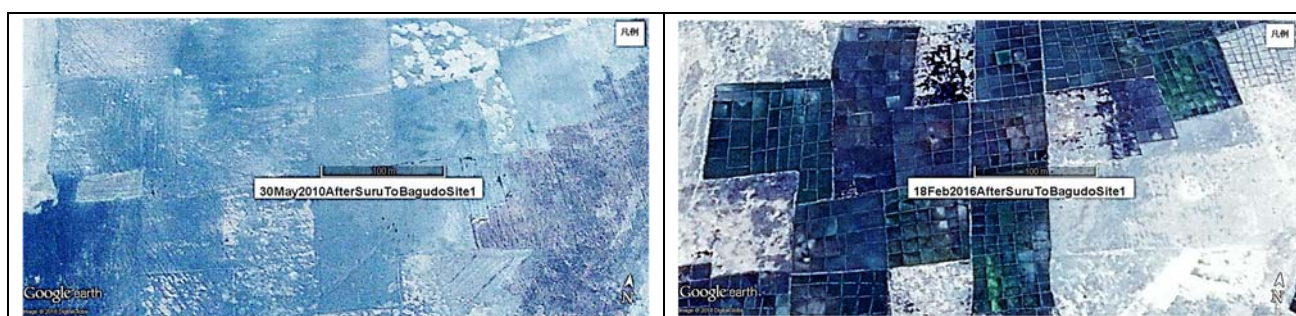


Figure 65. Progress of sawah platform improvement between 2010 (left) and 2016 (right) which appeared in Google image near Site 1, which is just south of Suru town, downstream of the Rima River floodplain shown in Figure 64. The total area shown is about 10 ha. The length of the scale marker is 100 m. In 2010, 100% flood plain has no sawah

system. In 2016, 60% land is covered with sawah system (mean sawah plot size is 150m^2)



Figure 66. Progress of sawah platform improvement between 2012 (left) and 2016 (right) which appeared in Google image near Site 2 of the Rima River floodplain shown in Figure 64. The total area shown is about 10 ha. The length of the scale marker is 100 m. In 2012, 90% flood plain has no sawah system and 10% rudimentary sawah system. In 2016, 50% land is covered with sawah system (mean sawah plot size is 150m^2). Ridge rice cultivation and micro rudimentary sawah can be seen at the red circle are. Remaining is non sawah.

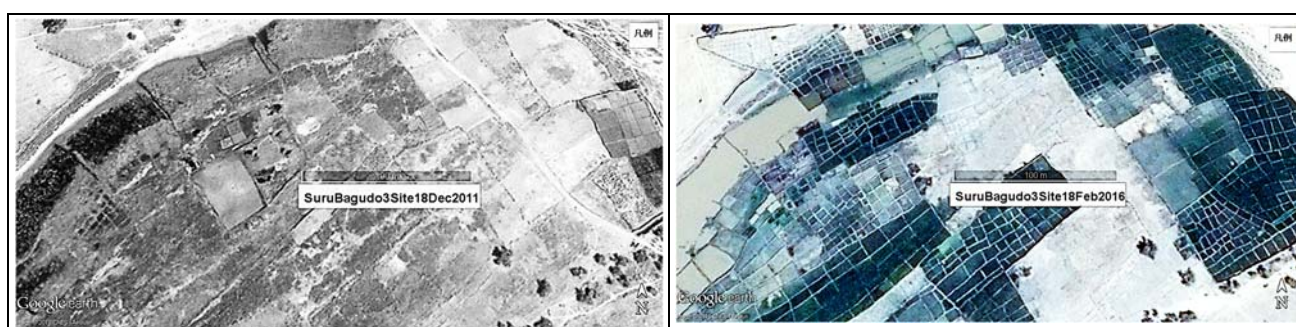


Figure 67. Progress of sawah platform improvement between 2011 (left) and 2016 (right) which appeared in Google image near Site 3 of the Rima River floodplain shown in Figure 64. The total area shown is about 10 ha. The length of the scale marker is 100 m. In 2011, 100% flood plain has no sawah system. In 2016, 70% land is covered with sawah system (mean sawah plot size is 70m^2).



Figure 68. Progress of sawah platform improvement between 2011 (left) and 2016 (right) which appeared in Google image near Site 4 of the Rima River floodplain shown in Figure 64. The total area shown is about 10 ha. The length of the scale marker is 100 m. In 2011, 100% flood plain has no sawah system. In 2016, 30% land is covered with sawah system (mean sawah plot size is 80m^2).

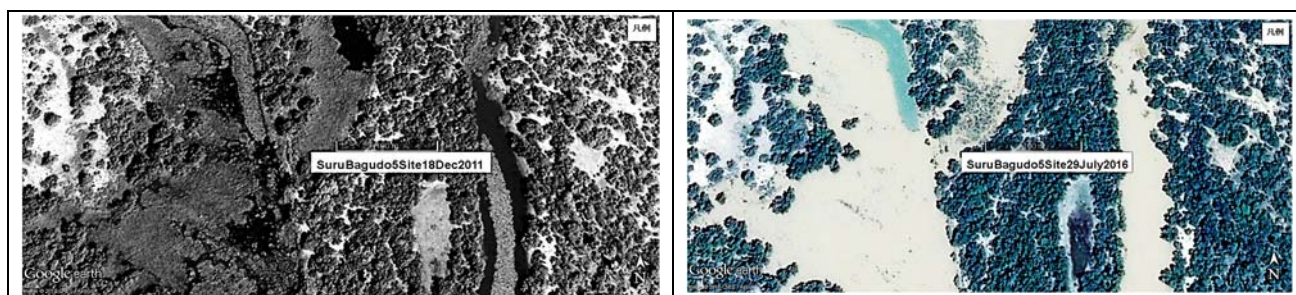


Figure 69. Progress of sawah platform improvement between 2011 (left) and 2016 (right) which appeared in Google image near Site 5 of the Rima River floodplain shown in Figure 64. The total area shown is about 10 ha. The length of the scale marker is 100 m. Both in 2011 and 2016, 100% flood plain has no sawah system. This is the plateaus

covered with forest left in the floodplain. Thus the site is inappropriate for wetland rice cultivation.



Figure 70. Progress of sawah platform improvement between 2012 (left) and 2014 (right) which appeared in Google image near Site 6 of the Rima River floodplain shown in Figure 64. The total area shown is about 10 ha. The length of the scale marker is 100 m. In 2012, 20% flood plain has covered with micro rudimentary sawah system (mean sawah plot size is 30m^2). In 2016, 40% land is covered with sawah system (sawah plot size range is $20\text{-}70\text{m}^2$).

7-3. The Ka River flood plains within the Kebbi state: 10,000 ha

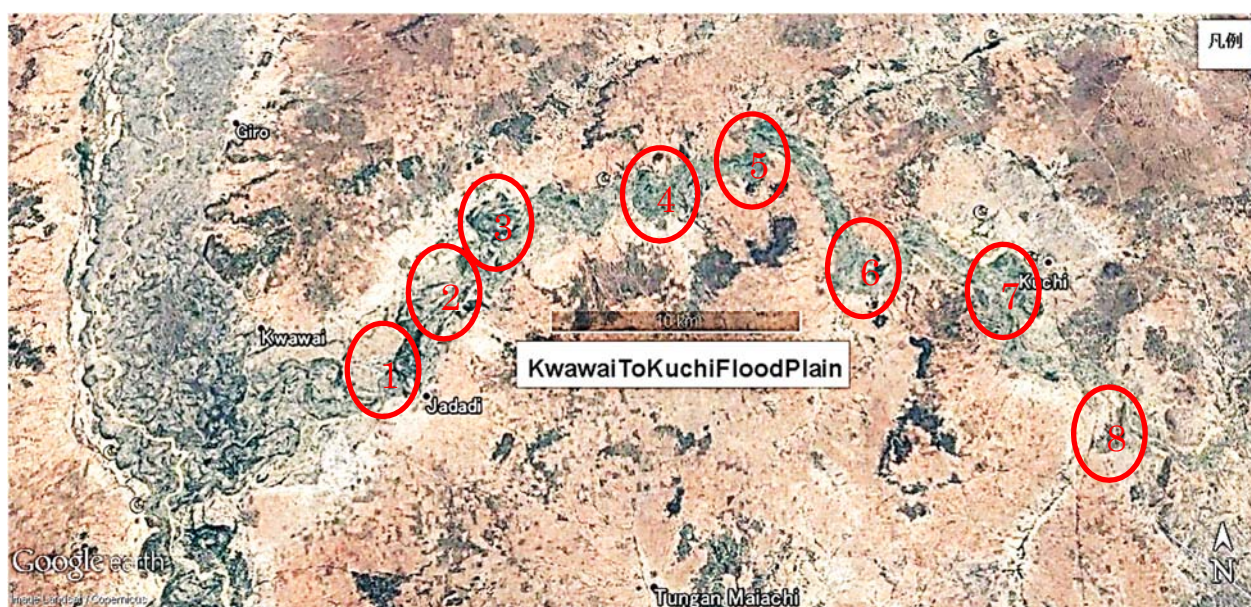


Figure 71. Eight sites ①—⑧ examined the progress of the sawah system platform during 2011/2012 and 2016 on the Ka river flood plains within the Kebbi state from the Rima River junction near Kwawai town to Kuchi town near the border of the Zamfara state. The scale marker length in the figure is 10 km. The area of the Ka River floodplain in this picture is 10,000 ha. The progress is shown in Figure 72-79 below.

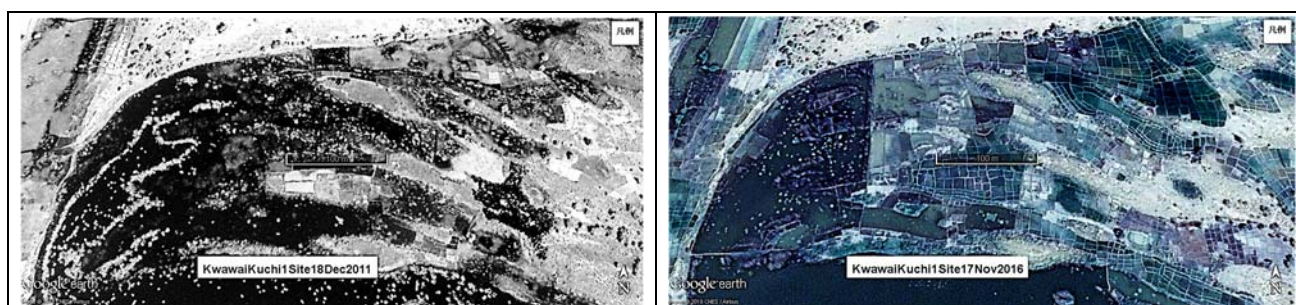


Figure 72. Progress of sawah platform improvement between 2011 (left) and 2016 (right) which appeared in Google image near Site 1 of the Ka River floodplain shown in Figure 71. The total area shown is about 10 ha. The length of the scale marker is 100 m. In 2011, 100% flood plain has no sawah system. In 2016, 40% land is covered with sawah system (mean sawah plot size is 80m^2).

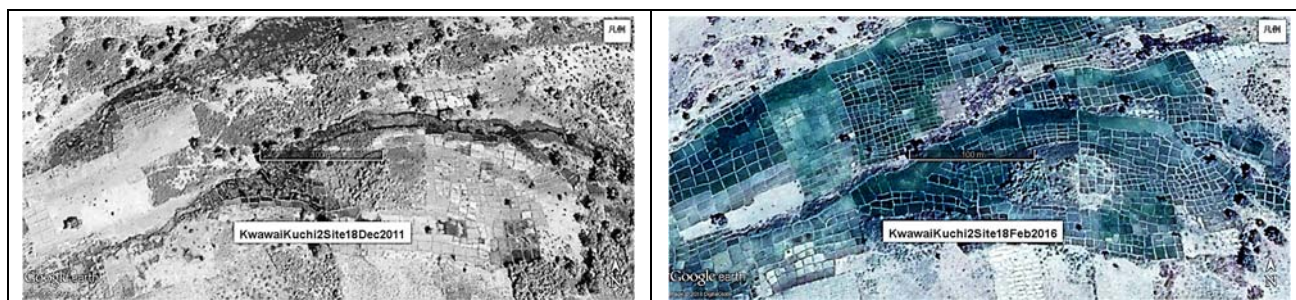


Figure 73. Progress of sawah platform improvement between 2011 (left) and 2016 (right) which appeared in Google image near Site 2 of the Ka River floodplain shown in Figure 71. The total area shown is about 10 ha. The length of the scale marker is 100 m. In 2011, 90% flood plain has no sawah system and 10% rudimentary sawah system. In 2016, 60% land is covered with sawah system (mean sawah plot size is 70m^2).



Figure 74. Progress of sawah platform improvement between 2011 (left) and 2016 (right) which appeared in Google image near Site 3 of the Ka River floodplain shown in Figure 70. The total area shown is about 10 ha. The length of the scale marker is 100 m. In December 2011, sawah system development is proceeding in 10% area, the others are ridge rice cultivation and non-sawah, in 2016 although still rudimentary level, sawah system is expanding to 20-30 % area (mean plot size is 50m^2). Remaining 80-70 % is ridge rice cultivation.

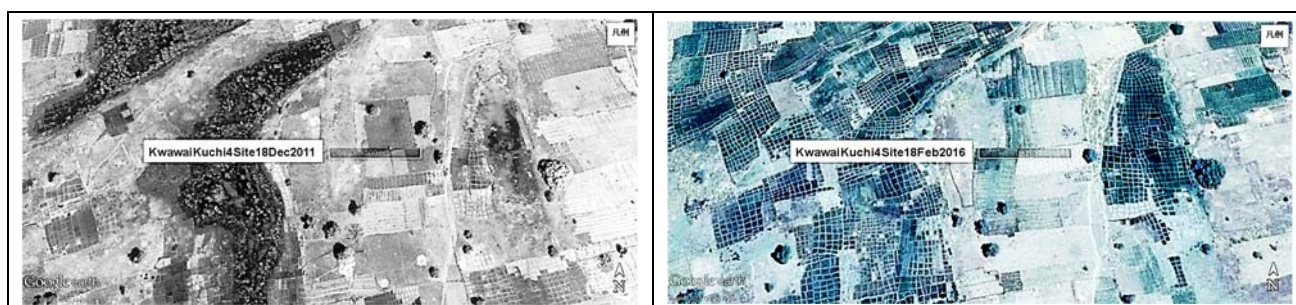


Figure 75. Progress of sawah platform improvement between 2011 (left) and 2016 (right) which appeared in Google image near Site 4 of the Ka River floodplain shown in Figure 70. The total area shown is about 10 ha. The length of the scale marker is 100 m. In December 2011, sawah system development is proceeding in 10% area, the others are ridge rice cultivation and non-sawah, in 2016 although still rudimentary level, sawah system is expanding to 60 % area (mean plot size is 50m^2). Remaining 40 % is ridge rice and non sawah rice cultivation.



Figure 76. Progress of sawah platform improvement between 2012 (left) and 2016 (right) which appeared in Google image near Site 5 of the Ka River floodplain shown in Figure 70. The total area shown is about 10 ha. The length of the scale marker is 100 m. In January 2012, sawah system development is proceeding in 10% area, the others are ridge rice cultivation and non-sawah, in 2016 although still rudimentary level, sawah system is expanding to 30 % area (mean plot size is 30m^2). Remaining 70 % is ridge rice and non sawah rice cultivation.

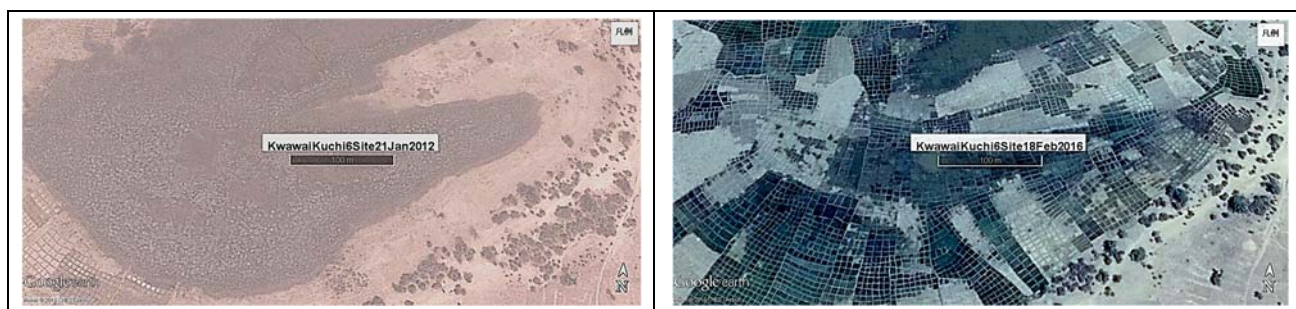


Figure 77. Progress of sawah platform improvement between 2012 (left) and 2016 (right) which appeared in Google image near Site 6 of the Ka River floodplain shown in Figure 70. The total area shown is about 10 ha. The length of the scale marker is 100 m. In January 2012, sawah system development is proceeding in 5% area, the others is non-sawah, in 2016 although still rudimentary level, sawah system is expanding to 70 % area (mean plot size is 50m²).



Figure 78. Progress of sawah platform improvement between 2012 (left) and 2016 (right) which appeared in Google earth image near Site 7 of the Ka River floodplain shown in Figure 70. The total area shown is about 10 ha. The length of the scale marker is 100 m. In January 2012, sawah system development is proceeding in 5% area, the others is non-sawah, in 2016, sawah system is expanding to 70 % area (mean plot size is 80m²).



Figure 79. Progress of sawah platform improvement between 2012 (left) and 2016 (right) which appeared in Google earth image near Site 8 of the Ka River floodplain in Figure 70. The total area shown is about 10 ha. Length of the scale marker is 100 m. In January 2012, 100% area are non-sawah and ridge rice cultivation. In 2016, although still rudimentary, sawah system is expanding to 40 % area (mean plot size is 40m²). Remaining is ridge rice cultivation.

8. The Niger River flood plain from Benin border to Bagudo junction of the Rima river: 150,000 ha



Figure 80. Ten sites of (A)-(B) and ①-⑧ examined the progress of the sawah system platform during 2007/2010 and 2012/2016/2017 on the Niger river flood plains within the Kebbi state from the Niger/Benin border to Bagudo (BGD) area. The scale marker length in the figure is 30 km. The area of the flood plains shown in this picture is about 150,000 ha. The following Figure 81-90 show the progress of sawah system development. The BGD area was described in Fig. 39-48 of Sawah Technology (5) Kebbi Rice Revolution, Nigeria.

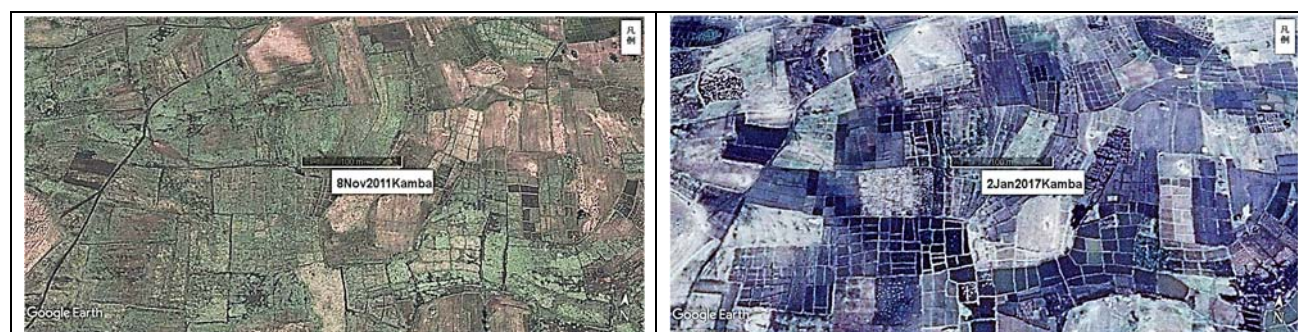


Figure 81. Progress of sawah platform improvement between 2012 (left) and 2016 (right) which appeared in Google earth image near Site A of Kamba town area in Figure 80. The site is a part of Niger river flood plain, just close to the border of Niger. The total area shown is about 10 ha. Length of the scale marker is 100 m. In 2011, 10% area is rudimentary sawah and remaining is non-sawah rice cultivation. In 2017, sawah system is expanding to 80 % area (mean sawah plot size is 170m²).

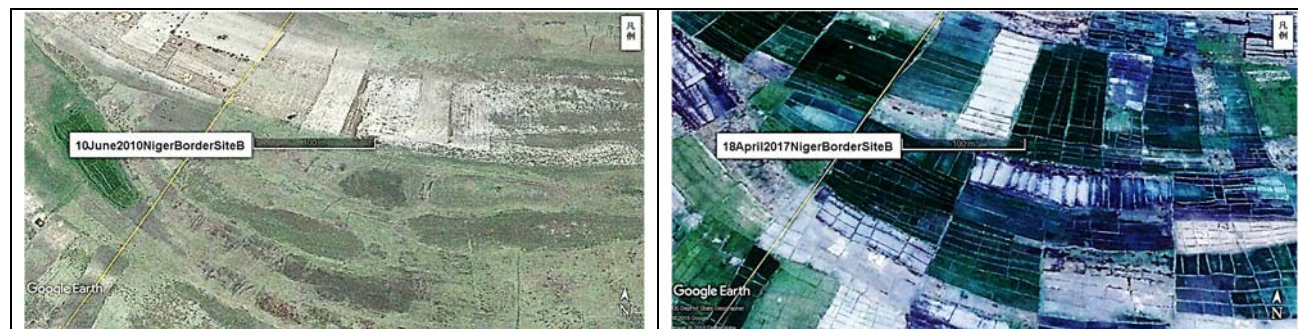


Figure 82. Progress of sawah platform improvement between 2010 (left) and 2017 (right) which appeared in Google

earth image near Site B in Figure 80. The site is a part of Niger river flood plain, just close to the border of Niger and Benin. The total area shown is about 10 ha. Length of the scale marker is 100 m. In 2010, almost 100% area is non-sawah rice cultivation. In 2017, sawah system is expanding to 90 % area (mean sawah plot size is 150m²).



Figure 83. Progress of sawah platform improvement between 2010 (left) and 2017 (right) which appeared in Google earth image near Site 1 in Figure 80. The site is a part of Niger river flood plain, just close to Tugun Rogo town. The total area shown is about 10 ha. Length of the scale marker is 100 m. In 2010, 10% area is being on development of sawah system. In 2017, although still rudimentary, sawah system is expanding to 80 % area (mean sawah plot size is 50m²).



Figure 84. Progress of sawah platform improvement between 2010 (left) and 2017 (right) which appeared in Google earth image near Site 2 in Figure 80. The site is a part of Niger river flood plain. The total area shown is about 10 ha. Length of the scale marker is 100 m. In 2010, 10% area near the village (red circle) is being on development of sawah system. In 2017, although still rudimentary, sawah system is expanding to 60 % area (mean sawah plot size is 70m²).



Figure 85. Progress of sawah platform improvement between 2010 (left) and 2017 (right) which appeared in Google earth image near Site 3 in Figure 80. The site is near Tugun Rafi town, which is a part of Niger river flood plain. Total area shown is about 10 ha. Scale marker length is 100 m. In 2010, 100% area has no sawah system. In 2017, sawah system is expanding to 60 % area (Red circled sawah system is the best, which mean sawah plot size is 130m²).



Figure 86. Progress of sawah platform improvement between 2010 (left) and 2017 (right) which appeared in Google earth image near Site 4 in Figure 80. The site is a part of Niger river flood plain. Total area shown is about 10 ha. Scale marker length is 100 m. In 2010, 100% area has no sawah system. In 2017, sawah system is expanding to 50 % area

(mean sawah plot size is 100m²).



Figure 87. Progress of sawah platform improvement between 2010 (left) and 2016 (right) which appeared in Google earth image near Site 5 in Figure 80. The site is a part of Niger rive flood plain. Total area shown is about 10 ha. Scale marker length is 100 m. In 2010, 100% area has no sawah system. In 2016, although still rudimentary, sawah system is expanding to 50 % area (mean sawah plot size is 40m²).

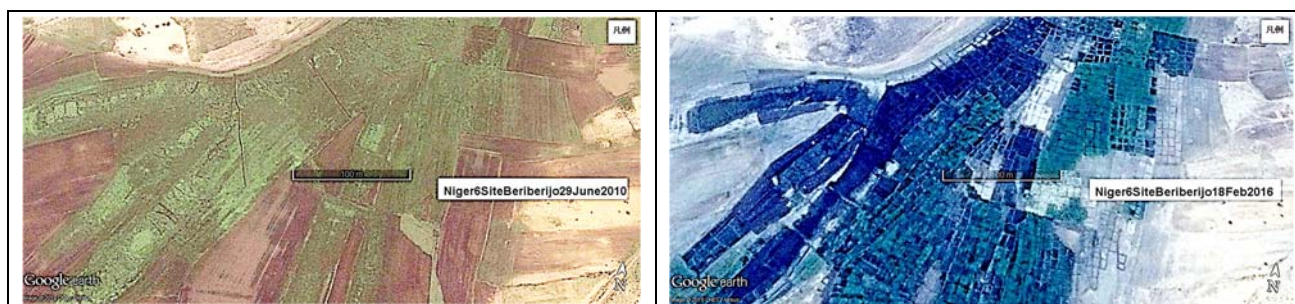


Figure 88. Progress of sawah platform improvement between 2010 (left) and 2016 (right) which appeared in Google earth image near Site 6 in Figure 80. The site is a part of Niger rive flood plain. Total area shown is about 10 ha. Scale marker length is 100 m. In 2010, 100% area has no sawah system. In 2016, sawah system is expanding to 50 % area (mean sawah plot size is 70m²).

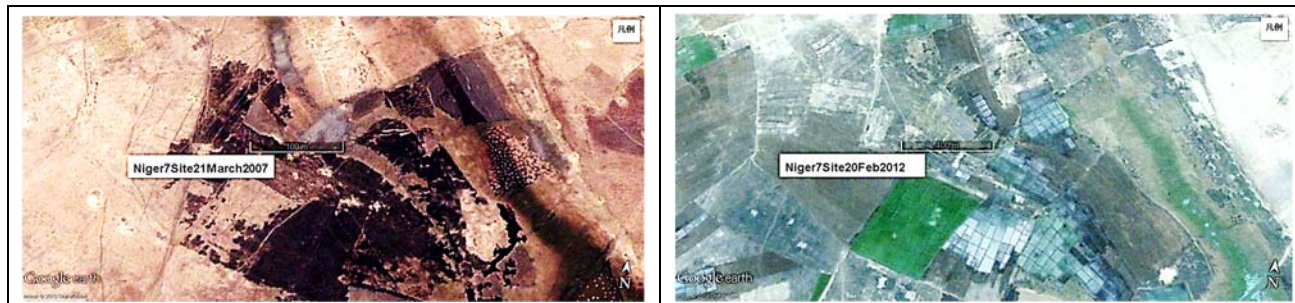


Figure 89. Progress of sawah platform improvement between 2007 (left) and 2012 (right) which appeared in Google earth image near Site 7 in Figure 80. The site is a part of Niger rive flood plain. Total area shown is about 10 ha. Scale marker length is 100 m. In 2010, 100% area has no sawah system. In 2016, sawah system is covering 20 % area (mean sawah plot size is 140m²). Please note the most recent available Google image was 2012.

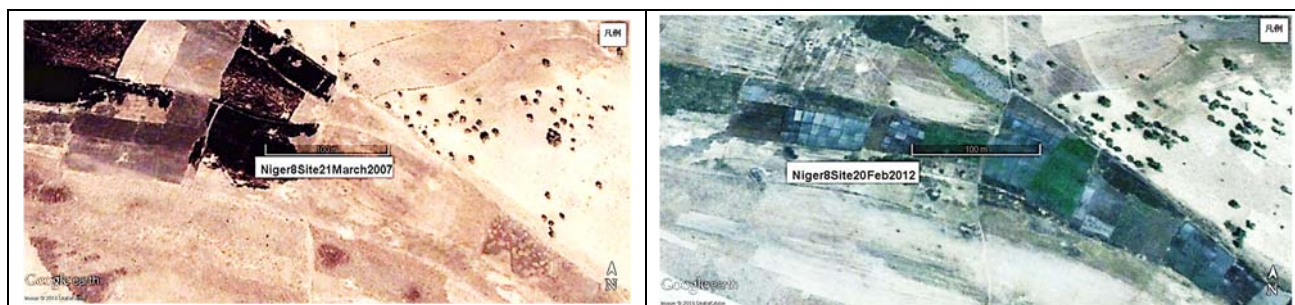


Figure 90. Progress of sawah platform improvement between 2007 (left) and 2012 (right) which appeared in Google earth image near Site 8 in Figure 80. The site is a part of Niger rive flood plain. Total area shown is about 10 ha. Scale marker length is 100 m. In 2010, 100% area has no sawah system. In 2016, sawah system is covering 20 % area (mean sawah plot size is 70m²). Please note the most recent available Google image was 2012.

9. The Niger River floodplain from the Bagudo junction to the lake Kainji dam: 60,000 ha

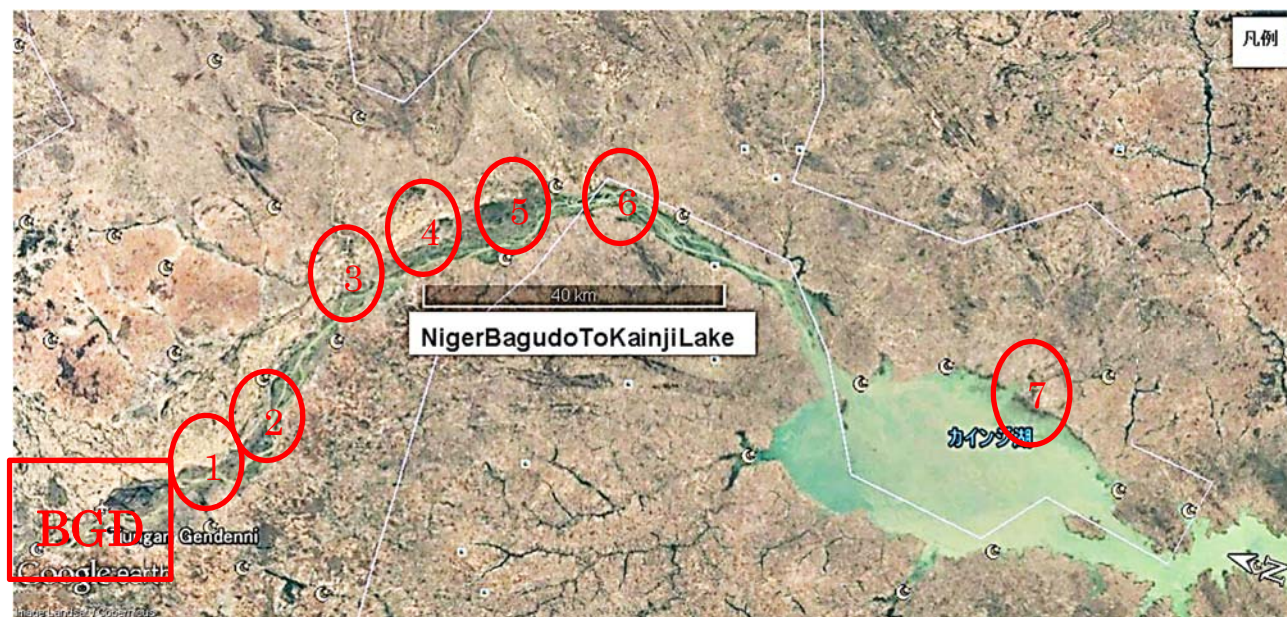


Figure 91. The Niger river flood plains from Bagudo (BGD) area to the Kainji dam lake. The scale marker length in the figure is 40 km. The area of the floodplain in this picture is about 60,000 ha. The following Figure 92-97 shows the progress of sawah system development and improvement by farmers' own efforts during 2011/2012/2013 and 2014/2016. The ⑥ site is Yelwa town. There are few suitable sites for sawah based rice cultivation in the downstream part of Yelwa. ⑦ is an incomplete government irrigated rice land.



Figure 92. Progress of sawah platform improvement between 2011 (left) and 2014 (right) which appeared in Google earth image near Site 1 in Figure 91. The site is a part of Niger river flood plain. Total area shown is about 10 ha. Scale marker length is 100 m. In 2011, 10% area has started sawah system development. In 2014, although still rudimentary, sawah system is expanding to almost 100 % area (mean sawah plot size is 50m²).

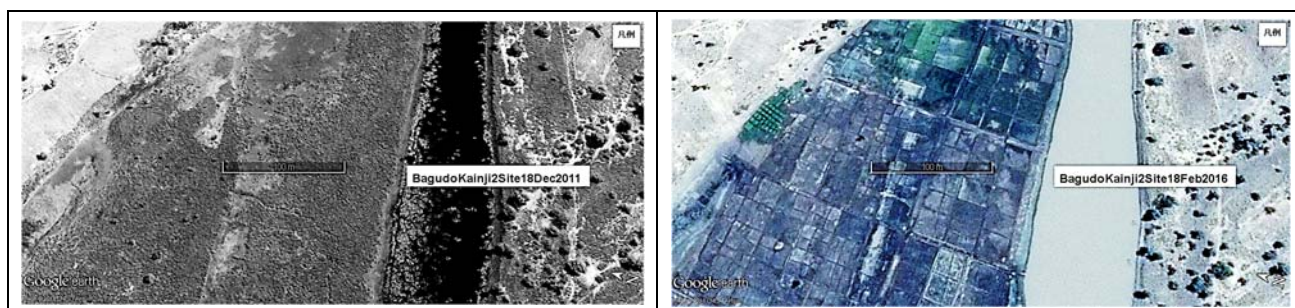


Figure 93. Progress of sawah platform improvement between 2011 (left) and 2016 (right) which appeared in Google earth image near Site 2 in Figure 91. The site is a part of Niger river flood plain. Total area shown is about 10 ha. Scale marker length is 100 m. In 2011, 100% area has no sawah system. In 2016, sawah system is expanding to 60 % area (mean sawah plot size is 180m²).

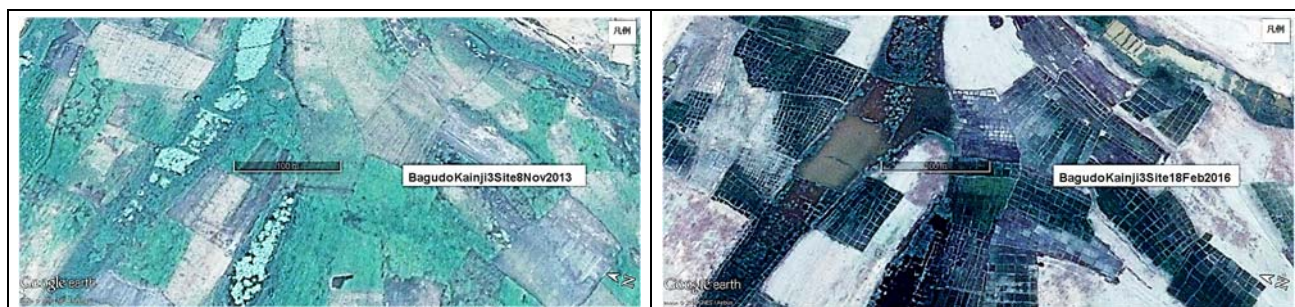


Figure 94. Progress of sawah platform improvement between 2013 (left) and 2016 (right) which appeared in Google earth image near Site 3 in Figure 91. The site is a part of Niger river flood plain. Total area shown is about 10 ha. Scale marker length is 100 m. In 2013, 10-20% area has started sawah system development. In 2016, sawah system reached to 70-80 % area (mean sawah plot size is 70m^2).

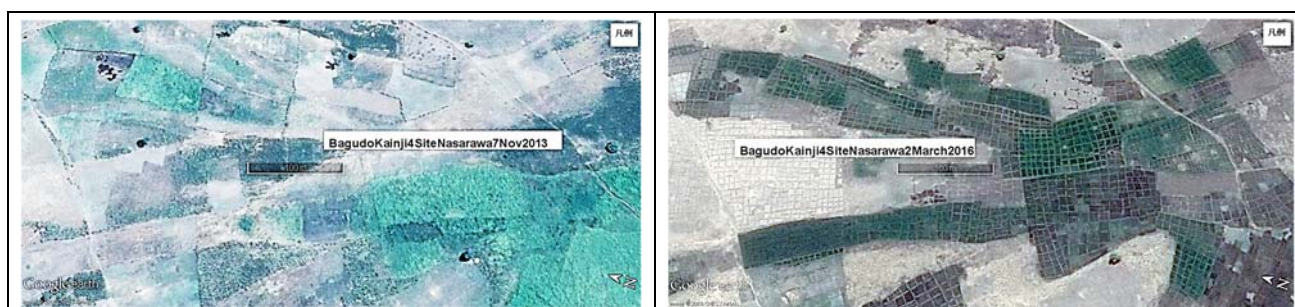


Figure 95. Progress of sawah platform improvement between 2013 (left) and 2016 (right) which appeared in Google earth image near Site 4 in Figure 91. The site is near to Nasarawa town and a part of Niger river flood plain. Total area shown is about 10 ha. Scale marker length is 100 m. In 2013, 100% area has no sawah system. In 2016, sawah system reached to 70-80 % area (mean sawah plot size is 100m^2).



Figure 96. Progress of sawah platform improvement between 2012 (left) and 2016 (right) which appeared in Google earth image near Site 5 in Figure 91. The site is near to Tungan Maaji town and a part of Niger river flood plain. Total area shown is about 10 ha. Scale marker length is 100 m. In 2012, 100% area has no sawah system. In 2016, sawah system reached to 80 % area (sawah plot size range is $20\text{-}100\text{m}^2$).



Figure 97. Google image in January 2011 near Yelwa. This picture shows the Site 6 of the Figure 91 near Yelwa town and the site is a part of Nigeri river flood plain. The time series of Google satellite pictures could not be obtained. The total area shown is about 10 ha. The length of the scale marker is 100 m. In 2011, 100 % agricultural land are ridge rice and others' cultivation.



Figure 98. Google earth image in 2002 near Site 7 on the left bank of Kainji Dam Lake shown in Figure 91. The total area shown is about 1400 ha. The length of the scale marker is 1 km. The time series of Google satellite pictures could not be obtained. This site was planned to operate irrigated rice production by pumping water of Kainji dam lake, but the situation as of 2018 is unknown. However, this type of government irrigation system in Kebbi state did not contribute much to rice development promotion in Kebbi state during 2010-2017, compared with sawah technmology, which is irrigated sawah system development and sawah based rice farming by farmers' self-help efforts. (African paddy farming method, Sawah Technology).

10. References

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