Study on Driftwoods that Flow along with Debris Flow and Control by Closed-type Check Dam - Case of Iwaizumi-cho, Iwate Prefecture Sediment-related Disaster Caused by Typhoon No.10 (Lionrock) in 2016 -

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INTRODUCTION

In planning land erosion control master plan, it is very important to consider driftwoods that flow along with debris flow. Driftwoods not only bury buildings but also block up watercourse (bridges and culvert). Check dam is an important facility among sabo facilities against debris flow and driftwood. The process of driftwoods controlling by check dam has been clarified by experimental analysis [e.g., *Minami et al*, 2000]. However, experimental analysis is modeling the actual basin with ideal condition, and cannot consider the influences of driftwoods and topographical conditions on process of controlling driftwoods by the check dam. There are few studies in actual basins, for example there were *Yamada et al.* (1999). There are not enough cases accumulated to verify the controlling process of driftwoods. We find the conditions of driftwoods (volume and causes) and topography and the process of controlling driftwoods by closed-type check dam in Iwaizumi-cho sediment related disaster caused by Typhoon No.10 (Lionrock) in 2016 to assess the influence of these conditions on controlling driftwoods by the check dam.

STUDY AREA AND METHOD

The study areas are the Ishibatakesawa basin and Osawa basin in Iwaizumi-cho, Shimohei County, Iwate Prefecture, Japan (see **Fig. 1**). Ishibatakesawa basin's area of 1.96 km^2; and its main a mean bed slope of 7.6 degrees. The closed-type check dam (Ishibatakesawa sabo dam) is constructed downstream area in Ishibatakesawa basin by sabo works. Osawa basin's area of 2.08 km^2; and its main a mean bed slope of 8.4 degrees. Two closed-type check dams are constructed downstream area in Osawa basin by erosion control works. The continuous precipitation by Typhoon No.10 (Lionrock) in 2016 is 194.5 mm (8/30 3:00-20:00) and maximum hourly precipitation is 62.5 mm/h (8/30 17:00-18:00).

Driftwoods conditions are estimated using aerial photographs taken during two different periods 2000s and 2016 and field survey by the same method as the driftwood survey of the land erosion control master plan. Volume of driftwoods controlling by closed type check dam is measured using field survey results.

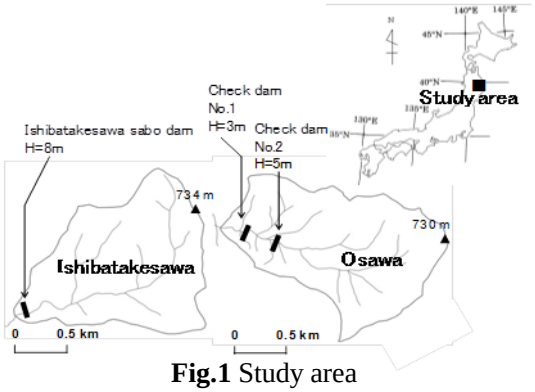

Fig.1 Study area

RESULTS

1. Driftwoods volume

Driftwood volume are 95m^3 (48m^3/km^2) in Ishibatakesawa basin and 866m^3 (416 m^3/km^2) in Osawa basin. The average length of driftwood is 6.1 m in Osawa and 4.0 m in Ishibatakesawa.

2. Causes of driftwoods

The cause of driftwoods is the following three types (see **Fig. 2**): 1) Outflow of standing trees (deciduous broad-leaved tree shrubs) due to collapse. 2) Outflow of standing trees such as deciduous broad-leaved trees and cedar due to torrent bed erosion. 3) Outflows of logging trees that are below the slope sites and along the valley. Many of deciduous broad-leaved trees with a height of less than 10 meters of type 1) and type 3) length of about 2-5 m of logging trees flow out downstream. These driftwoods flow out by sediment flow earthflow in section where the bed slope is 10 degrees or less. It is assumed to these driftwoods outflow with earthflow at once by traces of earthflow. Types 1) and 2) are no branches and leaves, with roots.

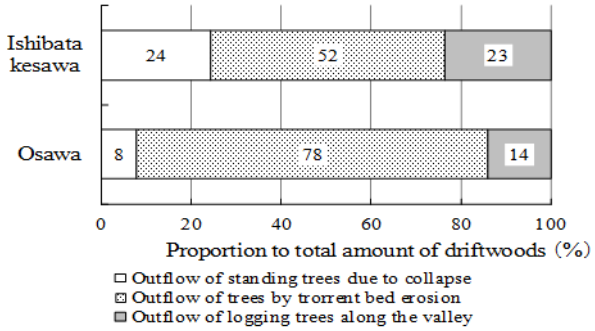

Fig.2 Causes of driftwoods

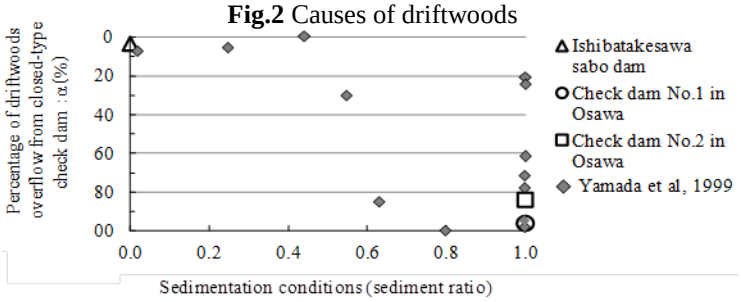

Fig.3 Relationship of sediment ratio and α

3. Percentage of driftwoods overflow from closed-type check dam

Fig. 3 shows the relationship between sedimentation conditions (sediment ratio) before the disaster and percentage of driftwoods overflow from closed-type check dam (α (%)).

Two dams in Osawa basin are in the full sedimentation (sediment ratio: 1) is also higher than the past record of full sedimentation (it was 80% more). In Osawa basin, as mentioned above, the driftwood flowing out to the check dam is mainly composed of relatively short length driftwood, and driftwoods do not close with spillway. On the other hand, α of the Ishibatakesawa basin (sediment ratio: 0) tend to be somewhat lower than the past record. The outflow discharge is not as large as it flowed beyond spillway and the driftwood is stored in a floating state on the flooded surface of the back of the weir in Ishibatakesawa basin.

CONCLUSIONS

We find that the short length driftwood such as tree shrubs and logging trees flow down by sediment flow earthflow that compared to the surrounding standing trees in Iwaizuma-cho sediment related disaster. The percentage of driftwoods overflow from closed-type check dam tends to be different influence of sediment transportation, trapping process of driftwoods by the check dam, the sedimentation condition, and outflow discharge and driftwood length.

REFERENCES

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