Reviewer #1

Comments 1		
Reviewer's comments		P3, L24: Years 2006_2010 are not really recent. Maybe add an explanation about the selection of the study period.
Response		We added the new section about data and explained the selection of the study period.
	page 5, line 22 - page 5, line 28	According to the World Meteorological Organization report (WMO, 2013), there were several significant events related to food trade during 2000-2010. For example, Australia suffered severe drought damage in 2007, but the drought was solved in 2009, and Australia was noticeable as a main exporter in 2010. In addition, the Russian federation had the worst drought, and the government decided to stop exporting wheat, barley, and maize. This action could affect Middle East countries, and also the entire crop trade. We expected the global virtual water trade in these seasons could be important issues, and collected international trade data of food and feed crops during 2006-2010 from PC-TAS.

Comments 2	
Reviewer's comments	P4, L1: Maybe delete "Subsection (as Heading 2)".
Response	We removed "as Heading 2"

Comments 3	
Reviewer's comments	P4, L13～15: I assume a node represents a country here, so maybe use "country", instead of "node" to explain the equation to avoid confusion. Also, please delete the comma at the end of equation.
Response	We changed "node" to "country" with following your comments, and deleted the comma.

Comments 4		
Reviewer's comments		P5, L9～11: I would think the fact that blue water consumption for crop export is smaller than green water consumption is part of the reason that green water export has a stronger correlation with crop export.
Response		We tried to explain the diffusion of green and blue water export rather than the difference of amount of virtual water export. The different diffusion between green and blue water export was derived by the variance of water footprint, which is dependent on climate features in exporting country. Therefore, we changed the explanation about Figure 1 and focused on the diffusion of green and blue water export.
	page 6, line 3 - page 6, line 14	The GVWT is dependent on the water footprint of each country, and a few countries cultivate and export water intensive crops. The different variability between green and blue water export was derived by the variance of water footprint, which is dependent on the climate features in the exporting country. Mekonnen and Hoekstra (2011) also mentioned the difference of water footprint for each country; for example, relatively smaller water footprints of cereal crops were estimated in Northern and Western Europe, rather than in most parts of Africa. In this study, we showed the variability of green and blue water export, respectively, in crop export during the period 2006-2010 (Fig. 1). The dispersion of scattered points of green water export and crop export was smaller than those of blue water export. One of the reasons why a large dispersion was shown in blue water export might be that the volume of blue water is much smaller than that of green water; thus a small amount of blue water might derive a large change in this plot. However, the main issue in Fig. 1 was that the blue water footprint differed more depending on the exporting country, rather than the green water footprint. Therefore, the variability of blue water export was larger than that of green water export, and crop export could bring differing impacts on irrigation water by country.

Comments 5	
Reviewer's comments	P6, Figure 1: Typos, change "crpos" to "crops".
Response	We corrected typos.

Comments 6	
Reviewer's comments	P6, L5: Typo, change "paly" to "play".
Response	We corrected typos.

Comments 7		
Reviewer's comments		P6, L1～20: For this part of the discussion on specific countries' high and low connectivity in the virtual water trade system, the authors may need to add some reference to support their statements.
Response		We considered the results from Konar et al (2011), and compared to the results of this study. We added the more explanation.
	page 7, line 16 - page 7, line 21	Konar et al. (2011) aggregated the virtual water trade of 5 crops and 3 animal products, and measured the node degree of the virtual water trade, which indicated the number of trade partners. They found that the U.S.A., the Netherlands, France, Italy, and the U.K. were the top 5 exporters who had large connections. On the other hand, China and Thailand were the only Asian countries in the top 15 exporters according to the number of connections. However, in this study, we found that Pakistan, India, and Vietnam also had high connectivity in virtual water export through food crops, because we analyzed the connectivity of the virtual water trade of food and feed crops, respectively.
	page 7, line 31 - page 7, line 34	Konar et al. (2011) also found that the U.S.A., U.K., Germany, Canada, and Netherlands were the top 5 importers. On the other hand, Saudi Arabia and Hong Kong were the only Asian countries in the top 15 importers. These results were similar to this study; for example, European countries had higher connectivity than Asian countries.

Comments 8		
Reviewer's comments		P7, L15～23: In this part, the authors suggested that virtual water imports have saved water resources in several countries and the vulnerable structure of VWT could cause water shortage problems in importing countries. Please add references to support these statements.
Response		We defined the vulnerable structure of VWT and considered this structure could cause water shortage problem in this study. For example, in 2010, Russia banned the wheat export because of severe drought, and global wheat price went up. Oxfam Research Reports analyzed the impacts of Russia ban of wheat export on global and local area in terms of economic impacts (Welton, 2011). However, it was hard to find the reports about relationship between water shortage and virtual water trade. Accordingly, we referenced the studies about water saving impacts in importing countries through trade, and tried to explain the vulnerable trade could cause the decrease of the water saving impacts.
	page 9, line 20 - page 10, line 8	**3.2.3 GVWT impacts on water savings in importing countries** Virtual water trade could help the importers save water resources by crops import. For example, if the importing country replaces crop import with domestic production, this will be accompanied by additional water use. Table 4 shows the water savings by virtual water import in main importers from 2006 to 2010. China and Japan saved 24.7 and 18.7 Gm^3/yr of green water, respectively, by crops import. In addition, Egypt and Iran saved 15.3 and 10.1 Gm^3/yr of blue water, respectively, by crops import, because these countries depended on the irrigation water for domestic crop production. In particular, Egypt and Iran have few water resources; therefore, the virtual water impacts on water resource savings in these countries might be larger than on other importers. Accordingly, VWT is a very important issue for these importers; thus the vulnerable structure of VWT could cause water shortage problems to importing countries. For example, in 2010, Russia banned wheat export because of severe drought, and the global wheat price rose. Oxfam Research Reports analyzed the impacts of the Russia ban of wheat export on global and local areas in terms of economic impacts (Welton, 2011). Wheat import in Egypt has high dependency on the Russian federation's export, which we regarded as a vulnerable structure, and the insufficient import of crops due to the export ban in the Russian federation could also bring not only economic impacts, but also serious water consumption for increasing domestic food production. Chapagatin et al. (2006) found the import of wheat in Egypt contributed to a national water saving of 3.6 Gm^3/yr during 1997-2001, which according to the 1959 agreement was about seven percent of the total volume of water that Egypt was entitled to. Fader et al. (2011) also found that some water-scarce countries, such as China and Mexico, but also the Netherlands and Japan, would need relatively high amounts of water to produce the goods they otherwise import, i.e. they save high amounts of water by importing goods. Therefore, if they stopped importing and exporting agricultural products, these countries would need to use more water in their agricultural sectors (Fader et al., 2011). In other words, a vulnerable trade structure with low connectivity could be one of the main reasons for water shortage problems.

Comments 9	
Reviewer's comments	Table 4 and 5: The numbers in the "GVWT for feed crops" part of the two tables are identical. Could the authors explain the reason for this?
Response	This was a mistake when I copied table to manuscript. I revised the table.

Comments 10		
Reviewer's comments		P8, L19~22: The words "However" and "but" in this part make the logic hard to follow. Please revise.
Response		We revised these sentences.
	page 11, line 5 - page 11, line 11	In terms of water resources and virtual water use, over 30 % of internal water resources were used for exporting crops in Argentina, followed by Pakistan (25.1%), and the Ukraine (19.4 %). In addition, some countries used a lot of water to export crops, for example, over 50 % of virtual water use for food and feed crops production was used for export crops in Argentina, Canada, and Paraguay. In addition, Thailand and Paraguay used 39.5% and 54.2% of domestic virtual water use, respectively, for virtual water export, and the dependence on internal water resources was over 10 % in both countries. Therefore, virtual water export of these countries could be strongly affected by internal water resources, and this could have a negative impact on importers.