Addressing Flood Risk Due to Climate Change: What's Really At Stake for Agriculture & the Region?

Multi-stakeholder Forum
East Delta Hall, January 13, 2015

Climate Action Initiative
BC AGRICULTURE & FOOD

ACKNOWLEDGEMENTS

We would like to the thank all of the participants in the forum for contributing their time and ideas

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Introduction

In 2013, a regional agriculture adaptation plan was developed in Delta. During two workshops with Delta's agricultural producers, the risks associated with coastal flooding emerged as one of the highest adaptation priorities. While producers identified salt water flooding on agricultural lands as a significant challenge, there was little information available to assess the magnitude and severity of the potential impacts for agriculture.

As a follow up to that work, a study was commissioned to explore the agricultural and economic impacts of climate change related flooding in the Fraser delta region. This study was a first step to increase understanding of a plausible range of flood risks, in ways that can be used to better inform decision-making about climate change-related flood management and agricultural production in this region. The study and a study summary are available at: *URL pending final edits to report*

On January 13, 2015, a group of stakeholders from local and provincial government and local agricultural organizations, came together to discuss the results of the recently completed study. A full list of participants is included in Appendix 1.

The objectives of the Forum were to:

- Introduce and discuss the findings in the report, and their implications
- Develop shared understanding & awareness of the impacts for agriculture & the region
- Build collaboration to address issues identified in the study
- Identify opportunities to address agricultural impacts in planning and decision-making

The Forum consisted of two short presentations, and three structured discussions. An detailed agenda for the session is provided on the following page.

This report summarizes the process and the results of the discussions in the following sections:

- Study Approach & Results: Plenary Discussion
- Participants' intentions for the day
- Complexity of Decision-Making and Management Context: breakout and plenary discussion
- World Café Dialogues: three rounds of small group discussion

FORUM AGENDA **9:00 am – 1:00 pm, January 13th, East Delta Hall**	
Welcome, overview of the day	Leisa Yee (Delta Farmers Institute)
Presentation #1: Study approach & results	Kristi Tatebe & Mark Robbins (Report Authors)
Plenary discussion: • *What did you find most important or interesting?* • *How might this information be useful or important?* • *What surprised or challenged you? What are you wondering about?*	
Introductions & goals for the day (all participants)	
BREAK (10:30)	
Presentation #2: Decision-Making & Management in Complexity	Angela Danyluk (Corp. of Delta) & Erica Crawford (Facilitator)
Small group discussions & whole group debrief about key issues • *What do we know so far, and what do we still need to know about these topics to plan or take next steps?* • *To what extent is joint action required? Why, or in what ways does this aspect require that different people, organizations or parts of the system work together?*	
World Café dialogues *Round 1 & 2 questions:* - *What about this case study is new, helpful, or compelling for your area of work?* - *What important questions does it help you to answer, that we couldn't answer before?* - *What are we learning from this that could be applied to planning & decision-making in the region?* *Round 3 question:* - *What bold steps could we choose that would make the most difference to the future of agriculture in this region?* - *How can we support each other in taking the next steps? What unique contributions can we each make? What/who else is needed to ensure success?*	
Final Words	Leisa Yee (Delta Farmers Institute), Emily MacNair (Climate Action Initiative), Mike Brotherston (Corp. of Delta)
LUNCH	

1. Study Approach & Results: Plenary Discussion

An overview of the study, *Potential economic and agricultural production impacts of climate change related flooding in the Fraser Delta*, was presented by the report authors Kristi Tatebe and Mark Robbins.

Participants were then invited to pose clarifying questions about the study, and then considered the following questions in discussion with their neighbours:

- *What did you find most important or interesting about the results or approach of the study?*
- *How might this information be useful or important for your area of work? For flood management in this region? For agriculture or food security? For your community?*
- *What surprised or challenged you? What are you wondering about?*

Key points from the plenary discussion that followed are summarized here.

Study complexity

- There is a great deal of complexity in this type of analysis/evaluation – it is challenging to choose what variables to include in an economic analysis and in the flood modeling.
- Many assumptions have to be made to construct a model of economic impacts
- There are so many variables to consider, and the actual losses and economic impact will always vary from farm to farm.
- The study assumptions are articulated in the full report, and are important to keep in mind as the results of the study are interpreted
- A key assumption in the Delta case study was that dikes would be raised to keep pace with sea level rise, and that the breach would be in a localized area. This highlighted the fact that changes and upgrades to flood protection infrastructure are very costly and will require provincial and federal funding in addition to any resources that can be mobilized locally.
- The study provides one piece of the picture, and help to clarify where there are additional gaps or questions that may need to be addressed with subsequent work.
- We will never have a complete picture – knowing what the assumptions and limitations are can help to use the information we now have, to make better-informed decisions.

- The approach and methods used in this study can be informative for to how to include agricultural vulnerabilities and impacts in other studies in the region (eg: regional flood vulnerability studies).

Study limitations/gaps

- Some key issues that were not included in this study, such as crop insurance and stored crops
- A number of participants noted that the estimates here seemed conservative, and would increase as other factors are taken into consideration.
- It was felt that the estimates for winter flooding were unrealistically low, particularly if stored crops (for which no crop insurance is available) were considered.
- Producers emphasized that even one flood event could be difficult for producers to recover from.
- Between current and stored crops, farmers could lose two years of income, which could put some farms out of business.
- The distinction between what was meant by "Farmer Costs" and "Total Economic Impact" was not clear enough to some participants.

2. Participants' intentions for the day

Participants had the opportunity to meet with one other person in the room and then introduce their partner to the larger group, sharing one question or intention their partner had for the day. The range of interests and intensions included:

- Gaining better understanding the situation for agriculture—vulnerabilities, general and economic impacts for agriculture due to climate change, sea level rise & flooding; status of agricultural adaptation work in the region—and what might be done to support agriculture in the face of climate change.
- Strengthening understanding of the content and implications of the study, and looking at ways this could be integrated into policy & decision-making in the region and used to inform discussions nationally.
- In the context of ongoing regional flood adaptation work, there was a desire to look at the costs of adapting flood & drainage infrastructure, and consider innovative ways to adapt to climate change.

3. Complexity of Decision-Making and Management Context

In this exercise, participants discussed two pre-selected topics at each of the breakout tables (see Box 1). The intention was to explore two key questions about the management and decision-making around these issues:

- Do we have enough knowledge to act?
- Does this require joint action?

Participants discussed the topics and then placed their issue on a chart (shown in Figure 1) that evaluated the amount of existing knowledge and the degree of collaboration required.

Box 1. Discussion Topics

- Impacts of saltwater flooding for farms & crops
- On-farm & regional drainage infrastructure
- On-farm & regional drainage management
- Upgrading flood protection system;
- Maintenance of flood protection infrastructure
- Future flood management planning & policies
- Emergency preparedness for flooding on agricultural land
- Resilience of agricultural systems

Discussion Questions:

- *What do we know so far, and what do we still need to know about these topics to plan or take next steps?*
- *To what extent is joint action required? Why, or in what ways does this aspect require that different people, organizations or parts of the system work together?*

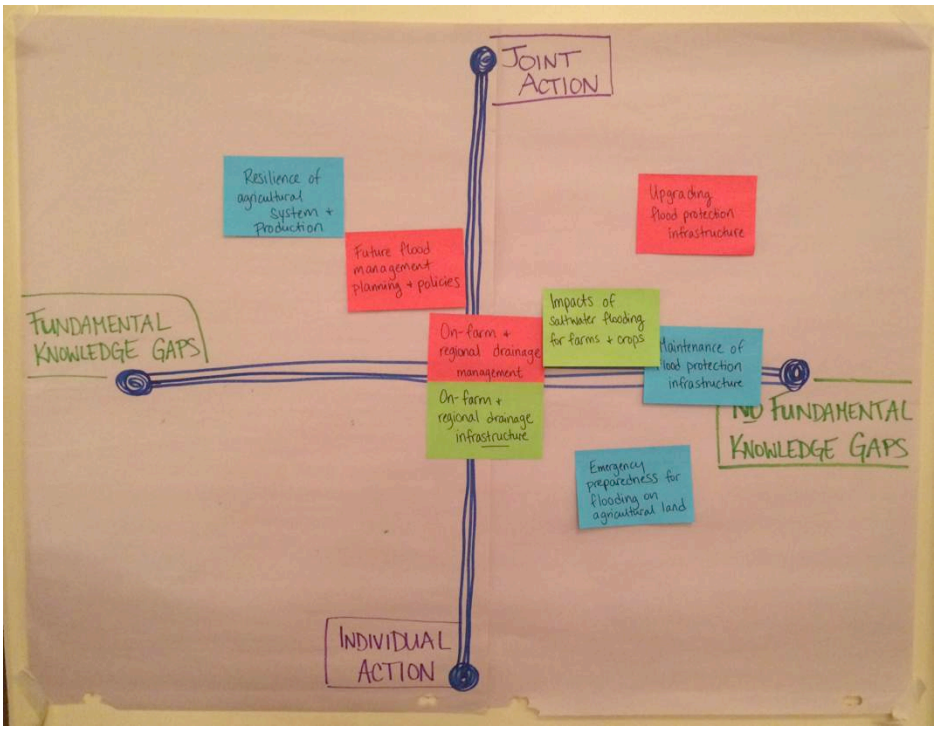

Figure 1. Knowledge – Collaboration Diagram with Key Topics

Plenary discussion of Knowledge-Collaboration Diagram

Following the small group discussion and "ranking" of the issues, the group gathered to discuss the logic behind the placement of the issues on the Diagram.

It was acknowledged that each of the issues includes many potential actions within it that would potentially be placed in different quadrants of the chart. The discussion highlighted that many factors impact the ability to act on these issues. Overall, most of the topics fell into the range of having **enough knowledge to act**, while **requiring joint action to move forward** with some or all of the associated actions. The topic of "Resilience of agricultural systems & production" was an exception; participants felt that there remain significant knowledge gaps, as well as the need for significant joint action.

Emergency preparedness was a topic that sparked further discussion. It was suggested that there can be a tendency to view this as an individual responsibility but there is a need for joint action as well. Participants noted that in a provincial context (during an emergency) agriculture is often lower on the priority list than other concerns. Therefore, there is a need for emergency preparedness for agriculture to be included at the municipal level so agriculture isn't left out of emergency planning and response.

On the issues of current and future flood management, planning and infrastructure, it was noted that there is a relatively high level of capacity to act within the three municipalities under discussion (Delta, Surrey and Richmond). This is because these communities have already undertaken work on these issues and there is adequate information to take next steps (whether this is a further study, or implementation based on planning & research). However, it was noted that this is not necessarily the case for all municipalities along the lower Fraser River. Information is not always being shared so that stakeholders understand the approach or decisions about flood planning across different municipalities in the region.

An insight emerging from at least one of the group discussions was that joint actions can result in increased ability and motivation for individual actions. For example, joint action is needed to undertake research on saltwater/salinity impacts for agriculture—this is a collective need and is not likely to be accomplished through individual action. However, as this information is developed and communicated, it will allow for individuals to take action on implementation.

Other ways in which joint action could lead to individual actions include:

- Information and training on flood preparedness and how to plan for flooding needs to be communicated to producers (pilot project underway through Delta Farmers' Institute and Climate Action Initiative)
- Funding to support moving forward with identified needs for upgrades & maintenance of flood infrastructure at local level

Key areas where joint action is required, include:

- Dike maintenance and improvement (ongoing collaboration/coordination required)
- Funding (magnitude of funding required, development of different models of funding needed, decisions about who pays/benefits from collective efforts)
- Factors affecting willingness to invest in on-farm improvements (e.g.: short-term leases on agricultural land, offshore land ownership; state of surrounding infrastructure, etc.)
- Management/maintenance of drainage system: many partners/pieces and conditions/needs are changing over time
- Raising awareness of value of agriculture for our communities & economically (education and outreach pilot project underway through Delta Farmers Institute/Climate Action Initiative)

Key areas where individual action is possible, include:

- Most actions to mitigate risks will occur at the individual level: producers will take steps to protect their property and livelihoods
- Implementation of areas of municipal responsibility, where funding/authority is present (e.g.: infrastructure planning & upgrades)

Factors affecting adequacy of knowledge to support action, include:

- Location: the information you require and your response to salt-water flood risk depends on where you are located
- Type of flood risk (different infrastructure and management needs for freshet versus rainfall-driven, versus coastal flood risk)
- Interactions of different parts of the system (e.g.: implications of flood management & infrastructure, for drainage system needs and design)
- Uncertainty of projections (e.g.: we know that sea level rise is happening, but timing is not entirely predictable)
- Public, policy-maker and decision-maker awareness of the information that we do have (education and stronger messaging is required to communicate need and importance)
- Ability to monitor conditions to keep up with changing requirements for maintenance, upgrades, adaptation

Key knowledge gaps or questions identified, include:

- How does salt-water (and salinity) affect different types of crops
- Is drainage the best approach to mitigate salt water flood risk, or should we be choosing different crops?
- Some aspects of infrastructure/planning have had less attention to date, need to consider climate change implications (e.g.: sea dams)

4. World Café Dialogues

The next part of the day was structured as a World Café dialogue. This format was chosen to enable generative dialogue about the planning and decision-making implications of each of the three flooding case studies outlined in the study (one in each community: Delta, Surrey and Richmond). The first two rounds of discussion were specific to one of the three case studies at each of three breakout tables. A summary of the main ideas from these discussions is outlined below. This was followed by a third round of broader discussion about compelling opportunities for action across the region.

Discussion Rounds 1&2: Delta Case Study

What about this case study is new, helpful, or compelling for your area of work? What important questions does it help you to answer, that we couldn't answer before?

- Winter flood impact is potentially undervalued
- How important drainage is for salinity management (but there are a lot of knowledge gaps still, and producers think impacts would be more significant)
- Key role of seasonality of flooding, for economic impacts

What are we learning from this that could be applied to planning & decision-making in the region?

- Dollar values are interesting and potentially useful to make the case to senior levels of government & leverage funding for dike improvements
- Farmers maybe need to consider how to protect their own investments on-farm (e.g. flood proofing). But, there are potentially barriers to this action (e.g. there are issues around fill & farming on fill on top of good agricultural land).
- Salt water seepage is a large potential issue –dike designs to address this? (traditional dike vs. modern dike which prevents seepage)
- High cost of dike improvements - does it make more sense to explore offshore defences as a more cost effective measure?
- Challenges around land ownership and cost of land
    - Leases are an issue for investment
    - Offshore owners less likely to invest in improvements
    - Land costs high

Discussion Rounds 1&2: Surrey Case Study

What about this case study is new, helpful, or compelling for your area of work? What important questions does it help you to answer, that we couldn't answer before?

- Better understanding of economic value and impacts for agriculture (for decision-making and educating the public)
- What is being planted may not be appropriate in light of flood risk (e.g.: perennials in areas where flooding is likely)
- Cumulative damage to perennial crops is a concern
- Impact of flood timing on economic consequences; precipitation-driven flooding could happen anytime, and need to consider cumulative effects of smaller precipitation events
- There is a small window for agricultural production, growing shorter due to increased rainfall
- Need for increased stormwater management capacity to deal with changing precipitation patterns
- Hillside housing developments exacerbate flood issues in lowlands

What are we learning from this that could be applied to planning & decision-making in the region?

- May inform producers to consider whether to invest in certain technology (e.g.: drainage)
- May need to invest in new types of stormwater management infrastructure
- Economic impacts for agriculture would be higher than the study suggests
- Costs and limits of infrastructure, mean that we may have to consider options for retreat

- Need to focus on cost-effective solutions
- Need to look at options for alternative infrastructure (soft infrastructure, green infrastructure)
- Some farms have agreements with municipal government to allow flooding, and Surrey has spillways where it can flood land when required
- Delta case study is relevant to Surrey: sea level rise will increase vulnerability over time, so we need to consider land use change, insurance and community support
- Need to discuss reality that flood risk is not going to decrease over time, but increase, due to climate change

Discussion Rounds 1&2: Richmond Case Study

What about this case study is new, helpful, or compelling for your area of work? What important questions does it help you to answer, that we couldn't answer before?

- Different impacts/considerations for perennial crops
- Difference between economic impacts of 1 week and 2 week duration flooding (and this may be underestimate when you factor in repairs to dike plus time to drain)
- Freshet and tidal influences on duration and depth (East Lulu Island more vulnerable to freshet)
- Would internal dikes or cranberry dikes protect agriculture in case of a dike breach?
- Silt build up on cranberries would be devastating
- Infrastructure on agricultural lands may be more of the impact than crop damage
- Timing of flooding is critical
- How channelization and flood management of the river upstream has implications for Richmond/Delta. Is agricultural land seen as floodable to protect other areas? In past experience, flooding lands upstream has had negligible impact on water levels downstream

What are we learning from this that could be applied to planning & decision-making in the region?

- Value of other infrastructure and other development in Richmond could justify flood protection infrastructure that also protects agricultural lands
- Understanding true value of agriculture to the community & economy is critical for including agriculture in decision-making. It is easy to overlook agriculture when such risk to residential and business.
- Dike utility: look for lessons learned, how did this come to be supported?
- Need to prepare and prevent flooding—once flooding happens, all you can do is clean up
- Need forward thinking—plan/design infrastructure & management strategies for long term

Discussion Round 3: What bold steps could we choose that would make the most different to the future of agriculture in this region?

In the third round of discussion, groups were asked to draw together the threads of all of the earlier discussions to explore the question:

- What bold steps could we choose that would make the most difference to the future of agriculture in this region?

A summary of the ideas generated are grouped below into the following themes:

- *Policy & Planning*
- *On-Farm Improvements*
- *Land Management & Use*
- *Research, and Education*
- *Communication*

Policy & planning

- Integrate agricultural impacts into Fraser Basin Council's regional flood adaptation project
- Collective approaches at policy level (e.g.: intergovernmental policy document agreed to by municipalities all along the lower Fraser, committing to a shared approach to flood management & planning)
- Surrey's bold step: report to council, looking at 2070 sea level rise projections & implications for current flood infrastructure
- Explore options for funding of adaptation measures and flood infrastructure through existing or new taxation vehicles; some creative ideas include:
    - Earmark from existing taxes
    - Assign 0.5% from Transit Referendum Tax to flood infrastructure fund
    - Direct Carbon Tax revenues to flood adaptation
    - Sequestration tax credits for farmers
- Collective approaches to preparedness, planning and response to flood risk for agricultural land (how can we come together to support preparedness & response?)
- Look at different approaches to flood protection (e.g: surge protection, barrier islands). What critical pieces of infrastructure do we have to build/upgrade now?
- Other infrastructure (urban, highways, railways, etc.) will be impacted—explore opportunities to leverage funds to also protect agricultural land
- What is the community's vision? What do they want to spend their money on? It has to be a community solution

On-farm improvements

- Invest in drainage systems—current benefit & large factor in mitigating damage in event of flooding; also less costly than some other options
- Look at ways of addressing farmer costs incurred by flood event damage, build farm preparedness & resilience – (ie: support farms/farmers so that flood risk doesn't result in them going out of business) – putting funds here may be more efficient than investing in large infrastructure

Land management and use

- Support land ownership / long-term leases for farmers, to create incentives to invest in improvements to land
- Re-examine what we are growing and in which locations
- Short-term there are actions that can be taken for agriculture to continue in this area. When we look past 100 years, sea level rise becomes so great we may have to look at transition strategies. When to make this decision?

Research

- Identify outstanding knowledge gaps that prevent us from moving forward
- Look to other jurisdictions facing similar flood risk and see what they are doing (Holland, Netherlands, Denmark)

Education & communication

- Education of general public on impacts to their food sources—impacts of flooding to agriculture & food security
- Publicly release important reports like this one and get the discussion going
- Be bold about messaging – don't assume people understand
    - We're all in this together (don't focus on agriculture alone)
    - Work with the media
    - Talk about the true costs of impacts & flooding
    - Communicate the impacts for citizens—local food supply matters! (eg: price of food; security of food supply as impacts to other regions reduce their production; 3 day supply locally, in case of disaster event)
- Educate local government Councils so that they can think about full value of agriculture and factor this into decision making (so they have better information to apply to their efforts)
- Education of citizens about costs of infrastructure & preventative measures, and the need to begin planning & building decades in advance

Conclusions

The "host" organizations of the Delta Farmers Institute, the Corporation of Delta and the BC Agriculture & Food Climate Action Initiative thanked participants for their contributions to the session. A reminder was also provided that these groups are all active in the on-going implementation of projects from the *Delta Adaptation Strategies* and this Forum is part of that implementation process. These organizations are also committed to ensuring that the study and its findings are shared and continue to be applied in future work.

A commitment was made to provide a summary of the Forum discussions and findings back to participants via email. In addition, although the full study and study summary are not yet public, participants will be notified as soon as this occurs.

Appendix 1: Participant List

Name	Role/Organization	Government	Producer/ Producer Association	Other
Carrie Barron	Engineer, City of Surrey	1		
Jack Bates	Delta Producer (blueberry)		1	
Philip Bergen	Agriculture and Agri-Food Canada	1		
Harmony Bjarnason	Climate Action Initiative			1
Mike Bristol	Deputy Inspector of Dikes, South Coast Region, FLNRO	1		
Mike Brotherston	Manager of Climate and Environment, Corporation of Delta	1		
Nancy Chong	Delta Producer (blueberry)		1	
Erica Crawford	Facilitator			1
Angela Danyluk	Corporation of Delta	1		
Dave Duchek	Producer		1	
Theresa Duynstee	Metro Vancouver	1		
Harald Fograscher	Corporation of Delta	1		
Hugh Fraser	Corporation of Delta	1		
Dieter Geesing	Ministry of Agriculture	1		
Pat Harrison	Agriculture Food Safety Advisory Committee (AFSAC) Surrey, BC		1	

Geoff-Hughes Games	Ministry of Agriculture	1		
Brent Kelly	Delta Producer		1	
Jerry Keulen	Delta Producer		1	
Jaclyn Laic	ArdCorp		1	
Steve Litke	Fraser Basin Council			1
Emily MacNair	Climate Action Initiative Coordinator			1
Matt Osler	Surrey planner, engineer sea level rise	1		
Mark Robbins	Report Author			1
Carla Stewart	Surrey planner, advisor to AFSAC	1		
Kristi Tatebe	Report Author			1
Christine Terpsma	Delta Farmland and Wildlife Trust		1	
Mike Wallis	Fraser Valley Cole Crop Growers' Association and BC Cranberry Growers' Association		1	
Leisa Yee	Delta Farmers' Institute		1	
		Government	Producer/ Producer Association	Other
		12	10	6