

Article

Excavation of irrigation canal changes the cropping pattern in 2013-14: Auria Union, Narail, Bangladesh

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Abstract: The principal crop during winter is Bororice and it occupies about 70% of crops. Being a country of 140 million inhabitants, agriculture is still the major water using sector in order to feed a growing population where at least 40 million people do not have a square meal. Recently, Bangladesh Water Development Board (BWDB) launched some projects to various water user groups for maintenance and expenditure recovery. Chenchuri Irrigation Sub Project is under South-West Area Integrated Water Resources Planning and Management Project (SWAIWRPMP). The project area covers the South Western Narail District along with Auria Union at Narail Sadar Upazila. Data were collected from 150 farmers of 6 villages in Auria Union. This research investigates the overall cropping pattern in Auria Union, Narail Sadar Upazila, before the construction of canal (during 1987-88), after the construction of canal (during 2009-10) and after re-excavation of canal (2012-13). The result showed that, before the construction of canal (during 1987-88) there were 5 types of cropping pattern and after the construction of canal (during 2009-10) there were 6 types of cropping pattern. But after re-excavation of canal (2012-13), 12 types of cropping pattern were recorded. Among them, the T. Aman and Boro were the most prominent cropping pattern. In Kharif 1, Kharif 2 and Rabi seasons, various types of crops were cultivated. Such as Aus, B. Aman, T. Aman, Boro, Jute, Sesame, Summer vegetables, Chilly, Garlic, Chickpea, Lentil, Mustard, Onion, Sugarcane, Turmeric, Wheat, Winter vegetables etc. The result revealed that, the re-excavation of canal have significantly positive impact on the Boro, Wheat, Turmeric, Chilly, Chick pea, Sugarcane, Lentil production. The Boro rice cultivation increased significantly day by day and it replaced other crops gradually. Because, farmers get irrigation water easily and cheaply from canal in Rabi season (16 October - 15 March). The present study showed that, the excavation of irrigation canal completely changes the cropping pattern at auriaunion in Narail, Bangladesh.

Keywords: canal; cropping pattern; irrigation; re-excavation; seasons

1. Introduction

Narail is a District in South-Western in Bangladesh. It is the part of Khulna Division. It has an area of 990.23 km², located to the South of Magura District, North of Khulna District, with the Faridpur District and Gopalganj District on the East and Jessore District to the West. Its average temperature ranges between 11.2 °C and 37.1 °C. The Madhumati, Nabaganga, Bhairab, Chitra and Kajla rivers pass away this District. There are many beels and baors most noted is Chachuribeel. Total land of Narail District is present 240,439 acre (973 km²) of which 176,504 acre (714 km²) is cultivable, 25,090 acre (102 km²) is fallow land, 10 acre is under

forest, 36,208 acre (147 km²) is under irrigated and 8,562 acre (35 km²) is under river (wikipedia, 2014). There are three Upazilas in this District e.g. Narail Sadar, Kalia and Lohagara Upazila but the District has four than as e.g. Narail, Kalia, Lohagara, Noragati. Administration of Narail District was established in 1984. It consists of two municipalities, 18 wards, 43 mahallas, 3 Upazilas, 4 police stations, 37 Union parishods, 445 mouzas and 649 villages. Municipalities are Narail Sadar and Kalia. Narail (Town) stands on the bank of the Chitra River. It consists of 9 wards and 24 mahallas. The area of the town is 28.89 sq km. The town has a population of 36785 of where 51.34% is male and 48.66% is female. Population density per sq km is 1273. Literacy rate among the town people is 51.7%. The town has one rest house and one dakbunglaow. Chenchuri Irrigation Sub Project is under South -West Area Integrated Water Resources Planning and Management Project (SWAIWRPMP). It is located in the South Western region of Bangladesh. The project area covers the South Western Narail Districts along with Auria Union at Narail Sadar Upazila. The Chenchuri Irrigation Sub Project is under implementation with financial assistance from International Development Association (IDA) (Credit No.1467 BD) and Government of Bangladesh (GoB) and expenditure of the project is 512.70 lac taka. The power and type of pump is respectively 21.20 cusec and axial flow which suction head 54, delivery head 35-0", suction and delivery radius 20", number of motor 02 and power of motor 140 horse power (per motor). Total area of the project is 543 hectare and net irrigable area is 442 hectare. The length of irrigable canal Kamlapur is 7.79 km (BWDB, 2012). It has covered 6 villages i.e. Kamlapur, Goshpur, Nakoshi, Khalishakhali, Taltola (Partial), Muldair (Partial) and 353 farmers are taking benefit from this project. The pump supplies water only in Robi season. The canal was constructed during 1989-90. Local people were participated to construct the canal. The canal was damaging and covering by silt day by day. As a result, water flowed slowly and water logging was created. For this reason BWDB decided to re-excavate the canal and canal was re-excavated in 2012 (BWDB,2012). The present study is to identify the suitable crops in Auria Union and the net productivity as well as to know the status of modern rice varieties in different patterns and seasons.

2. Materials and Methods

2.1. Study area

For this study, the South- -Western belt Narail Sadar Upazila of Narail District was selected (Figure 1). Among Narail Sadar Upazila, Auria Union has been selected. Primary data were collected through questionnaire survey. The survey was conducted among Kamlapur, Goshpur, Nakoshi, Khalishakhali, Taltola and Muldair villages of Auria Union at Narail Sadar Upazila. Selection criteria of the villages are based on getting water from Chenchuri Irrigation Sub-Project pump. Narail Upazila is located between 23⁰⁰2' and 23⁰¹7' North latitudes and between 89⁰²3' and 89⁰³7' East longitudes. The upazila is bounded on the North by Lohagara and Shalikhha Upazilas of Magura District, on the East by Lohagara Upazila, on the South by Kalkia and Abhaynagar Upazilas of Jessore District and on the West by Bagherpara and Jessore Sadar Upazila (LZR, 2012). Auria Union is comprised of a total area of 3244 ha, of which the net cultivable area is 2134 ha (66%). The number of farm family is about 3,282 where 20% are share croppers. The area under irrigation is about 50% of the cultivated land which indicates that the agricultural practices under irrigation are dominant in the area. Boro (HYV) is the main irrigated crop cultivated by using both surface and ground water. Area and yields of Boro (HYV) crop could be increased if more irrigation facilities and inputs like seeds, fertilizers and pesticides were timely (LZR, 2012).

2.2. Data collection

Secondary data were collected from the various sources. They are as follows-Bangladesh Water Development Board, Dept. of Agriculture, Narail Upazila, Internet/Journal and newspapers.

2.3. Data input and analysis

The survey have been edited and coded manually and processed by MS EXCEL. Qualitative data have been manually compiled according to diverse issues considering the research sites. For data processing and analyzing, MS EXCEL has been used for some descriptive statistics like: percentage, mean, standard deviation etc. All the collected data were analyzed using computer prominent program (MS WORD and MS EXCEL). Statistical methods such as frequency count, percentage, bar diagram, pie chart etc. were used for analysis. After collecting the secondary data, efforts made for interpretation and processing them. After data processing the data was sorted for analysis.

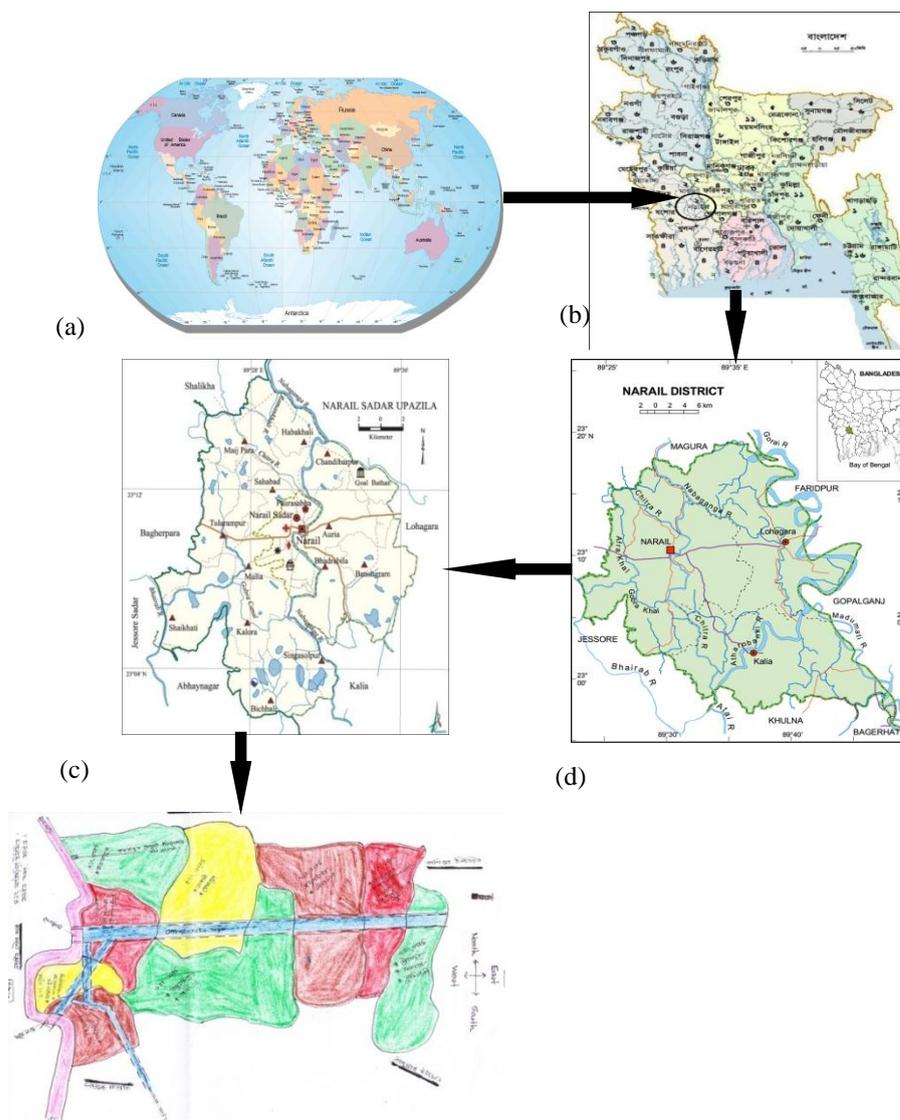


Figure 1.(a) Map of the World; (b) Map of Bangladesh; (c) Map of Narail District; (d) Map of Narail Sadar Upazila and(e) Map of Auria Union, Narail, Bangladesh.

3. Results and Discussion

3.1. Crop cultivation in Narail district

Table 1 has shown season wise crop cultivation in Narail District and crops were cultivated mainly in three seasons and these are Kharif 1 (16 March - 30 June), Kharif 2 (1 July - 15 October) and Rabi season (16 October - 15 March). In Kharif 1, various types of crops were cultivated. Such as Aus, B. Aman, Groundnut, Jute, Mung, Sesame and summer vegetables. Among these crops, Aus, B. Aman and Jute crops were cultivated mostly. But in Kharif 2, only T. Aman was cultivated. In Rabi season various types of crops were also cultivated. Such as Boro, Chilly, Coriander, Garlic, Chickpea, Lentil, Mustard, Onion, Pea, Potato, Gram, Sugarcane, Sweet guard, Turmeric, Wheat, winter vegetables and Ginger. Among these crops Boro, Lentil, Mustard, Sugarcane and Wheat were greatly cultivated. Season Wise Different Crop Cultivation in Narail District is shown in Table 1.

Table 1. Season wise different crop cultivation in Narail district.

Kharif 1 (16 March - 30 June)	Kharif 2 (1 July - 15 October)	Rabi (16 October - 15 March)
Aus	T. Aman	Boro (HYV + Hybrid)
B. Aman		Chilly
Groundnut		Coriander (Dhania)
Jute		Garlic
Mung		Chickpea (Khesari)
Sesame (Til)		Lentil
Summer vegetables		Mustard
		Onion
		Pea
		Potato
		Gram (Chola)
		Sugarcane
		Sweet guard
		Turmeric
		Wheat
		Winter vegetables
		Ginger

Source: Bangladesh Water Development Board, Narail, 2013; Personal Communication, NB: B. Aman = Broadcast Aman, T. Aman = Transplant Aman, HYV= High Yielding Varieties

3.2. Cropping pattern in Bangladesh, Narail Sadar Upazila and Auria Union

We found that the cropping pattern in the study area was diversified (Table 2). Among them, the T. Aman and Boro were the most prominent cropping pattern. The fallow lands were much more higher in Narail Sadar Upazila as compared to Bangladesh cropping pattern (Table 2). In Narail Sadar Upazila, the cropping patterns were Sugarcane – Papaya/Banana - Betel leaf, Fallow - B. Aman – Fallow, Boro – Fallow - Fallow, Rabi crop – Aus/Jute - Fallow, Boro – Fallow - T. Aman, Boro - B. Aman - Fallow, Rabi crop – Fallow - T. Aman, Fallow – Aus/Jute - T. Aman, Boro – Aus - Fallow, Boro – Aus/Jute - T. Aman, Vegetables – Jute – Vegetables and Rabi crop – Vegetables - Vegetables. However, the T. Aman and Boro were the most prominent cropping pattern in Auria Union. We found that the cropping pattern in Auria Union (study area) was bit different as compare to Narail Sadar Upazila as well as Bangladesh (Table 2). In Auria Union, the cropping patterns were Boro – Jute - T. Aman, Oil seed/Pulse - B. Aman - Fallow, Vegetables - Fallow - T. Aman, Wheat - Jute - T. Aman, Wheat – Sesame - T. Aman before construction (1987-88) of canal. In Auria Union, the cropping patterns were Boro (HYV) - Fallow - T. Aman/B. Aman, RC - T. Aus - Fallow, Wheat/Species/Pulse/Oilseed - Jute, T. Aman, Sugarcane/Betel leaf/Turmeric – Fallow - Fallow, Boro (HYV) – Fallow - Fallow, Vegetables – Fallow - Fallow after construction (2009-10) of canal. It has been found that after construction (2009-10) of canals, cropping patterns of Auria Union has been changed remarkably as compared to before construction (1987-88). Interestingly, more fallows were found after construction (2009-10) in Kharif 1 (16 March - 30 June of the year). This is because; in Kharif 1 (dry season), the irrigation water is not available and the farmers need to spend huge money for irrigation purposes. As a result farmers did not cultivate crops greatly in Kharif 1. On the contrary, farmers get irrigation water easily and cheaply from canal in Rabi season (16 October - 15 March). In Kharif 2 (1 July - 15 October) farmers get water from rainfall and cultivate the crops naturally. At present (2012-13), the cultivators are becoming inclined to cultivate Boro and T. Aman mostly and in the other times the fallows were found more. In the context of present construction (2012-13), cultivators intrinsically are cultivating Boro – Fallow - T. Aman, Boro – Jute - T. Aman, Boro - B. Aman - Fallow, Boro – Jute - Fallow, Boro – Fallow - Fallow, Oil seed/Pulse, Fallow - T. Aman, Oil seed/Pulse – Jute - T. Aman, Oilseed/Pulse – Jute - Fallow, Wheat – Jute - T. Aman, Fallow - B. Aman - Fallow, Oilseed/Pulse - B. Aman - Fallow, Pulse – Fallow – Fallow (Table 2).

Table 2. Cropping pattern in all over Bangladesh and Narail Sadar Upazila, before the construction of canal (during (1987-88), after the construction of canal (during 2009-10) and at present (2013-14) in Auria Union, Narail, Bangladesh.

*Bangladesh	*Narail Sadar Upazila	Auria Union		
		*Before construction (1987-88)	*After construction (2009-10)	**Present construction (2013-14)
Potato - Kaon - T. Aman	Sugarcane-Papaya/Banana-Betel leaf	Boro-Jute-T. Aman	Boro (HYV)-Fallow-T. Aman/B. Aman(HYV/LIV)	Boro-Fallow-T. Aman
Boro - T. Aman – Fallow	Fallow-B. Amon-Fallow	Oil seed/Pulse-B. Aman-Fallow	RC-T. Aus-Fallow	Boro-Jute-T. Aman
Wheat - Kaon - T. Aman	Boro-Fallo-Fallow	Vegetables-Fallow-T. Aman	Wheat/Species/Pulse/Oilseed-Jute-T. Aman	Boro-B. Aman-Fallow
Potato - Boro - T. Aman	Rabi crop-Aus/Jute-Fallow	Wheat-Jute-T. Aman	Sugarcane/Betel leaf/Turmeric-Fallow-Fallow	Boro-Jute-Fallow
Tomato - Aus - T. Aman	Boro-Fallow-T. Amon	Wheat-Sesame-T. Aman	Boro (HYV)-Fallow-Fallow	Boro-Fallow-Fallow
Pulses - Aus - Fallow	Boro-B. Amon-Fallow	***	Vegetables-Fallow-Fallow	Oil seed/Pulse-Fallow- T. Aman
Wheat - T. Aman – Fallow	Rabi crop-Fallow-T. Amon	***	***	Oil seed/ Pulse-Jute-T. Aman
Boro - T. Aman – Fallow	Fallow-Aus/Jute-T. Amon	***	***	Oilseed/Pulse-Jute-Fallow
Potato - Boro - Aus	Boro-Aus-Fallow	***	***	Wheat-Jute-T. Aman
Aus - T. Aman - Fallow	Boro-Aus/Jute-T. Amon	***	***	Fallow-B. Aman-Fallow
Kaon - T. Aman – Fallow	Vegetables-Jute-Vegetables	***	***	Oilseed/ Pulse-B. Aman-Fallow
Boro (HYV) - Fallow – Fallow	Rabi crop-Vegetables-Vegetables	***	***	Pulse-Fallow-Fallow
Mustard - Kaon - T. Aman	***	***	***	***
Potato - Kaon - T. Aman	***	***	***	***
Spices - T. Aman – Fallow	***	***	***	***
Wheat - Vegetable - T. Aman	***	***	***	***
Pulses - Aus - T. Aman	***	***	***	***
Wheat - Jute – T. Aman	***	***	***	***

N.B = *Indicates that the data were collected from various sources as secondary data; **Indicates that the data were obtained by the authors during the study; ***Indicates data were not available. B. Aman= Broadcast Aman, T. Aman= Transplant Aman, HYV= High Yielding Varieties

3.3. Crop production from 2008 to 2013 in Auria Union, Narail, Bangladesh

3.3.1. Aus

The Aus production increased slightly in 2009, 2010, 2012 and 2013 but was similar in 2011 as compared to 2008 (Figure 2.a). The highest production was found in 2012 and the lowest was in 2009. The production was most probably due to availability of irrigation water in Kharif 1. It has been found that, the production of Aus in Kharif 1 (2013) was almost similar in 2008, 2009, 2010 and 2011 but was the highest in 2012. In this study the re-excavation of canal was done in 2012. The result showed that the re-excavation of canal did not have any

positive impact on Aus production. This was most probably in Aus production; farmer did not use canal water as irrigation. Therefore it is unwise to draw any kind of comment regarding this.

3.3.2. Broadcast Aman

The B. Aman production decreased gradually from 2008 to 2013 as compared to 2008 (Figure 2.b). The highest production was found in 2008 and the lowest was in 2013. It has been found that, the production of B. Aman in Kharif 1 (2013) was almost similar in 2010, 2011 and 2012. In this study the re-excavation of canal was done in 2012. The result showed that the re-excavation of canal did not have any positive impact on B. Aman cultivation. This was most probably in B. Aman production local people did not use canal water as irrigation. Therefore it is difficult to draw any kind of comment regarding this.

3.3.3. Jute

The jute production increased slightly in 2009, 2010, 2011, 2012 and 2013 (Figure 2.c). The highest production was found in 2012 and the lowest was in 2008. The production was most probably due to availability of irrigation water in Kharif 1. It has been found that the production of jute in Kharif 1 (2013) was almost similar in 2008 and 2011. In this study, the re-excavation of canal was done in 2012. The result showed that the re-excavation of canal did not have any positive impact on jute production. This was most probably in jute production; cultivators did not use canal water as irrigation. Therefore it is difficult to draw any kind of comment regarding this.

3.3.4. Sesame

The sesame production increased in 2009, 2010, 2011, 2012 and 2013 as compared to 2008 (Figure 2.d). The highest production was found in 2011 and the lowest was in 2008. It has been found that the production of sesame in Kharif 1 (2013) was almost similar in 2009 and 2010. In this study, the re-excavation of canal was done in 2012. The result showed that the re-excavation of canal did not have any positive impact on sesame production. This was most probably in sesame production; farmers did not use canal water as irrigation. Because, canal water supplied only in Rabi season. So, it is a great problem to draw any kind of comment regarding this.

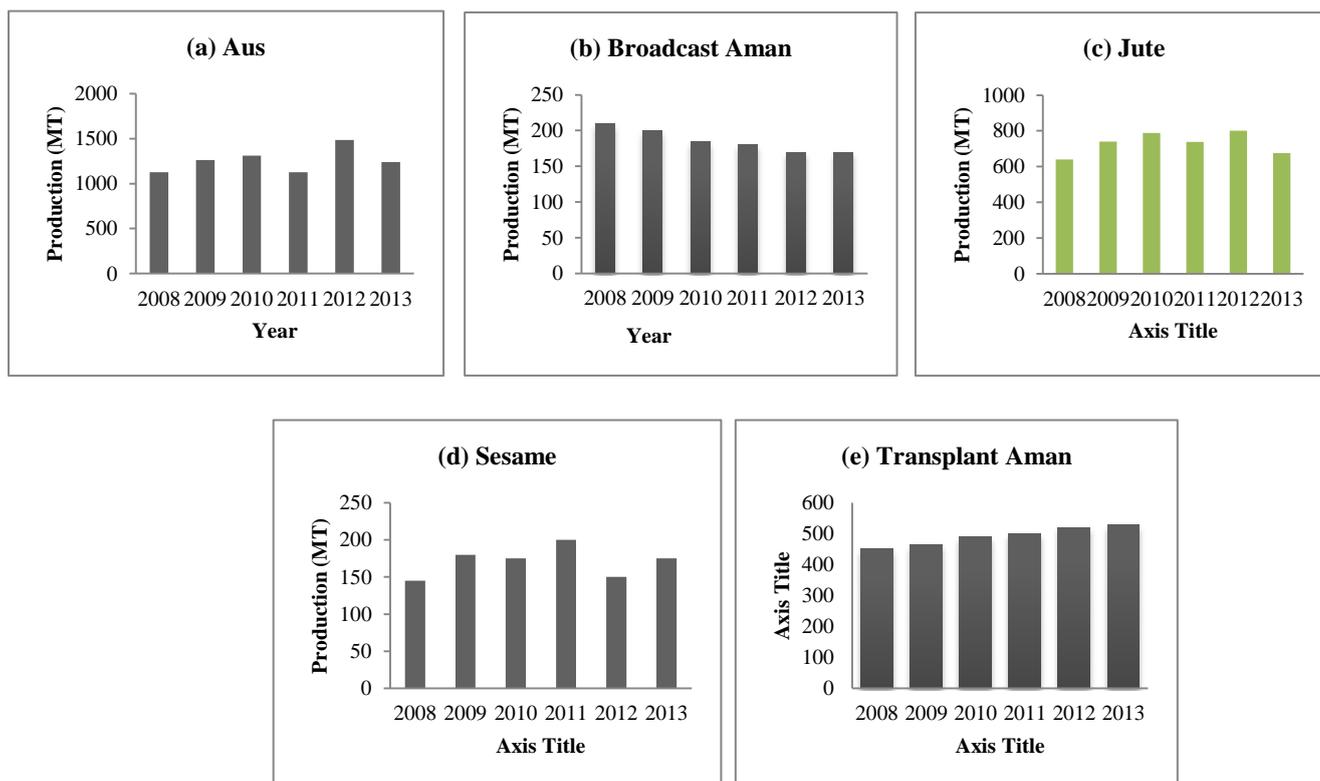


Figure 2. (a) Aus; (b) Broadcast Aman; (c) Jute (d) Sesame; and (e) Transplant Aman production in Kharif season from 2008 to 2013 in Auria Union, Narail, Bangladesh. NB: MT= Metric Ton.

3.3.5. Transplant Aman

The T. Aman production increased in 2009, 2010, 2011, 2012 and 2013 as compared to 2008 (Figure 2.e). The highest production was found in 2013 and the lowest was in 2008. It has been found that, the production of T. Aman in Kharif 2 (2013) was almost similar in 2011 and 2012. In this study the re-excavation of canal was done in 2012. The result showed that the re-excavation of canal did not have any positive impact on T. Aman production. This was most probably in T. Aman production farmers did not use canal water as irrigation. Therefore it is unwise to draw any kind of comment regarding this.

3.3.6. Boro

The Boroproduction increased slightly in 2009, 2010, 2011 and 2013 (Figure 3.a). The highest production was found in 2013 and the lowest was in 2012. It has been found that, the production of Boro in Rabi season (2013) was almost similar to 2011. In this study the re-excavation of canal was done in 2012. The result showed that the re-excavation of canal has much positive impact on Boro production. The production of Boro was increasing day by day due to availability of canal water as irrigation. But in 2012, the canal was under construction. For this reason the production was very low. Therefore, it could be said that re excavation of canal greatly improved the cropping intensity or cropping pattern.

3.3.7. Wheat

The wheat production increased in 2009, 2010, 2012 and 2013 as compared to 2008 (Figure 3.b). The highest production was found in 2013 and the lowest in 2011. The result showed that, the production of wheat in Rabi season (2013) was almost similar in 2009. In this study, the re-excavation of canal was done in 2012. The result showed that the re-excavation of canal has much positive impact on wheat production. The production of wheat was increasing day by day due to availability of canal water as irrigation. But in 2012, the canal was under construction. For this reason the production was low. Therefore, it could be said that re-excavation of canal greatly affected the cropping intensity or cropping pattern.

3.3.8. Onion

The onion production increased in 2009, 2010, 2011, 2012 and 2013 as compared to 2008 (Figure 3.c). The highest production was found in 2010 and the lowest was in 2008. In this study the re-excavation of canal was done in 2012. The production of onion was increasing day by day due to availability of canal water as irrigation. The production of onion in 2010, 2011, 2012 and 2013 was about seven, three, seven and six times higher than in 2008. In onion cultivation, there is a low need of water. The result showed that the re-excavation of canal did not have any positive impact on onion cultivation. This was most probably in onion cultivation; farmers did not use much canal water as irrigation. Therefore, it is difficult to draw any kind of comment regarding this

3.3.9. Garlic

The garlic production unchanged in 3 years (2008, 2009 and 2012) where it shows decrease in 1 year (2010) and no production was observed in 2011 and 2013 during (2008-13) in my study area (Figure 3.d). In this study the re-excavation of canal was done in 2012. The reduction of garlic cultivation was most probably due to increase of rice cultivation. The result showed that the re-excavation of canal was much affected in garlic production. Therefore, it could be said that re-excavation of canal greatly affected the cropping intensity.

3.3.10. Turmeric

The turmeric production increased in 2009, 2010, 2011, 2012 and 2013 as compared to 2008 (Figure 3.e). The highest production was found in 2013 and the lowest was in 2008. The result showed that, the re-excavation of canal was much affected in turmeric production. The production of turmeric was increasing day by day due to availability of canal water as irrigation. The production of turmeric in 2009, 2010, 2012 and 2013 was about two, two, two and four times higher than in 2008. Therefore, it could be said that, re-excavation of canal greatly improved the cropping intensity.

3.3.11. Chilly

The chilly production increased in 2009, 2010, 2011, 2012 and 2013 as compared to 2008 (Figure 4.a). The highest production was found in 2009, 2010, 2011 and 2013 but the lowest in 2008. It has been found that, the production of chilly in Rabi season (2013) was almost similar in 2009, 2010, 2011 and 2012. In this study the re-excavation of canal was done in 2012. The result showed that the re-excavation of canal has much positive impact on chilly production. The production of chilly was increasing day by day due to availability of canal

water as irrigation. The production of chilly in 2009, 2010, 2011, 2012 and 2013 was about two times higher than in 2008. Therefore, it could be said that re-excavation of canal greatly affected the cropping intensity.

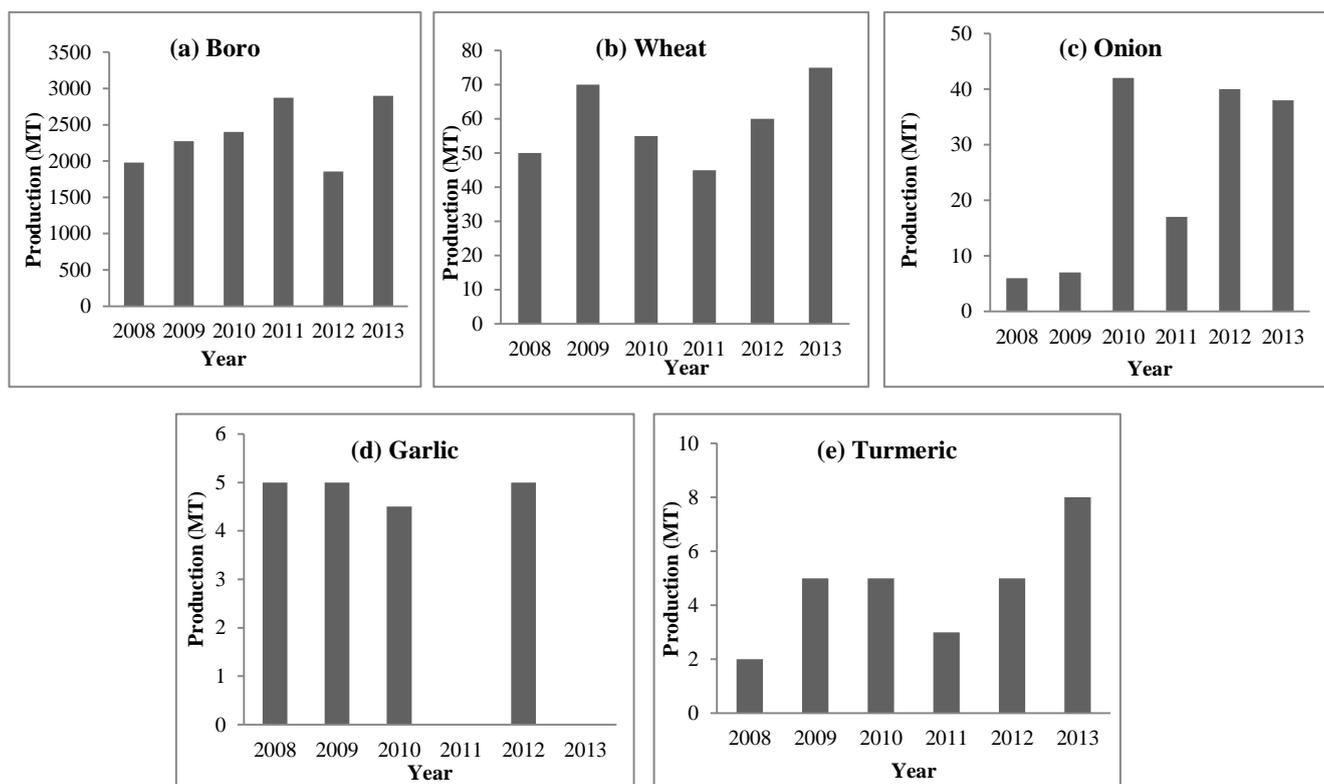


Figure 3. (a) Boro; (b) Wheat; (c) Onion (d) Garlic; and (e) Turmeric production in Rabi season from 2008 to 2013 in Auria Union, Narail, Bangladesh. NB: MT= Metric Ton.

3.3.12. Chickpea (Khesari)

The chick pea production increased in 2009, 2011 and 2013 as compared to 2008 (Figure 4.b). The highest production was found in 2011 but the lowest was in 2012. In this study the re-excavation of canal was done in 2012. The result showed that the re-excavation of canal was much affected in chickpea production. The production of chick pea was increasing day by day due to availability of canal water as irrigation. But in 2012, the canal was under construction. For this reason the production was very low. The production of chickpea in 2011 and 2013 was about six times higher than in 2012. Therefore, it could be said that re-excavation of canal greatly improved the cropping intensity.

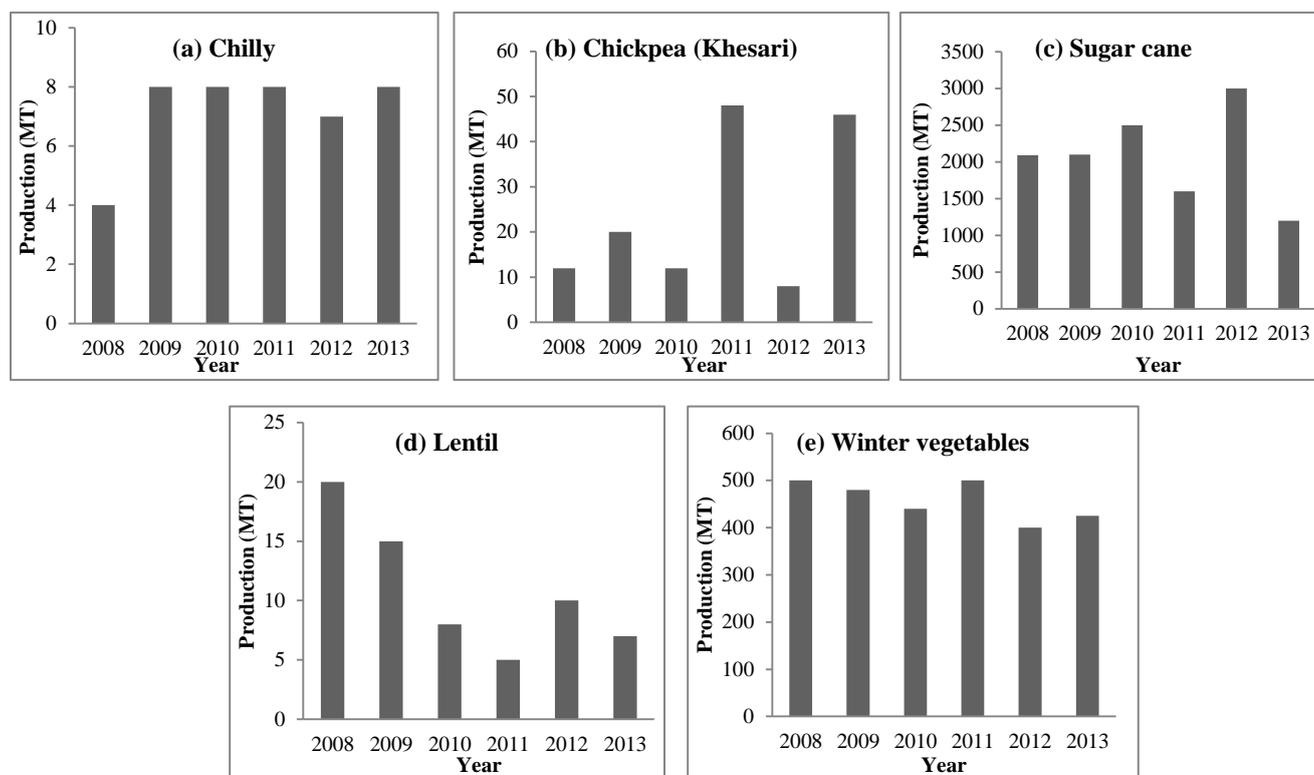


Figure 4. (a) Chilly; (b) Chickpea (Khesari); (c) Sugar cane; (d) Lentil; and (e) Winter vegetables production in Rabi season from 2008 to 2013 in Auria Union, Narail, Bangladesh. NB: MT= Metric Ton.

3.3.13. Sugar cane

The sugar cane production increased in 2009, 2010 and 2012 as compared to 2008 (Figure 4.c). The highest production was found in 2012 and the lowest was in 2013. In this study the re-excavation of canal was done in 2012. The result showed that the re-excavation of canal was much affected in sugar cane production. In 2012, the canal was under construction. For this reason, the production was very high. But in 2011 and 2013 the production was low because of much cultivation of Boro rice. The reduction of sugar cane cultivation was most probably due to increase of rice cultivation. Therefore, it could be said that re-excavation of canal greatly changed the cropping pattern.

3.3.14. Lentil

The lentil production decreased in 2009, 2010, 2011, 2012 and 2013 as compared to 2008 (Figure 4.d). The highest production was found in 2008 and the lowest was in 2011. It has been found that, the production of lentil in Rabi season (2013) was almost similar in 2010, 2011 and 2012. In this study, the re-excavation of canal was done in 2012. The result showed that the re-excavation of canal was much affected in lentil production. The production of lentil is decreasing day by day due to availability of canal water as irrigation. Because farmers were cultivating Boro rice mostly by replacing lentil. The production of lentil in 2010, 2011, 2012 and 2013 was about two or three times lower than in 2008. Therefore, it could be said that re-excavation of canal greatly changed the cropping pattern.

3.3.15. Winter vegetables

The winter vegetables production decreased in 2009, 2010, 2012 and 2013 as compared to 2008 but was similar in 2008 and 2011 (Figure 4.e). The highest production was found in 2008, 2011 and the lowest was in 2012. It has been found that, the production of winter vegetables in Rabi season (2013) was almost similar in 2010 and 2012. In this study the re-excavation of canal was done in 2012. The result showed that the re-excavation of canal was much affected in winter vegetables. The production of winter vegetables is decreasing day by day due to increase of rice cultivation. Boro rice is replacing winter vegetables mostly. Therefore, it could be said that re-excavation of canal greatly changed the cropping pattern.

3.4. Cultivated land area, crop production and cropping intensity during survey 2013 in Auria Union, Narail, Bangladesh

Figure 5.a showed the land use pattern of various crops in Kharif 1 and Kharif 2 season during survey period (2013). Information was collected from 150 farmers of 6 villages of Auria Union and they got irrigation water from canal supported by BWDB. In Kharif season, farmers mostly cultivated various types of rice (e.g. BR 10, BR 11, BRRI 22, BRRI 23, BRRI 39, BRRI 49, Jabra, Machranga, Monohar and Shorna), Jute and Sesame. Among the rice varieties Shorna, BRRI 22, Machranga, BARRI 49, BRRI 39 and BRRI 23 were mostly cultivated, respectively. Jute was the second main crop in Kharif 1. In 257.17 acres of cultivable land, rice was cultivated in 145.92 acres, jute was in 62.07 acres and only 5.49 acres were used for sesame production.

Figure 5.b showed various types of crops production in Kharif 1 and Kharif 2 season during survey period (2013). Information was collected from 150 farmers among 6 villages of Auria Union and they got irrigation water from canal. In Kharif season, farmers mostly cultivated various types of rice (e.g. BR 10, BR 11, BRRI 22, BRRI 23, BRRI 39, BRRI 49, Jabra, Machranga, Monohar and Shorna), Jute and Sesame. Among the rice varieties Shorna, BRRI 22, Machranga, BRRI 39, BRRI 23 and BRRI 49 mostly produced, respectively. Jute was the second main crop in Kharif 1. In 290.94 MT of total production, rice was produced 234.2 MT, jute was 54.92 MT and only 1.82 MT was sesame production.

Information was collected from 150 farmers of 6 villages of Auria Union and they got irrigation water from canal. In Kharif season, farmers mostly cultivated various types of rice (e.g. BR 10, BR 11, BRRI 22, BRRI 23, BRRI 39, BRRI 49, Jabra, Machranga, Monohar and Shorna), Jute and Sesame. Among the rice varieties BR 10, BR 11, BRRI 22, BRRI 23, BRRI 39, BRRI 49, BRRI 52, Jabra, Machranga, Monohar and Shorna showed 0.92%, 0.85%, 7.36%, 4.16%, 4.39%, 4.46%, 2.43%, 1.59%, 6.06%, 1.43% and 21.82% cropping intensity, respectively (Figure 5.c). In 81.17% of total cropping intensity, only the rice varieties showed 55.47%, jute showed 23.62% and 2.08% was sesame.

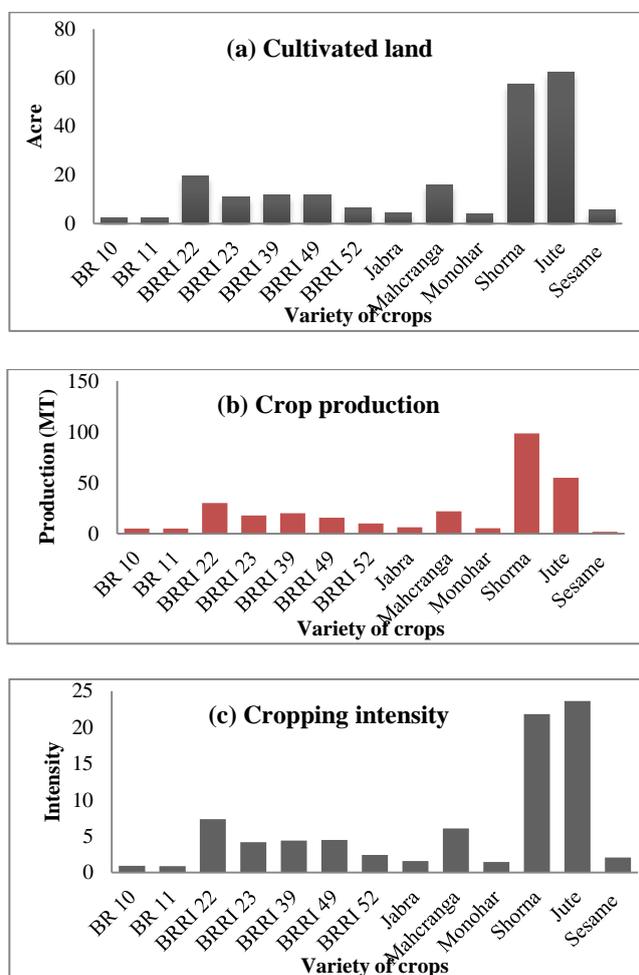


Figure 5. (a) Cultivated land; (b) Crop production and; (c) Cropping intensity of various crops in Kharif season at 2013 in Auria Union, Narail, Bangladesh.

Figure 6.a showed the land use pattern of various crops in Rabi season during survey period (2013). Information was collected from 150 farmers of 6 villages of Auria Union and they got irrigation water from canal supported by BWDB. In Rabi season, farmers mostly cultivated various types of rice (e.g. BRRI 28, BRRI 29, BRRI 41, GS, Hira, Jagoron, Kajollata, Ratna and Sarnolata), Chickpea (Khesari), Lentil, Pulse (Kalai), Rape seed and Wheat. Among the rice varieties BRRI 28, GS, Hira, Ratna and BRRI 29 were mostly cultivated, respectively. In 231.24 acres of cultivable land, rice was cultivated in 168.93 acres and Chickpea (Khesari), Lentil, Mustard, Pulse (Kalai), Rape seed, Wheat was cultivated about 8.55, 22.59, 17.58, 7.80, 0.09, 5.70 acres, respectively.

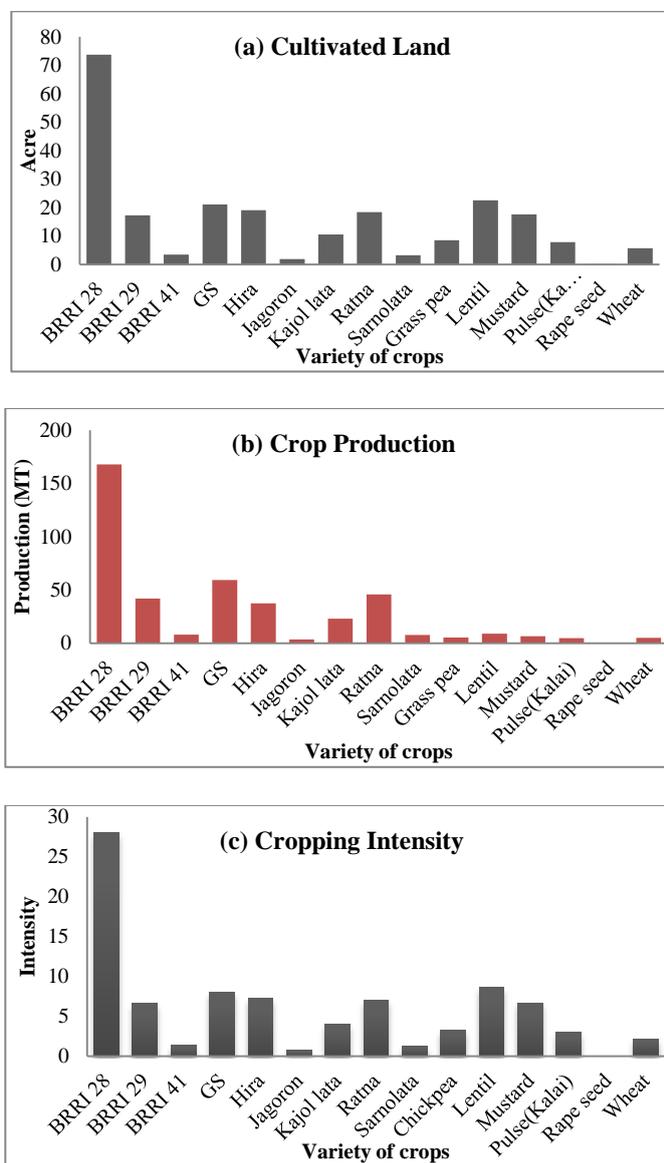


Figure 6. (a) Cultivated land; (b) Crop production and; (c) Cropping intensity of various crops in Rabi season at 2013 in Auria Union, Narail, Bangladesh.

Figure 6.a showed various types of crop production in Rabi season during survey period (2013). In Rabi season, farmers mostly cultivated various types of rice (e.g. BRRI 28, BRRI 29, BRRI 41, GS, Hira, Kajollata, Ratna and Sarnolata), Chickpea (Khesari), Lentil, Mustard, Pulse (Kalai), Rape seed and Wheat. Among rice varieties BRRI 28, GS, Ratna, BRRI 29 and Hira mostly produced, respectively. In 427.42 MT of total production, only rice varieties were produced about 395.90 MT (Figure 6.b). Chickpea (Khesari), Lentil, Mustard, Pulse (Kalai), Rape seed and Wheat was produced 5.66 MT, 9.08 MT, 6.72 MT, 4.80 MT, 0.04 MT and 5.22 MT, respectively (Figure 6. b).

Figure 6.c showed the cropping intensity of various crops in Rabi season during survey period (2013). In Rabi season, farmers mostly cultivated various types of rice (e.g. BRRI 28, BRRI 29, BRRI 41, GS, Hira, Kajollata, Ratna and Sarnolata), Chickpea (Khesari), Lentil, Mustard, Pulse (Kalai), Rape seed and Wheat. Cropping intensity of rice varieties such as BRRI 28, BRRI 29, BRRI 41, GS, Hira, Jagoron, Kajollata, Ratna and Sarnolata were shown 28.06%, 6.58%, 1.32%, 8.04%, 7.27%, 0.70%, 4.01%, 7.00% and 1.25%, respectively (Figure 6. c). In 87.91% of total cropping intensity in Rabi season, only rice varieties showed 64.23%. Chickpea (Khesari), Lentil, Mustard, Pulse (Kalai), Rape seed and Wheat were shown 3.25%, 8.59%, 6.69%, 2.96%, 0.03% and 2.16% cropping intensity, respectively (Figure 6. c)

4. Conclusions

It was found that the cropping pattern in Auria Union was bit different as compare to NarailSadarUpazila as well as Bangladesh. Before construction of canal the cropping patterns in Auria Union were Boro – Jute - T. Aman, Oil seed/Pulse - B. Aman - Fallow, Vegetables - Fallow - T. Aman, Wheat - Jute - T. Aman and Wheat – Sesame - T. Aman. But after construction of canal during (2009-10) the cropping patterns in Auria Union were Boro (HYV) - Fallow - T. Aman/B. Aman, Robi crops - T. Aus - Fallow, Wheat/Species/Pulse/Oilseed - Jute, T. Aman, Sugarcane/Betelleaf/Turmeric – Fallow - Fallow, Boro (HYV) – Fallow - Fallow, Vegetables – Fallow - Fallow. It has been found that after construction of canal during (2009-10), cropping patterns of Auria Union has been changed remarkably as compared to before construction (1987-88). Interestingly, more fallows were found after construction during (2009-10) in Kharif 1. This is because; in Kharif 1 (dry season), the irrigation water is not available and the farmers need to spend huge money for irrigation purposes. As a result, farmers did not cultivate water dependent crops mostly in Kharif 1 season. On the contrary, farmers get irrigation water easily and cheaply from canal in Rabi season. In Kharif 2 farmers get water from rainfall and cultivate the crops naturally. At present (2013-14), the cultivators are becoming inclined to cultivate Boro and T. Aman mostly and in the other times the fallows were found more. In the context of present construction (2013-14), cultivators intrinsically are cultivating Boro – Fallow - T. Aman, Boro – Jute - T. Aman, Boro - B. Aman - Fallow, Boro – Jute - Fallow, Boro – Fallow - Fallow, Oil seed/Pulse, Fallow - T. Aman, Oil seed/Pulse – Jute - T. Aman, Oilseed/Pulse – Jute - Fallow, Wheat – Jute - T. Aman, Fallow - B. Aman - Fallow, Oilseed/Pulse - B. Aman - Fallow, Pulse – Fallow – Fallow. The result showed that the re-excavation of canal did not have any positive impact on Aus, B. Aman, T. Aman, Jute, Sesame and Onion production. The result also showed that the Boro, Wheat, Turmeric, Chilly, Chick pea, Sugarcane, Lentil production has much positive impact on re-excavation of canal. The production of Boro is increasing day by day due to availability of canal irrigation water supported by Bangladesh Water Development Board, Narail. But in 2012, the canal was under construction. For this reason the production was very low. Therefore, it could be said that, re-excavation of canal greatly improved the cropping intensity or cropping pattern.

Conflict of interest

None to declare.

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