AgriRisk: Grape and wine value chain risk scenarios workshop report

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March 15th, 2018

Risk Proofing Nova Scotia Agriculture: A Risk Assessment System Pilot (AgriRisk)
Nova Scotia Federation of Agriculture would like to recognize the collaborative relationships that exist among Agriculture and Agri-Food Canada and the Nova Scotia Departments of Agriculture and Environment.

Acknowledgements

The authors gratefully acknowledge the many dimensions of support provided by NSFA, NSE, NSDA and AAFC. Many people have contributed to the development of the materials that went in to the scenarios workshops and thence the workshops themselves. We are grateful to them all. In particular we are grateful to the many contributions made by Francisco Diez, Rachael Cheverie and Amy Sangster of Perennia, thank you. Joanne Moran (GGANS) and Jerry White (WANS) have been tremendously helpful and supportive, thank you both. The growers and wine makers of Nova Scotia have been extraordinarily generous with their time and knowledge. Thank you, it makes all the difference in the world. The support provided by Heather MacDougall, Stephen Ford and Ritu Gautam of NSLC has been unprecedented and is greatly appreciated, thank you. Mark MacPherson has been rock solid in his support and guidance, thank you.

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Introduction

Three workshops were held with select stakeholders of the AgriRisk project in February and March 2018. The first two of these workshops were targeted at growers and wine makers. The third was targeted at senior leaders of the wine producing and grape growers' associations of Nova Scotia (WANS and GGANS), extension staff from Perennia and researchers from AAFC research facility in Kentville.

The workshop objectives were:

1) Demonstrate some of the results that the AgriRisk project was producing;
2) Show some of the tools the project was developing (and hence the user interfaces to some of the data);
3) Get feedback on both the data and tools;
4) Explore how industry representatives might respond to the scenarios that were presented.

In this report we present the results of these workshops.

Workshop processes

The workshops were designed to be highly interactive so that industry representatives were not burdened with huge volumes of data and tools but could engage meaningfully with the data and tools that were being produced by the AgriRisk teams. A total of 35 individuals participated across 3 workshops. Several individuals participated in more than 1 workshop resulting in a total attendance of 53. Participants represented wineries and WANS, grape growers and GGANS, NSDA, NSE, and NSFA. Participants also represented lead AgriRisk partners, governance, management, and technical teams

To achieve the stated objectives, workshop participants were divided into small groups that comprised (in the first two workshops): growers, wine producers, extension staff, WANS and GGANS representatives. Two such groups were formed in the first and three in the second workshops. Once these groups were formed they were informed that they now represented their industry (i.e. the grape and wine industry of Nova Scotia). They were asked to setup this mini-industry with the following:

- A small grower (4 acres)
- A medium grower (11 acres)
- A medium winery (5 to 10,000 cases per year)
- A large winery (>20,000 cases per year)
- Two associations (GGANS, WANS)
- Perennia

- NSLC

As NSLC did not have representation at the workshops they were not used in this group formation. In addition, groups did not always have sufficient participants to develop all roles. For the most part groups ended up having a winery, a large grower and a small grower. Participants were asked to play their role(s) and that they would be asked to respond to scenarios once they had established the simulated industry. Participants in each group were asked to draw the locations of their vineyards on a sketch map and to negotiate contracts or agreements with the wineries that were present in their groups.

The stage was set for the groups to simulate how they would respond to the scenarios that were to be presented in the following way:

- For growers (please document each of these decisions):
- Discuss with Perennia where in Nova Scotia you should locate your vineyard
- Decide on the varieties from the 14 options, and areas of each
- Sketch a map to show locations of your vineyard
- We are in the year 2020 and your vineyards are in full production
- For wineries (please document each of these decisions):
- Negotiate contracts or agreements with the growers
- Decide on your production goals (given these agreements)
- WANS and GGANS – what do you do?

Finally, the groups were asked to respond to the presented scenarios through identifying what they would do (as an industry or individuals) with respect to:

- Production practices
- Marketing practices
- Relationships
- Advice, information, knowledge
- Advocacy, lobbying
- Other

For each group a dedicated note and response taker was nominated.

The third workshop was designed with different objectives in mind:

1) To provide an overview and summary of the first two workshops and to elicit feedback on those;
2) To identify errors and omissions in the models and analyses;
    - Gaps, problems, things that are great
    - What could we do differently?

- What could you contribute to make it better?

3) To identify key messages and products;
    - Climate
    - Bayesian network
    - Other
    - For whom, how?

4) To explore options for sustaining the initiative
    - What does sustainable look like?
    - How can we achieve that?

Scenarios presented

In this section the three scenarios that were presented to workshop participants are briefly described and the supporting information provided to participants is presented. All scenarios were presented as:

1) A brief statement of the scenario;
2) Supporting evidence for the scenario claims.

After the first two scenarios were presented the participant groups were asked to respond to the scenario using the categories identified above (e.g. Production practices, marketing practices, etc). Responses were discussed among each group, but no barriers were imposed on cross group discussions. The responses were documented by the rapporteurs assigned to each group and these are summaries in the key responses section of this report.

In none of the workshops was there sufficient time to have the groups respond to the third scenario as groups. Rather there was discussion on the potential utility of the BN tool to explore the proposed scenario as well as others the industry were likely to be interested in.

Scenario 1

Scenario statement: WANS gets reliable information that historical patterns of wine sales are changing, and this trend is set to continue

Supporting evidence:

Two lines of evidence were presented. In the first, the global dataset developed by Anderson, Nelgen, and Pinilla (2017) was used to highlight trends in comparable wine markets which illustrate a flattening of per capita demand for wine (Figure 1, Figure 2).

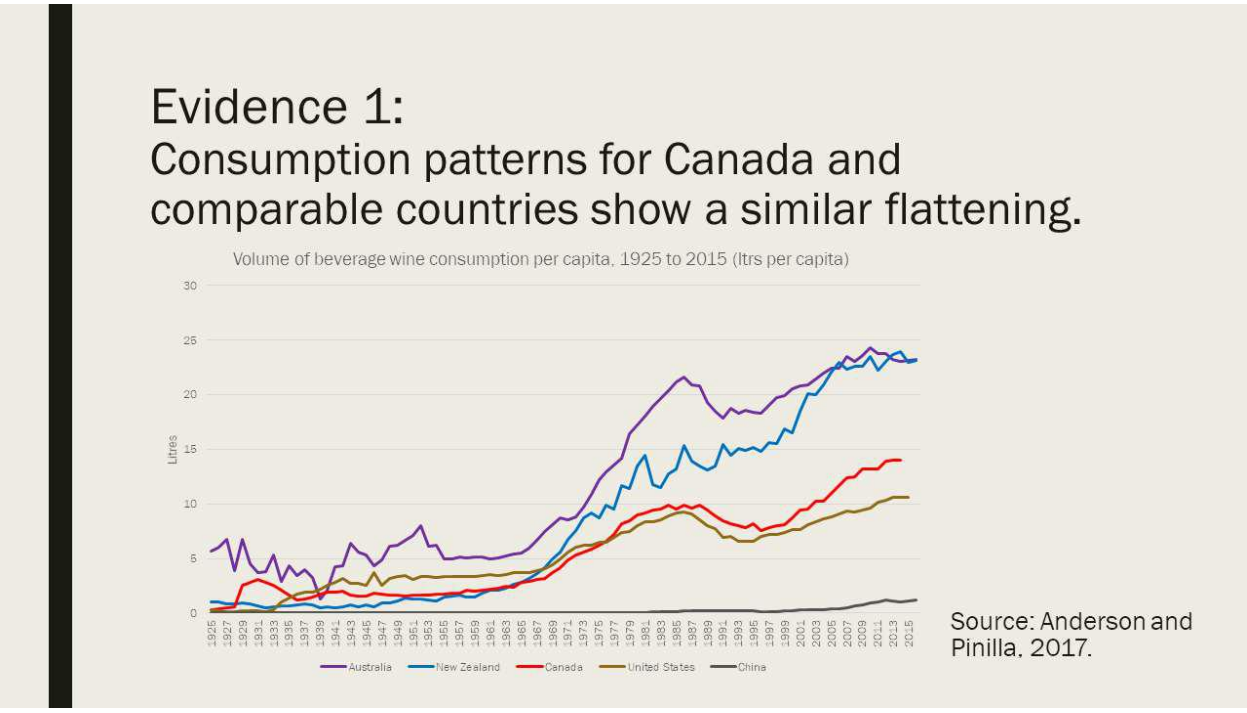

Figure 1. First piece of evidence presented in support of the scenario that wine sales of Nova Scotia wine were flattening.

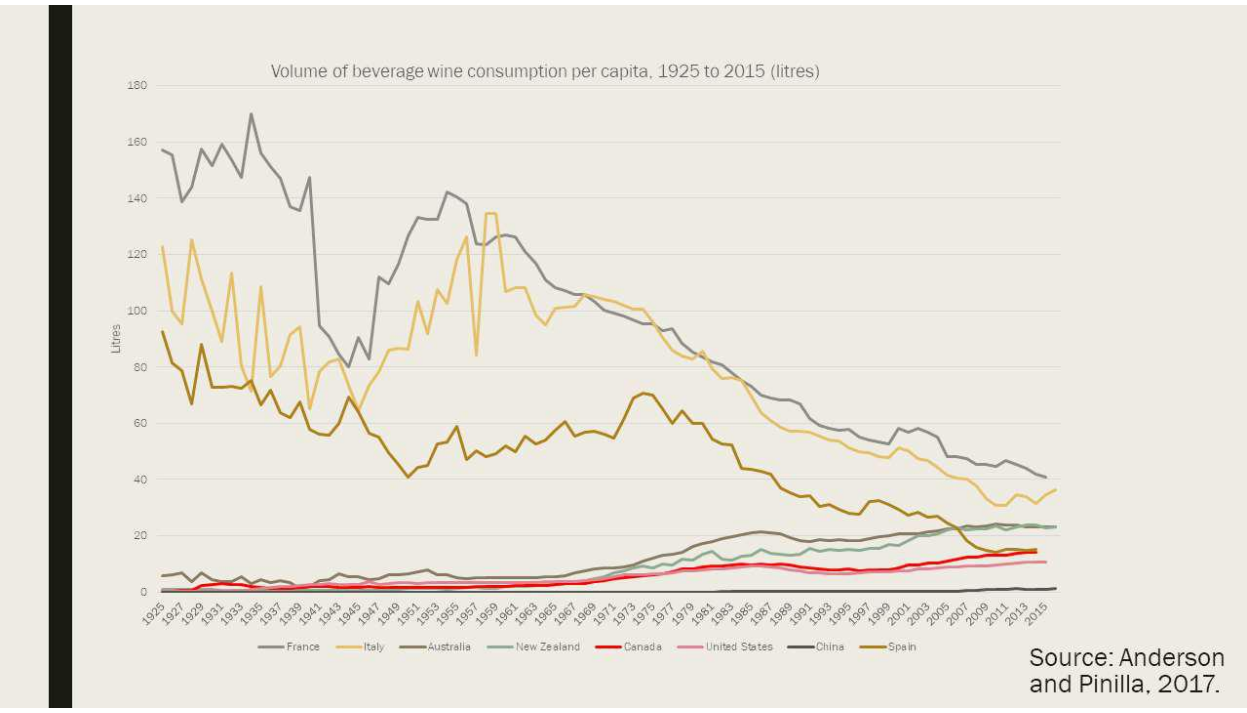

Figure 2. Additional evidence in support of the first piece of evidence.

In the second line of evidence the analyses conducted by Reflecting Society of NSLC annual volume per capita sales of wine were shown using an online app that enabled users to explore trends in different aspects of the NSLC sales database. Statistical models fit to the NSLC data

suggest a flattening of sales per capita from the 2008/09 to 2016/17 financial years. Results for two forms of statistical model were presented as being the best fit to the data: a linear model and a non-linear model. The analyses clearly identified the data as arising from the non-linear model relative to the linear model (Figure 3, Figure 4).

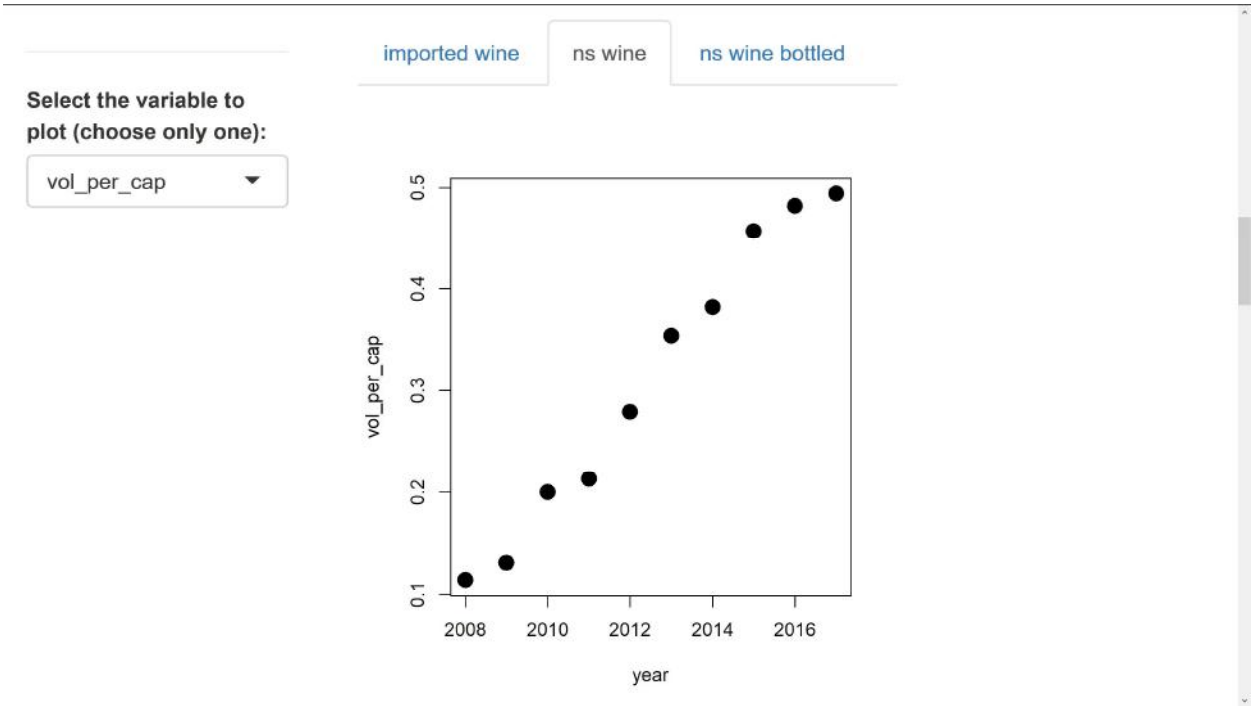

Figure 3. Screenshot of the wine sales R Shiny app with data for per capita consumption of Nova Scotia wines plotted for each financial year.

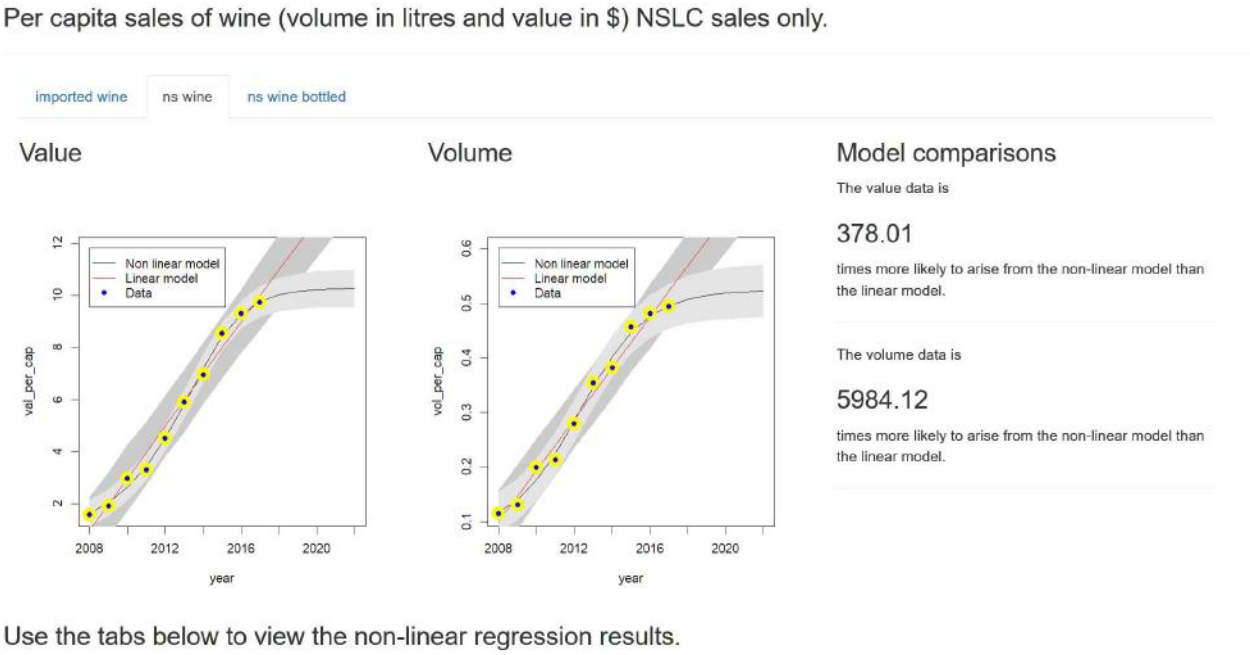

Figure 4. Screenshot of comparisons of linear and non-linear models as explanations for the per capita trends in sales volume and value for Nova Scotia wines for each financial year. Screen shot from Nova Scotia wine sales R Shiny app.

Having seen the trends in results used in the scenario workshop participants asked if they could see data for specific varieties. These data were not available in the app but were presented as slides.

Scenario 2

Scenario statement: Perennia provide the NS wine industry with convincing information that the climate over the next 10 to 15 years will be very different to what it is now.

Supporting evidence:

The R Shiny climate demo developed by Reflecting Society was used to illustrate the climate change scenarios. The app was briefly introduced to participants and then participants were shown the expected changes in frost free days (FFD), days less than -23°C and days greater than 30°C (Figure 5, Figure 6, Figure 7, Figure 8). In addition to seeing these demonstrations from the app participants were told that growing degree days would increase by about 8 to 10% by 2035.

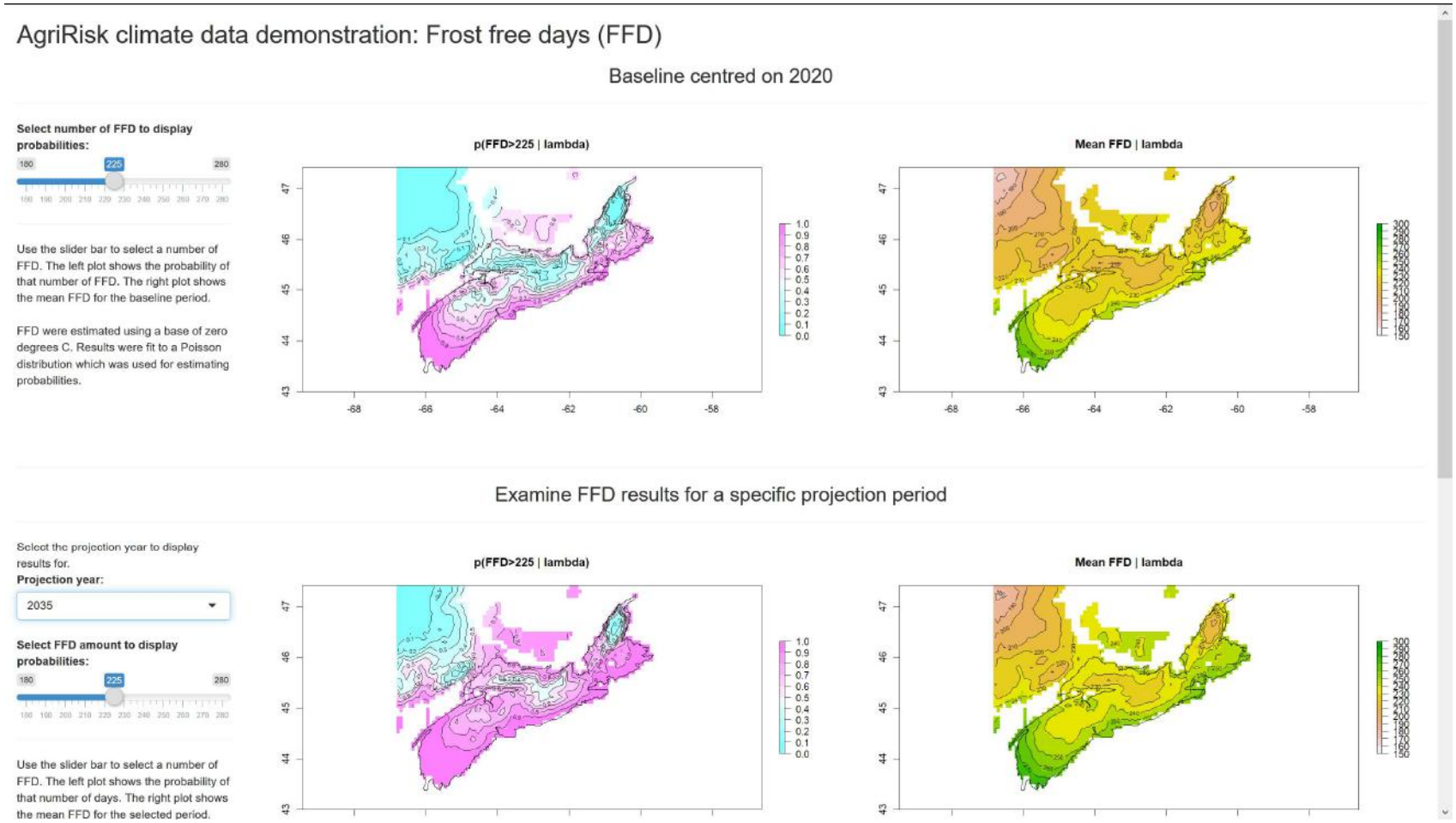

Figure 5. R Shiny app climate demo for frost free days (FFD). The top set of maps shows the results for the baseline projection period (i.e. centred on 2020) with the probability of a user selected number of FFD shown at left and the man number of FFD (for a season) shown at right. The user could select a number of FFD using the slider bar at top left and see the resulting probability in the top left figure. The second set of maps enables the user to select a specific projection period and see the results for (at left) a selected number of FFD and at right the mean for that period.

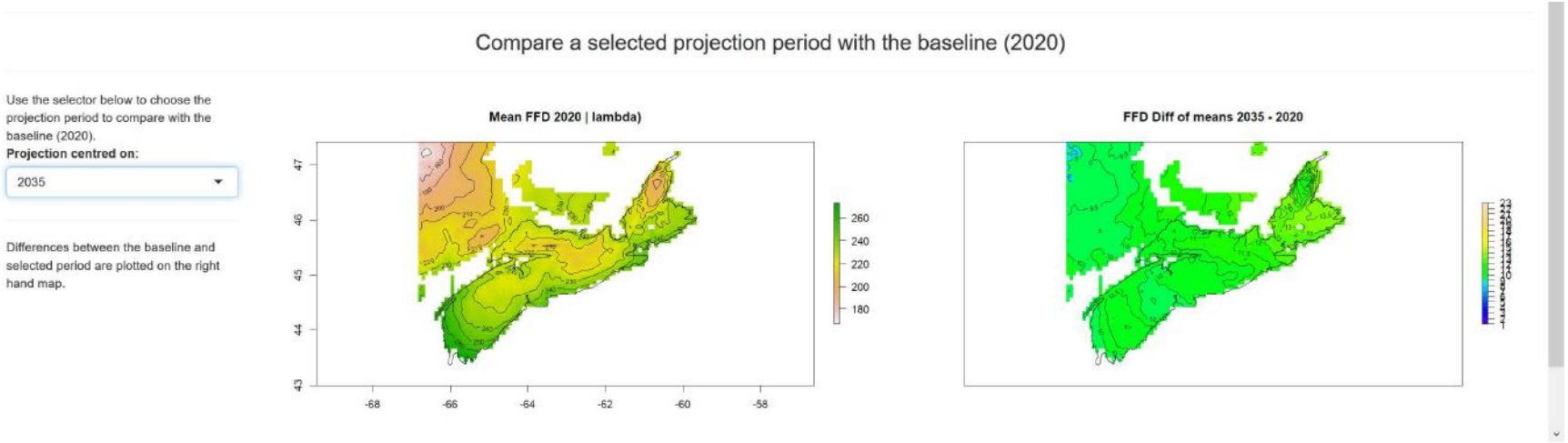

Figure 6. The third set of panels in each climate app shows the difference between the baseline and projected period for (in this case) FFD. The map on the left illustrates the baseline mean whilst the map on the right shows the different in mean FFD between 2035 (the selected projection period) and the baseline.

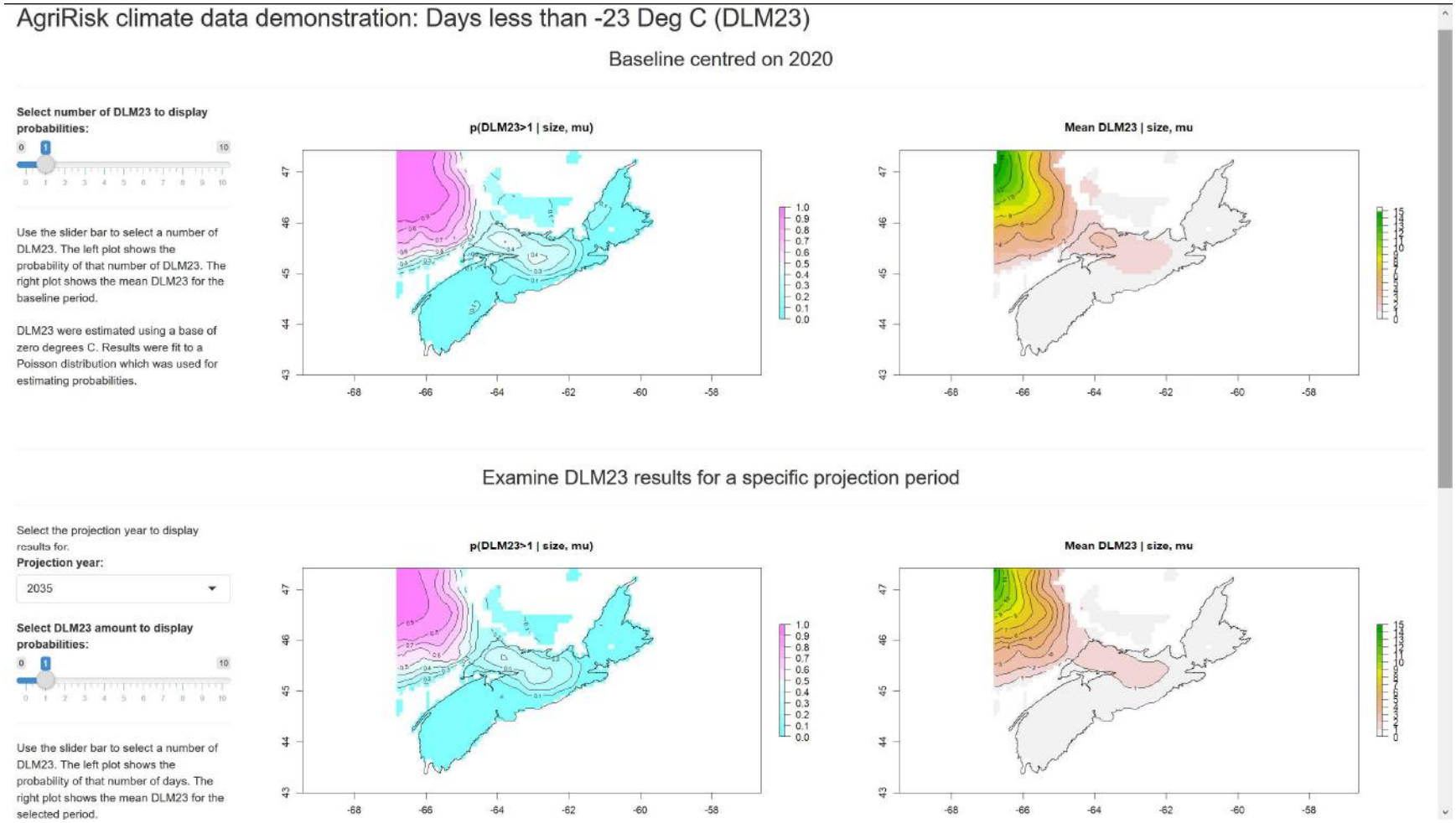

Figure 7. R Shiny app climate demo for days less than -23°C (DLM23). The top set of maps shows the results for the baseline projection period (i.e. centred on 2020) with the probability of a user selected number of DLM23 shown at left and the man number of DLM23 (for a season) shown at right. The user could select a number of DLM23 using the slider bar at top left and see the resulting probability in the top left figure. The second set of maps enables the user to select a specific projection period (in this figure 2035) and see the results for (at left) a selected number of DLM23 and at right the mean for that period.

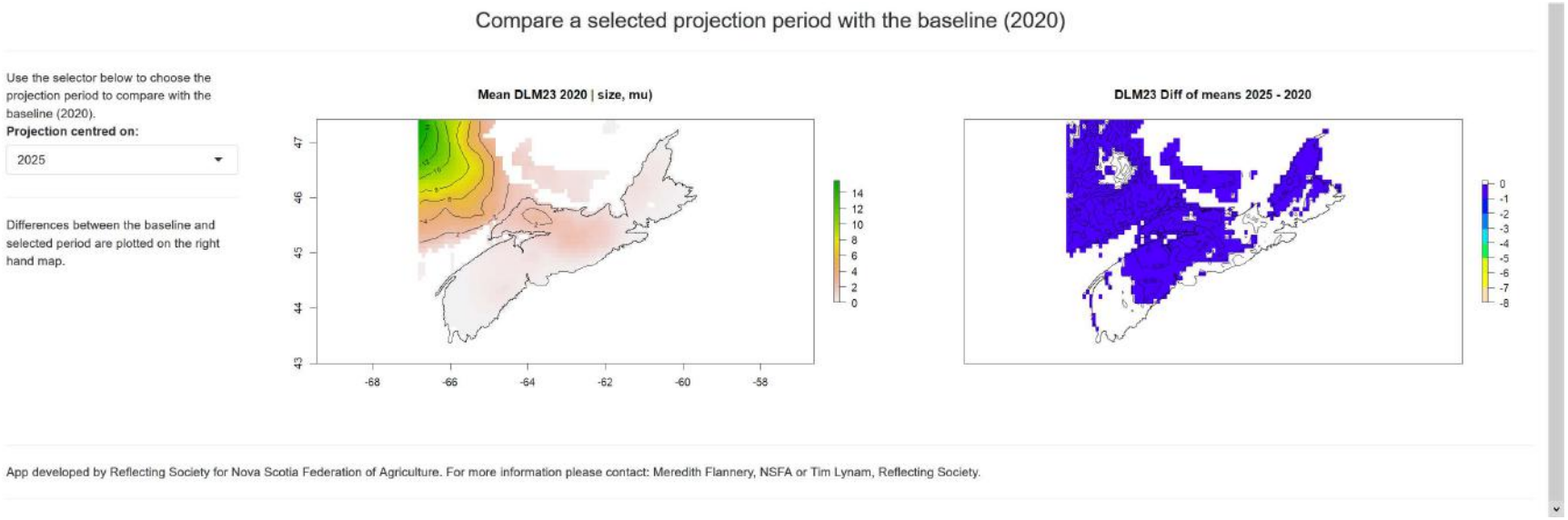

Figure 8. The third set of panels in each climate app shows the difference between the baseline and projected period for (in this case) DLM23. The map on the left illustrates the baseline mean whilst the map on the right shows the different in mean DLM23 between 2035 (the selected projection period) and the baseline.

Scenario 3

Scenario statement: High levels of a dangerous chemical are found in wine from a large winery in Nova Scotia + an NSLC report indicates that after years of expansion local wine supply may soon exceed demand.

Supporting evidence:

This was a composite scenario that had two elements of supporting evidence. The first element was a table of results that Reflecting Society developed after looking for evidence of wine production mishaps (Table 1).

The second body of evidence was a demonstration of the AgriRisk Bayesian Network (BN) model. Given prior experience of using the Bayesian Network model in workshop settings where was noted that BN can be overwhelming (a lot of variables and linkages) workshop participants were first introduced to BN models via quickly building one as part of the workshop. Participants were asked to identify the variables that would be important for estimating a total yield model of grapes and with the facilitator built a simple BN model (Figure 9).

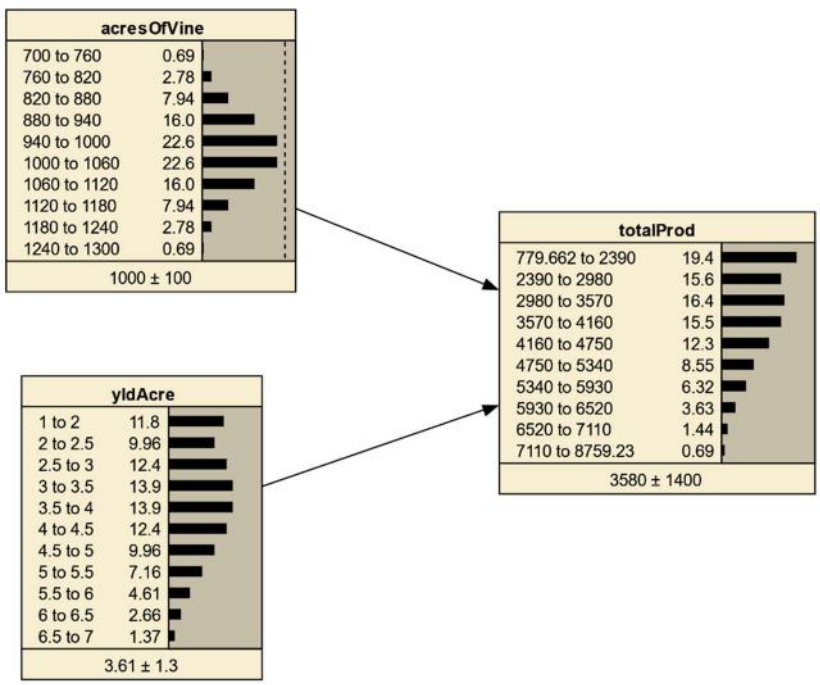

Figure 9. Simple BN model of total yield developed with growers and wineries from workshop 2.

Thereafter the presentation of the BN focused on examining the supply / demand ratio for Nova Scotia wines whilst highlighting the uncertainties and unknowns.

Table 1. Wine production mishaps and their consequences with key information highlighted in yellow as was presented to workshop participants.

Country	Winery	Region	Incident	Impact
Australia	**Warburn Estate**	**NSW**	Presence of glass inside the company's wine bottles	Full refund delivered to all consumers on a range of wine varieties. Profit losses. Unknow as to the long term financial loss or credibility
United States	**Sutter home; Korbel; Franzia; Charles Shaw White Zinfandel**	**California**	Over 30 wine brands were accused of containing dangerous levels of arsenic deemed 'unsafe'.	This claim was disputed by advocates for California Wineries. Consequently, this lawsuit was dismissed in 2016. There was no recall during the dispute however the exposure of this lawsuit is argued to have affected sales.
Australia	**De Bertoli Wines**	**VIC**	Spontaneously exploding bottles	A recall notice of a variety of shiraz wines that posed 'significant' risk to consumers.
Europe	**Vega Sicilia**	**Spain**	A problem with the trichloroanisole taint which cases 'corkiness' in wine.	The cost of the recall was estimated at $7.7 million.
Europe	**Vega Sicilia**	**Spain**	Excessive sediment in the bottles of wine produced in 2009	This was the second-time wine had been recalled through this company. The company offered to replace 500,000 bottles of wine, at significant expense to the estate. Unsure of the long term affects.

Canada	**Mogen David**	**Alberta**	Recalled due to a high presence of Arsenic	No information regarding the outcome for the winery
United Kingdom	**The Wine Society**	**London**	Recalled 15,000 bottles of its own labels Prosecco worth 145,000 pounds after they began spontaneously combusting.	The Wine Society is listed as the world's oldest wine club - the incident occurred in 2015, which was documented as the worst grape harvest in 50 years due to storms - causing champagne to be down by 15%. The recall would have affected an already struggling market for champagne in that year.
United Kingdom	**The Wine Society**	**London**	Recalled Ottoventi Punto 8 (2013) wines in 2015. The wines were recalled due to the glass wine bottle neck breaking when the cork was removed. The FSA issued a Product recall on this wine following an incident.	The company issued a refund for the product however, it was unclear as to how many bottles were sold or the profit loss.
Italy	**Riunite**	**Emilia-Romagna**	A toxic chemical found in low levels in four different Riunite wines (Ruinite is the largest selling imported label in the USA). 400,000 cases of wine were recalled. All wine was refunded	The company installed American testing machines in their Italian Laboratories to test for previously undetectable levels of diethylene glycol. All exports were forced to be tested prior to shipment to the US.

Australia	**McWilliams Wine**	**New South Wales**	Recalled seven of its fortified wines fearing damage of the flagon mouth and the presence of glass fragments in the bottle. Incident occurred in 2012	Wine was recalled from all major retail outlets in Australia and a full cash refund was given to all consumers
United States	**Cayuse Vineyards**	**Washington**	In 2017, Cayuse Vineyards recalled 3000 cases of its 2015 wines due to a consignment of faulty corks (paraffin particulates were discovered in the wine)	The company refunded all consumers who had bought the wine. No clear record of financial losses
United States	**Riunite**	**(Italian Wine, US distribution)**	(Incident occurred in 1990) The distributor of Riunite wines sought compensation from the US Government for the wrongful recall of wines with a cost to the company of $39 million.	The FDA wrongfully recalled the wine that was retested and deemed safe to drink. This case raised the question of what the government should do when it has erred in making a recall. However, it appears the company was again questioned of the appearance of Diethylene Glycol in their wines years later forcing them to test the wines before shipment to the US.
South Africa	**Nederberg (Distell Ltd.)**		(2015) Food safety authority of Ireland recall Pinot Grigio due to pieces of glass appearing in the wine.	The company issued a full refund for the affected wine - there is no information regarding the profit loss.

United States	**Indigenous Selections**	**Pennsylvania**	Reports of Prosecco bottles exploding at certain PA stores.	The company issued a warning for the bottles and offered a full refund for the product following immediate disposal due to risk.
Australia	**Samuel Gorge Pty**	**Canberra**	(2014) Recall on sparkling shiraz wine due to breakage, explosion and laceration hazards.	The company issued a full refund for this product - however, no further information regarding long-term effects are online.

Initially just the wine production components of the BN were introduced to workshop participants (Figure 10). The simple calculations that underpinned this component were described and illustrated by selecting variables and variable states in the model and noting the consequences on the total wine production for Nova Scotia node (NS wine production (litres / yr)). For example, in Figure 10 the base model elements for wine production are shown with no evidence selected or entered. In this figure the mean (standard deviation) of annual wine production was shown to be 1.89 (2.0) million litres of wine. The uncertainty therefore exceeds the mean. This uncertainty could be halved through reducing uncertainty as to the total area under grapes in Nova Scotia (i.e. by setting the starting area to 405ha, and the two growth variables of period of growth and expansion rate to 0). Sensitivity analyses of the model indicated that total wine production was very sensitive to grape yield per hectare. Through altering the uncertainties of grape yields users could reduce the uncertainty of total wine production quite considerably with the mean (std) after these findings were entered being 1.29 (0.62) million litres per year (Figure 11).

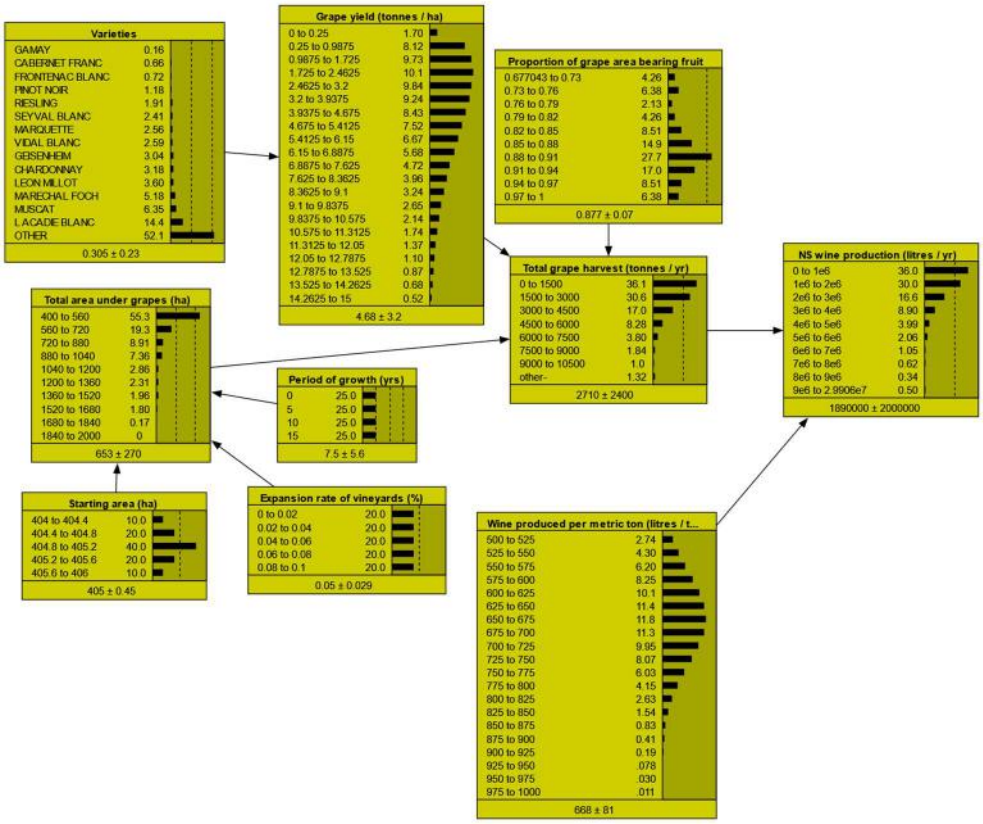

Figure 10. Wine production components of the integrated Bayesian Network (BN) model used for scenarios in the scenarios workshops.

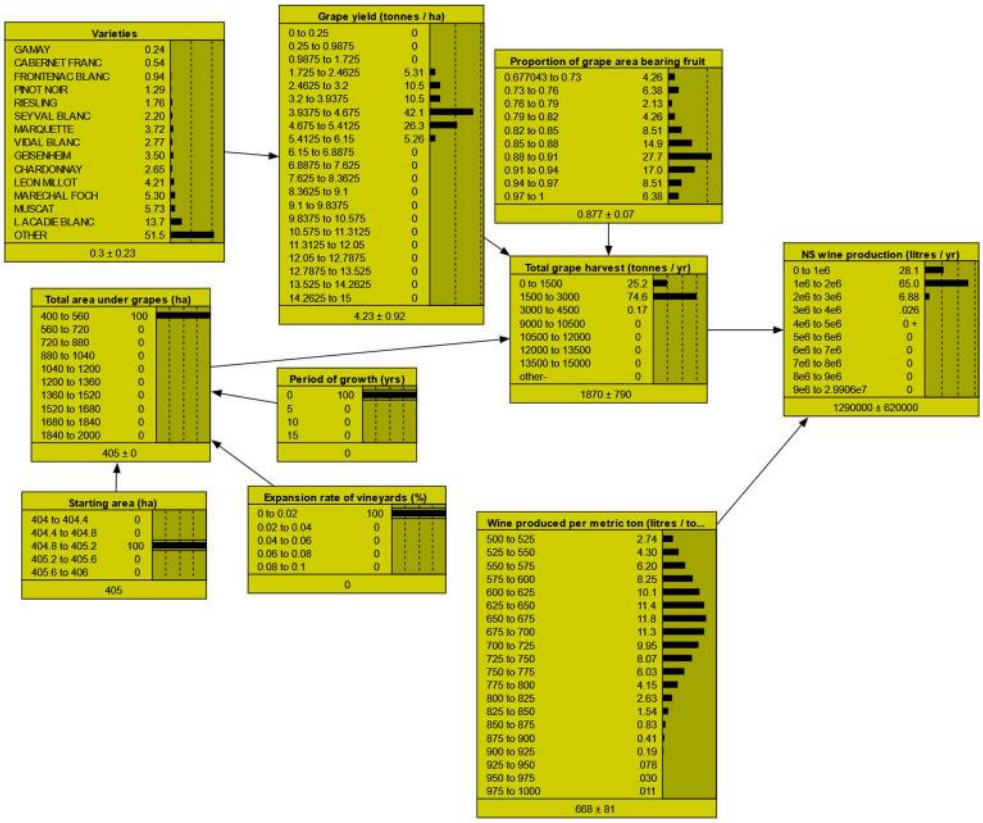

Figure 11. Wine production components of the integrated Bayesian Network (BN) model used for scenarios in the scenarios workshops with information entered (findings or evidence) to illustrate how additional knowledge reduces uncertainty.

Having examined the production side of the model, participants were then introduced to the demand side of the model. The demand side of the model was based on a simple calculation of per capita wine consumption (litres per capita per year) which was estimated from NSLC annual sales data. Because the NSLC sales did not include farm gate sales an adjustment of the per capita value was used. This mean that total sales of Nova Scotia wine (i.e. wine with 85% or more Nova Scotia grape juice in it) was the product of the estimated population of Nova Scotia times the per capita consumption divided by one minus the farm gate sales proportion (Figure 12).

Participants were shown how information (evidence) could be entered into the BN either through selecting particular states or altering the likelihood of states which is akin to altering the underlying distribution. This was done for farm gate sales proportion which was set to 0.43 (a result estimated from the NSLC data). Direct demand for Nova Scotia wine with this value entered was therefore estimated to be (on average) 0.871 (0.13) million litres per year. This is very much less than the 1.29 million litres of production (i.e. supply greatly exceeded demand).

Workshop participants were then introduced to the Nova Scotia bottled wine components in which some Nova Scotia grape juice is blended with imported grape juice. From the NSLC data

the per capita consumption of this wine (Nova Scotia bottled) was estimated to be 2.3 (0.058) litres per capita per year. None of this wine was reported to be sold at farm gate so that value was set to zero. An area of considerable uncertainty in the model was the proportion of Nova Scotia grape juice used in the Nova Scotia bottled wine. Where this value was set had a large impact on whether the model estimated an over-supply of Nova Scotia wine. As the proportion decreased the likelihood of an oversupply increased. At a value of 0.7 (i.e. 70% of the Nova Scotia bottled wine is from Nova Scotia juice) the probability that the supply of Nova Scotia wine exceeded demand was only about 0.04. But at 0.3 the probability of over-supply increased to 0.23.

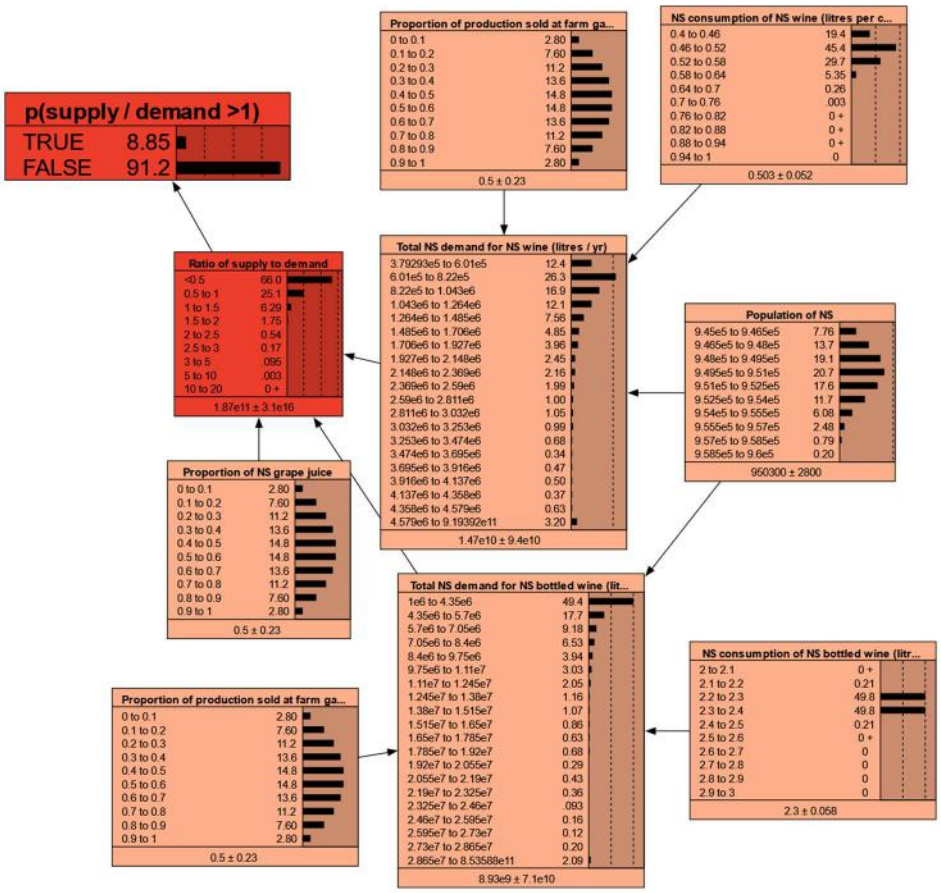

Figure 12. Demand for Nova Scotia wine components of the AgriRisk grape and wine industry BN.

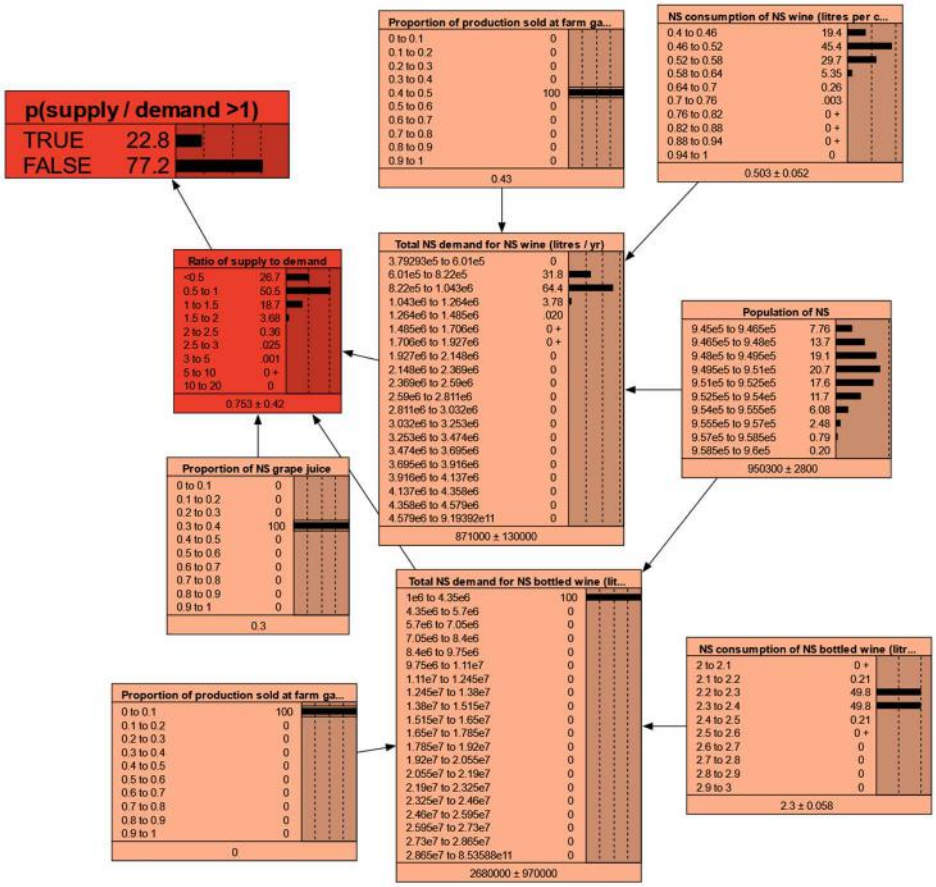

Figure 13. Demand for Nova Scotia wine components of the AgriRisk grape and wine industry BN with evidence entered for the farm gate sales proportion (0.43) and 0.3 being the proportion of Nova Scotia grapes in Nova Scotia bottled wine.

Workshop participants were also introduced to the possible consequences of continued expansion in the grape and wine sector through expansion of the area under grapes. A new area under grapes was estimated using a 15-year projection with 5% expansion per year. This resulted in total wine production being 2.15 (0.82) million litres of wine per year (with everything else in the model held the same (i.e. constant per capita consumption, farm gate sales proportions and proportion of Nova Scotia juice in Nova Scotia bottled wines). These results indicated a likelihood of 0.64 that supply would exceed demand for Nova Scotia wine (Figure 14).

Finally, participants were introduced very briefly to the whole BN model and briefly shown how it could be used at a farm level and whole of industry level (Figure 15).

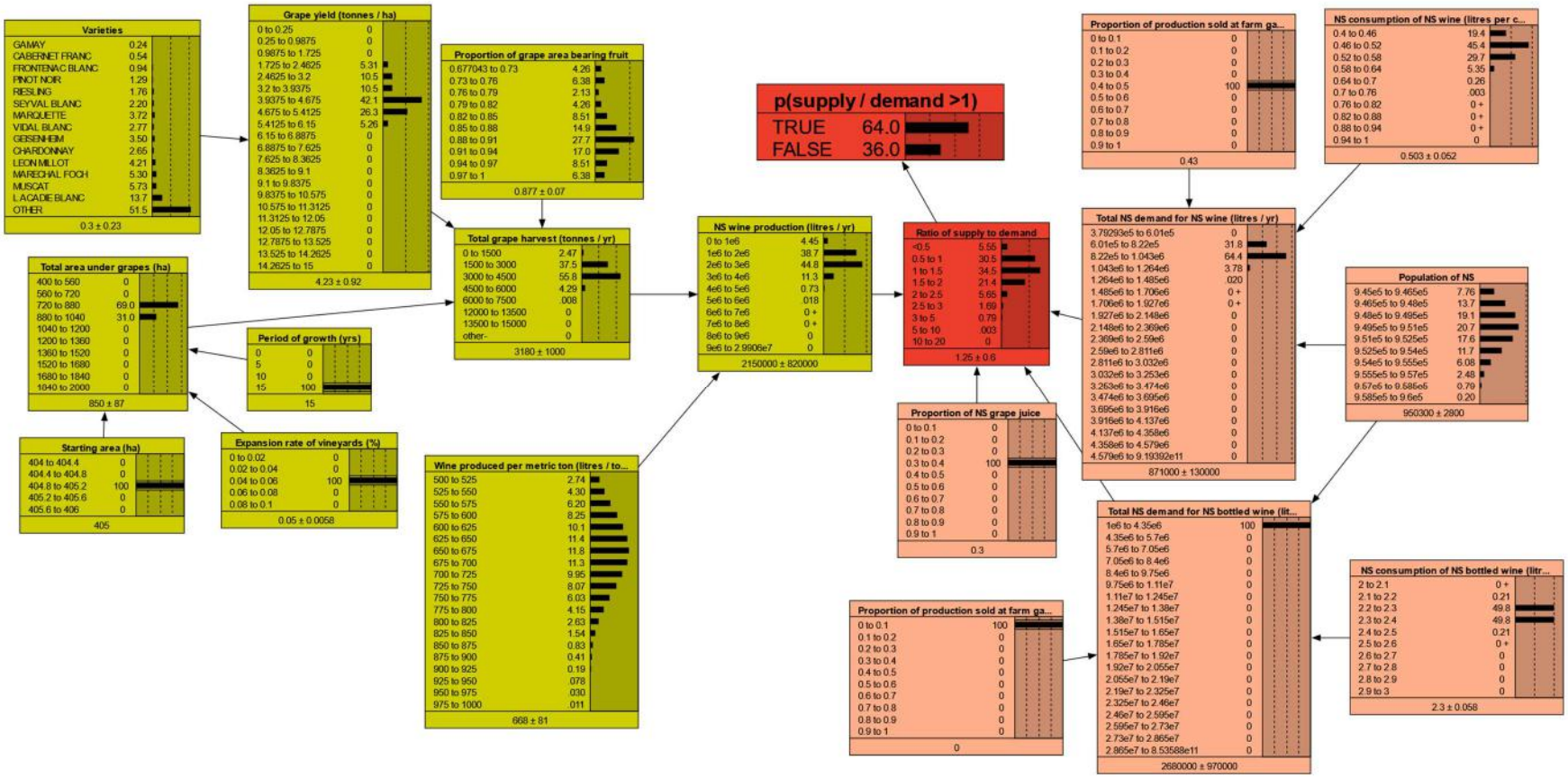

Figure 14. Supply and demand for Nova Scotia wine components of the AgriRisk grape and wine industry BN with evidence entered for the farm gate sales proportion (0.43) and 0.3 being the proportion of Nova Scotia grapes in Nova Scotia bottled wine and for area expansion of 5% per annum for 15 years.

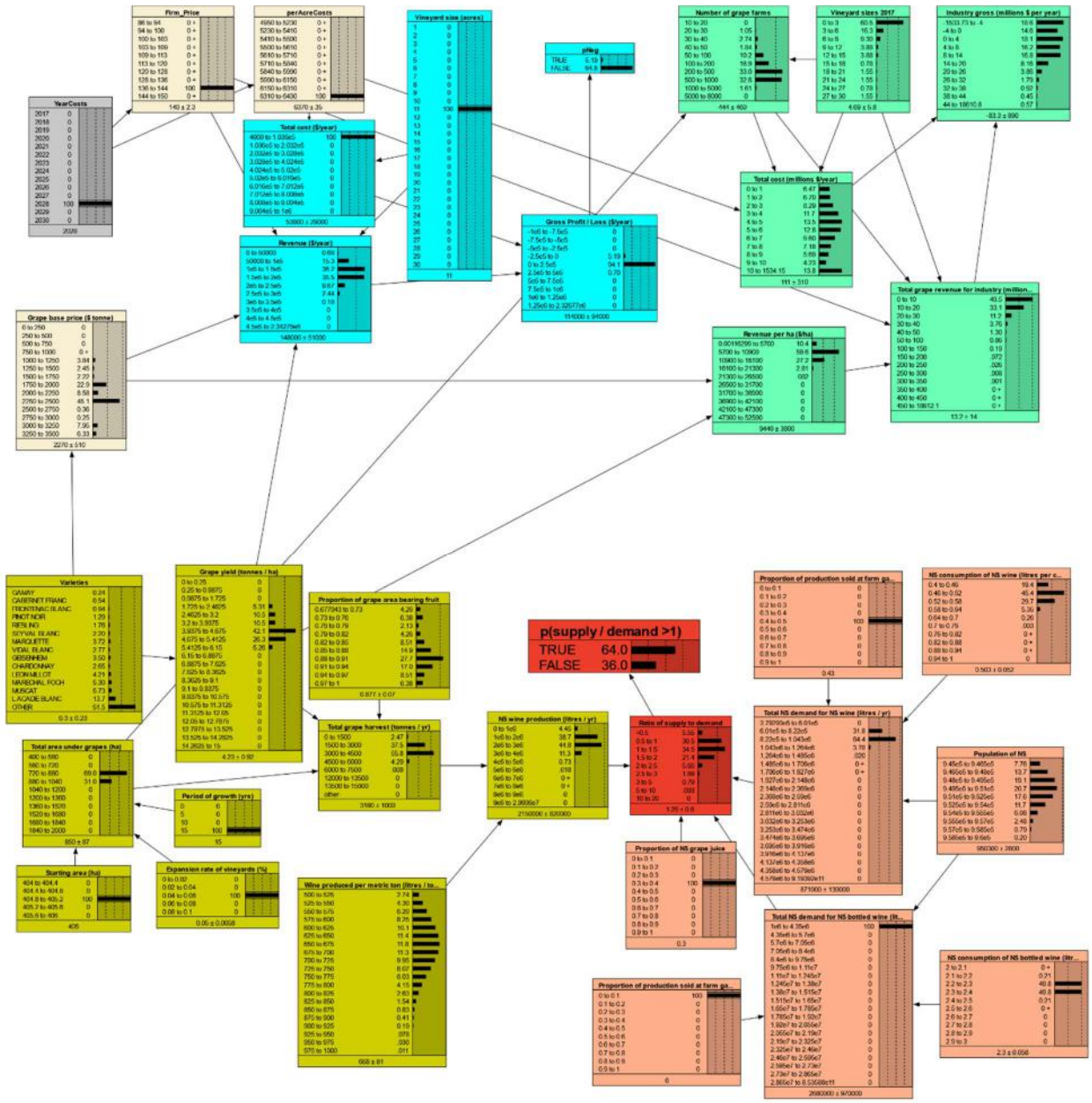

Figure 15. Complete BN model with all components shown and evidence entered for expansion program, farm gate sales proportion as well as vineyard size for farm (grower) economic modelling.

Key responses

Whilst not a response to the actual scenarios the setting up of the simulated industries among the participant groups was very interesting and provided some important insights into challenges and opportunities faced by the industry. We start therefore by highlighting some of the key points raised in the setup / establishment discussions and then discuss the scenario responses for each of the scenarios.

Insights into establishment

Although GGANS and Perennia identified the preferred approach to how a potential grower could get advice before entering the industry it was clear that this preferred pathway may not be the dominant route. Participants from the wineries reported being the first port of call for people wanting to grow grapes.

It was noted by one start up grower how difficult it had been for him to get commitment from wineries on what to plant and if they would buy his grapes given that he had no track record of producing grapes. There appears to be a circularity here of start-up growers trying to engage with wineries as to what to grow but wineries not being willing to commit or advise. This difficulty of establishing a vineyard in the "approved" way is an important element of value chain development and could benefit from some industry thinking in regards developing risk spreading options to ensure the industry grows in an effective, efficient and sustainable manner.

But this was not the pattern across all groups. In some instances, the winery – grower relationships developed smoothly, and agreements were quickly reached. But even here there seems to be scope for developing / refining winery to grower value adding agreements so that the potential risks and benefits are distributed, and hence greater value is added to the chain as a whole.

Suggestions as to what the simulated growers should plant or grow were more consistent for small growers (one or at most two varieties) than for large growers. In general, the suggestion for small growers comprised *L'Acadie Blanc* or a mixture of *L'Acdie Blanc* and *Pinot Noir*. For the larger growers the suggestions were for approximately equal proportions of three dominant varieties with small areas of some experimental varieties.

Scenario 1: Flattening consumer demand

Production practices

Common production practice responses to this scenario comprised: a) focusing on improved quality rather than quantity (with increasing product specialisation); and b) focusing on the well tested mix of varietals that could be used in either Tidal Bay wine or sparkling wines.

Marketing practices

A common marketing practice response to this scenario was to seek better information on where there were growth opportunities either in the Nova Scotian or export markets. There was recognition among some participants however that international wine markets demanded better quality wine than Nova Scotia was currently able to produce.

Relationships

A common observation emerging from these discussions was the need for better communication between growers and wineries. It was noted that shifts in products could take 2 to 3 years and it could take as much as 5 years to put a new wine on the shelf. Communication between growers and wineries, in a strategic sense, appears essential as there is an ongoing tension between what is producible from a given terroir and what the market demands in terms of type, taste and quality.

Advice, information, knowledge

Getting better data and particularly on growth areas in the demand for wine was an important response. Identifying what was happening in global markets was seen as important.

Advocacy, lobbying

Get support for the development of improved marketing advice and possibly to consider purchasing or supporting the collection of better data.

Scenario 2: Climate change

Production practices

Overall the climate change projection scenario responses suggested the climate change would likely be beneficial to growers through enabling greater flexibility, enabling the production of better quality grapes (and wines) and also providing opportunities for expanding into new areas. It was suggested that growers might add more of what are conventionally seen as more risky varietals (Riesling and more reds were suggested).

A concern with root stock and the presence of viruses was raised by one group and this became the focus of their discussion for this session. It was suggested that in the current climate, cold weather kills vines more quickly than viruses. But with warmer weather this could change, and viruses could become a bigger issue.

Relationships

As with the previous scenario the need for good communication between growers and wineries was highlighted.

Advice, information, knowledge

Uncertainty in the weather was seen as being more problematic than the changes identified in the scenario. Changes in precipitation, humidity and the dates of first and last frosts were considered important. In addition, the disease impacts of the changes were seen as being of concern.

Advocacy, lobbying

It was seen to be important that the message was conveyed that Nova Scotia was now producing better quality wines.

Scenario 3: Supply demand imbalance and production mishap

As previously noted there was not enough time in any of the workshops for groups to develop group level responses to this scenario. What was discussed among the groups were what were seen as the potential utility of the BN tools and what were some of the challenges they saw with the tools. In addition, the groups were asked to explore what sustainability of the initiative looked like. In this section these group deliberations are summarised.

What was liked

> "*This is a mechanism that could unite all parts of industry towards shared and coordinated efforts to improve NS wine industry*." [Overarching message from workshop 3 participants]

Overall the groups liked the climate demonstration models as being an easy way for users to look at climate projections. They asked for some additional variables (e.g. days less than -18°C,

precipitation, first and last frost days) and saw some that had been produced (e.g. days less than -26°C and days greater than 30°C) as not being that useful.

Participants saw the BN tool as being a potentially powerful resource for industry planning and strategizing. They felt that it:

- Showed the need for better data;
- Demonstrated why it was important to share data;
- Could support decision making and in particular, could help narrow uncertainty around key risks or at least identify the range of uncertainties associated with the risks ~ quantifying impacts with some level of confidence;
- Could be used for managing relationships with government;
- Enabled the industry to explore and understand the overall impacts of policy decisions, production decisions and changes in the market place;
- Could enable individual growers to run scenarios of risk or change and use it for planning purposes at the grower level;
- Provided support for industry to develop strategic plans;
- The tool was seen as especially important for supporting the industry to manage over-supply risk.

What was challenging

Participants recognised that the BN comprised many variables that represented a complex industry. It could be overwhelming for those who had not been working with or on it for some time. The general sense was that people needed to engage with the BN to become familiar with it and what it could do and learn how to manipulate and use it.

It was recognised that to remain current and reliable the tool would need a simple and institutionalised data collection process but one that did not compromise industry trade secrets. Maintaining the system would also require significant skills in data science.

What would be good to have

Several analyses or elements were identified as being desirable to include in future versions of the BN tool:

- Improved data on yields that enabled better linkages to climate and climate change;
- Greater granularity in the demand side of the model, and in particular in terms of key wine items such as Tidal Bay and sparkling wine;
- Building a wine inventory component into the BN model;
- Building a wine quality component into the BN model;
- The BN model need improved farm gate data;
- Skills or capacity across the industry to use and maintain what has been developed;
- Competition with international wine producers.

What sustainability might look like

The sustainability question was a focus of Workshop 3 and therefore, the following are the results of participant inputs at that workshop. However, through all workshops the issue of sustainability emerged. What follows are the key elements of what sustainability might look like for participants.

A primary requirement for sustainability was for buy-in from key stakeholders. Thereafter the workshop participants identified the following requirements for sustainability:

- A simple and easy to maintain data collection mechanism (and preferably one that reduced repetitive and redundant data requests from government);
- Must be available to people;
- Needs an owner (which could be a group or a distributed owner) to keep it alive, operational and current;
- Needs to be useful and relevant to growers, producers and tourism;
- Needs funding;
- Needs a short- and long-term plan;
- Needs to be economically feasible;
- Needs a pool of people in the industry to be trained in the use of the tool and marketing of the tool was needed;
- It would need technical support for when things needed to be changed, fixed or improved.

How might we achieve sustainability?

Participants at workshop 3 developed sketches of what a proposal to achieve sustainability might look like. These are the key elements of those proposals.

- NSFA puts in proposal (Perennia as lead agency);
- Timeline = 5 years (CAP is this long);
- Define HR needs/roles/partners;
- Website needs to be built (with logos, all partners linked to it, independent of any 1 partner);
- Need database manager & software developer for website and data entry tool;
- Need coordinator;
- It would be an operational proposal;
- Need to avoid duplication – ensure relationships are maintained so communication lines are open (so many things going on with grapes – make sure to know about all of these and be sure to coordinate efforts);
- NSFA would facilitate proposal submission; some in-kind from stakeholders, $ support for grower/wineries data collection;

- Critically important to recognize and build on the need for in-kind contributions from growers and wineries;
- Important to strengthen relationships to AAFC and other academic partners who may need to work to different funding cycles and mechanisms;
- Could consider establishing an AgriRisk NGO entity (co-op?) – spearheaded by associations and NSFA, have a board. Would provide framework for expansion to other commodities, when it does then working groups for different commodities could be formed to manage commodity-relevant components.

Discussion

The scenarios that were presented to workshop participants highlighted a number of key issues facing the industry whilst demonstrating the products from the AgriRisk project. The responses to each of the scenarios also provided important inputs for further analyses using the BN and climate demonstration apps.

Overall the outputs of the AgriRisk project were favourably received with a strong push from industry to develop it further and make it available to industry users. Key challenges with the tool were identified and as far as possible will be revised in the final BN and climate demo tools. The image of sustainability that emerged was useful and could form the basis of a sustainability plan for the AgriRisk project moving forward. Some foundational elements of a sustainability plan emerged from the discussions associated with developing a proposal to achieve sustainability.

References cited

Anderson, K., Nelgen, S., & Pinilla, V. (2017). *Global wine markets, 1860 to 2016: a statistical compendium*. Adelaide, Australia: University of Adelaide Press.