

Informed Omnivore: Visualizing Organic Food Production in Canada

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ABSTRACT

This project report documents a design study in the domain of organic agriculture, and presents Informed Omnivore, an exploratory analysis tool for visualizing the Canadian organic food industry. A goal of this application is to provide consumers with the information necessary to make informed choices when buying local or organic food. I provide an overview of the domain, task, and data addressed by the application, followed by a description of the information visualization solution. This is followed by an analysis of the solution's strengths and weaknesses. This report concludes with a discussion of potential areas for future work. The contribution of Informed Omnivore is a demonstration of information visualization techniques applied to domain of organic agriculture, motivating casual users to make sustainable and healthy food choices.

KEYWORDS: Design Study, Geospatial Visualization, Agriculture, Vis for the Masses, Visual Analysis and Knowledge Discovery

1 INTRODUCTION

How can we make informed decisions when buying food? Whether it be at the supermarket, at restaurants, or at the local farmers' market, we can become overwhelmed with choice. Should we buy organic? Should we buy local? What is the best choice for you and your family, for supporting farmers in your region, or for our country and environment? These questions are inspired by Michael Pollan's book *The Omnivore's Dilemma: A Natural History of Four Meals* [12], in which Pollan investigates the American "industrial organic" food industry. He argues that the organic food industry is not a sustainable source of food for the large American population, given the size and location of the organic food supply, the demands of the population, and the process of shipping organic food over long distances. Thus the idea for Informed Omnivore was conceived out of my own curiosity regarding the current state of the Canadian organic food industry, both out of concern and skepticism. I am also curious about the practice of eating locally, and whether or not it is feasible in the many regions of this country.

On a case-by-case basis, each individual must make their own decisions when buying specific types of food. In addition to considering what is required to maintain a healthy diet for one and one's family, we must also consider the size and location of food producers. For instance, is buying organic beef raised in Alberta on a large scale ranch a sustainable food choice for someone who lives in Nova Scotia?

We might also ask if it is preferable to support small-scale family farms, especially if we are to consider the possibility of substantial carbon footprints left by large-scale organic producers and their shipping and infrastructure needs. Unfortunately, access to small-scale organic producers may not be available in all regions of Canada. Despite this, an informed consumer with

access to organic food production data can make their own decisions to support local or organic producers, ideally contributing to positive national and global efforts to protect biodiversity, support local agrarian economies, and promote sustainability.

The application described in this report, Informed Omnivore, supports the task of exploring the Canadian organic agriculture landscape, providing the user with information relating to organic food production at national and provincial scales. The goal of this task is to help consumers answer the questions posed above, allowing them to make sustainable and healthy food choices. In addition, the application must be easily accessible to users, with highly intuitive interactive controls and visualizations. For this reason, Informed Omnivore has been developed as a web application targeted at casual everyday users, requiring no technical or domain knowledge in its use.

1.1 Data

Data used by Informed Omnivore was originally published in a 2005 report by Canadian Organic Growers, a national charitable organization [7]. In addition to written statements regarding organic food production, the report contains tables of data containing the number of organic producers in the entire country and in each region, for each food category. For each individual food type, tables display the acreage and hectares of organic land use in each region and for the whole country; in the case of livestock, figures are represented by head count, rather than acreage. The report also contains overview pages for by Canada and for each region, highlighting trends over time and specific food types of interest in each region. Informed Omnivore makes use of the regional and national data tables for food categories, such as livestock, grains, or vegetables, and for individual food types, such as beef cattle, wheat, or potatoes.

2 RELATED WORK

2.1 Geovisualization tools

Inspiration for Informed Omnivore is drawn from existing visualization applications containing geospatial navigation and multiple linked views. GeoVista Studio [7] is an exploratory geovisualization tool; its strengths include dynamic queries and the ability to filter and highlight data across multiple views; also notable is its geospatial component making use colour and saturation for bivariate map displays. Improvise [20] is another exploratory visualization tool which combines coordinated queries between linked views, including a geospatial view, and a customizable approach for displaying time-series data. Improvise has also been used to track geospatial patterns over time, in domains as specific as as historic hotel visits [19].

The drawback to these tools is that they are better suited for domain specialists and analysts with specific needs, and not casual users. Informed Omnivore aims to take advantage of the information visualization techniques used in these tools, albeit on a scale that allows for casual users to intuitively explore the interface with little or no learning curve or domain experience required.

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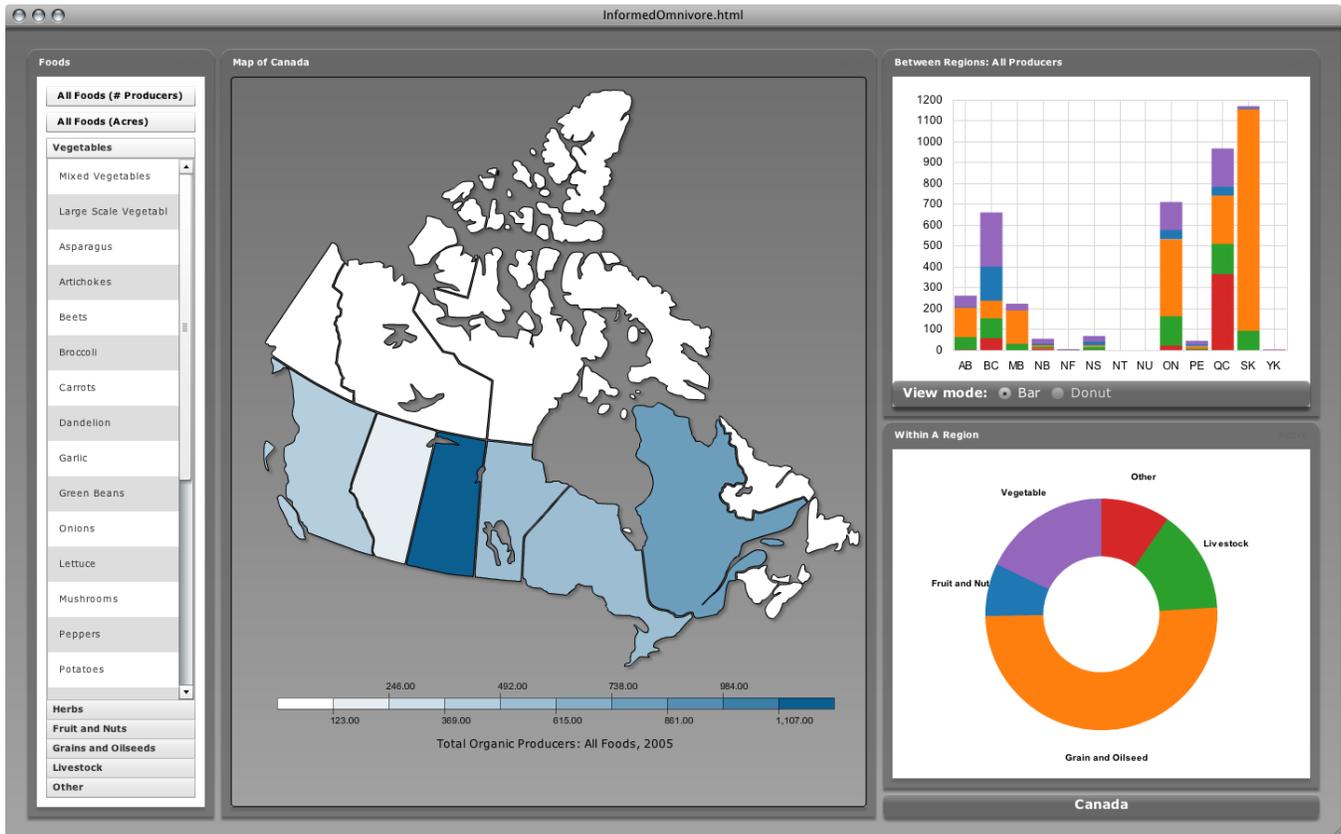


Figure 1. The Informed Omnivore user interface displayed in full; at left, the food type selection panel; at center, the map display, at right, the 'Between Regions' and 'Within a Region' displays.

2.2 Vis for the masses

Informed Omnivore is a web-based application, requiring no install or configuration on the user's behalf. The attraction of Informed Omnivore will be its ability to create conversation and discussion amongst friends and family; like the social discussion points everyone can identify with surrounding Wattenberg's BabyNames navigator [17], food is a topic that everyone can discuss.

2.3 Grassroots campaigns

Informed Omnivore also draws from grassroots efforts to support organic food producers and local farmers markets [1]. There have been instances of groups using the Google Maps API to visualize locations of organic food producers in a local region [10].

3 DESCRIPTION OF SOLUTION

Informed Omnivore is an exploratory application for visualizing the Canadian organic food industry, combining geospatial exploration with multiple linked displays for comparing food production data between and within geographical regions. The application allows users to form their own hypotheses with regards to organic food production in Canada, or to confirm or reject their own previously established hypotheses. Evaluation of these hypotheses will allow users to make their own judgements when making future food decisions.

The application supports overview-and-detail, as users can compare and analyse organic food production at several categorical scales, and by using different means or comparison; see Figure 1. To accomplish this, Informed Omnivore's user interface is arranged into four panels, with each panel serving a

distinct purpose in the sense that each conveys different aspects of the data set.

3.1 Food type selection panel

Controls on the leftmost panel aid the user to select general food categories, such as vegetables, grains, or livestock, as well as individual types of food, such as potatoes, wheat, or beef cattle. A hierarchical list of food types is represented as an accordion menu, wherein the accordion headers are general food categories, and within each accordion panel a list of individual food types. Above this accordion menu are a pair of buttons for selecting all food types, by number of food producers or by acreage. Clicking on either one of these buttons, any accordion header, or any individual list item changes the current food type selection in the other linked displays. Due to limitations of the data set, measured food production units are not consistent between all individual foods types and categories, described as follows.

All foods can be represented either in terms of the number of producers or in terms of acreage of organic land use.

Food categories are represented in terms of the number of producers, such as the number of livestock or vegetable producers.

Individual food types are represented in terms of acreage dedicated to that food type, or by head count in the case of livestock. For example, there are 484 organic producers in British Columbia, 33079 acres of certified organic land in use, 247 organic vegetable producers, 108 organic livestock producers, 457 acres of organic potato crops, and 2374 organic beef cattle¹.

3.2 Map panel

The central panel displays geographically where the currently selected food type is produced in Canada. This is done using an interactive map of the country, in which each provincial region

¹ all figures 2005

supports mouse-click and hover-over interactions. Hovering over a region displays a tool-tip containing the name of the region and the total amount of the currently selected food type in that region; a region will also emanate a glow while the cursor hovers over it. Clicking on a region changes the contents of the 'Within a Region' display to represent the data for that region; clicking a region also results in the textual display of organic food production data for that region, placed at the top right of this panel. This details-on-demand textual information contains the total number of organic food producers and organic acreage for that region, as well as the total number of units of the currently selected food type present in that region. To de-select a region, or to select all of Canada as a region, the user must click anywhere else in this panel.

Each region is coloured along a linearly increasing colour saturation encoding with ten saturation level bins; regions with a high colour saturation represent a large amount of the currently selected food type present in that region, whereas regions with little or no colour saturation contain little or no amount of the currently selected food type. The range represented by this colour saturation scale extends from zero to the maximum amount of the currently selected food type in any region. As such, the scale varies dependent on the currently selected food type and the units used to measure that food type. For instance, the scale for wheat ranges from less than 15516.3 to more than 139646.89 acres per region, while the scale for the number of livestock producers ranges from less than 21 to more than 189 producers per region. This scale is shown along with the currently selected food type and metric below the map display for easy reference.

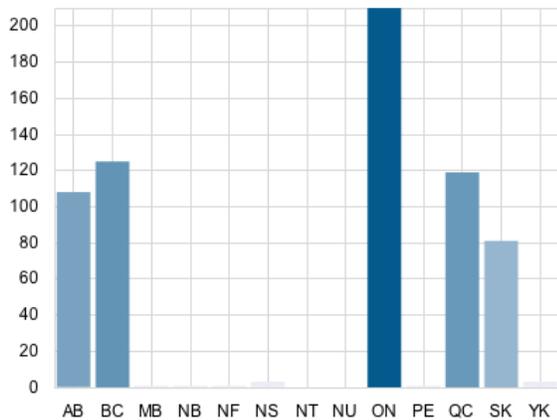


Figure 2. The 'Between Regions' display for a single food category or food type, represented as a bar chart (Livestock selected as food type)

3.3 The 'Between Regions' panel

The 'Between Regions' panel at the top right displays the same data as the map display, in either bar or donut representations. The ability to toggle between these visual representations is facilitated by a set of radio buttons at the bottom of this panel. In the bar representation, regions are arranged alphabetically along the x-axis², while the y-axis represents the count of the currently selected food type, whether it be acres, number of producers, or head count. As in the map view, the range along the y-axis in this display changes depending on the currently selected food type (see Figure 2). For instance, the scale for wheat ranges from 0 to 160,000 acres, while the scale for the number of livestock

² the alternative being arranged quasi-geographically from west to east, which may work well for a country such as Canada, having a convenient left-to-right layout of provinces, but not for other countries

producers ranges from 0 to 200. The donut representation displays the total number of units in each region as the proportion of the national total for currently selected food type; each wedge is labelled with the region name (see Figure 3). In both visual representations, hovering over a bar or wedge displays the region name, food type, and count for that food type as a tool tip. In the case of the donut representation, this tool tip also contains the percentage of the national total accounted for in that region.

The colour saturation encoding used in the map display is also used for each bar or wedge in the between regions display to redundantly emphasize the size of bars or wedges, except in the case where the user has selected 'All Foods (# of Producers)' from the food type selection panel. 'All Foods (# of Producers)' represents a special case in which the bar representation is displayed as a stacked bar chart (see Figure 1), with the number of producers for each general category of food shown as a proportion of the total number of organic producers in each region; each food category is shown as a different colour, with the colour choice being consistent with the colours used for each general food category in the 'Within a Region' display. In this case, each bar redundantly displays the the breakdown of producers of the 'Within a Region' display for the currently selected region. Also, the donut representation in the between region display is disabled, as the resulting visualization would be a confusing set of coloured wedges within regional wedges.

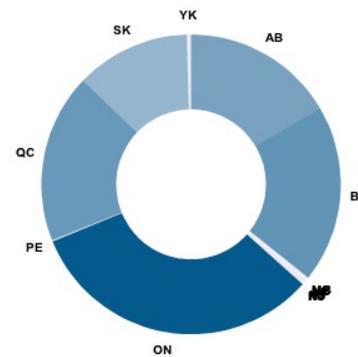


Figure 3. The 'Between Regions' display for a single food category or food type, represented as a donut chart; radial labels occlude one another when wedges are small. (Livestock selected as food type)

3.4 The 'Within a Region' panel

The 'Within a Region' panel at the bottom right displays proportional data for the currently selected region and food category, again using a donut representation. When 'All Foods (# of Producers)' is selected as the currently selected food type, coloured wedges displayed represent the broad food categories: vegetables, fruit, grains, livestock, and other (see Figure 4). The colours chosen for each wedge are identical to the colours used in the stacked bar chart representation in the 'Between Regions' display when 'All Foods (# of Producers)' is the currently selected food type (see Figure 1).

A radial-labelling scheme in addition to hover-over information shown as tool tips support this representation. Selecting a region in the map display redraws this display to show a proportional representation of the number of producers for each food category in the selected region. If no region is selected, the number of producers for each food category across all regions is displayed as a proportion of the national total of all organic producers.

When a broad food category is selected as the currently selected food type, this display is redrawn to show the proportional representation of each individual food type within that category for the selected region, with a new categorical colouring scheme, dependent upon the number of individual food types within that category (see Figure 5).

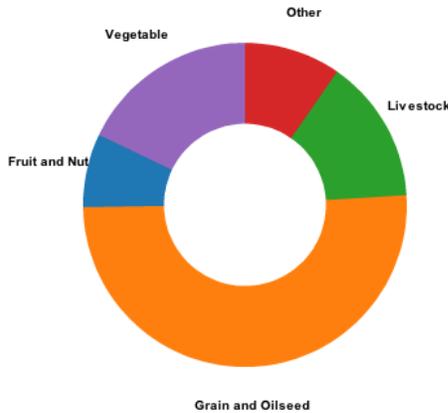


Figure 4. The 'Within a Region' display for the currently-selected region, 'All Foods (# of Producers)' selected as food type, no region selected (displaying national total)

The currently selected region is shown below this panel, along with selected food category. Depending on how many individual food types exist within a category, the radial labelling scheme may be removed to avoid visual clutter; currently this is done automatically. Recall that individual food types are displayed along different scales and metrics than broad food categories; the former being measured in terms of acreage or head count, while the latter in terms of number of producers. Finally, selecting an individual food type has no effect on the display of this panel, as individual food types cannot be broken down into smaller components.

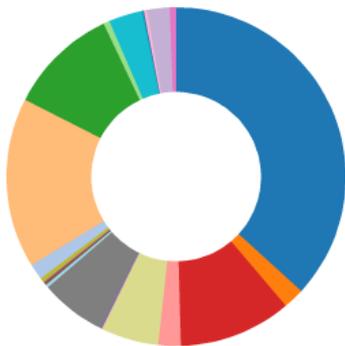


Figure 5. The 'Within a Region' display for type of livestock produced in the selected region; radial labels have disappeared to avoid visual clutter.

3.5 Description summary

In summary, Informed Omnivore uses several mutually supportive information visualization techniques and visual encoding strategies. Techniques include multiple linked views, overview-and-detail, details-on-demand through the use of tool tips and click-activated textual displays, and focus-and-context drill-down using a hierarchical accordion menu of food types. Overview-and-detail and details-on-demand techniques in particular have been

found to be highly useful when interacting with multiple views [9,18]. Visual encoding strategies include linear colour saturation encoding for the ratio variable of food amount, whether it be number of producers, acreage, or head count, consistency in colour saturation and hue encoding between multiple views, and categorical colour hue encoding to represent multiple food types in the 'Between Regions' and 'Within a Region' displays.

4 MEDIUM-LEVEL IMPLEMENTATION

A medium-fidelity prototype implementation of Informed Omnivore was created as a Flex-based web-application, and can be viewed in any web browser with the Adobe Flash plugin. The layout and user interface was written in Adobe Flex 3.0 using the Flex Builder plugin for Eclipse [2]. User interface widgets including panel layouts, button controls, list controls, highlighting effects, and the accordion control are existing Flex components. I justify the use of Flex as it contains the facility for highly intuitive interactive controls, the possibility for integrating third-party visualizations, and for the ease of rapidly developing web-based applications.

4.1 Toolkits used

The geospatial display, along with its colour saturation encoding and interactive behaviour were written and customized using the Mindset Geometrics toolkit for Adobe Flex [8]. For displaying geometric regions with this toolkit, an XML shape file in a format similar to SVG must be used as input. An converted SVG map of Canada [21] was used to manually create the XML shape file. Customized colour saturation encoding was a limitation of this toolkit, as it only supported manual and linear colour encodings. As such, a linear scale between white and blue was used³. Several alternative geospatial toolkits were also evaluated, however compatibility with Flex, expensive licences, and lack of documentation were limiting factors for these competing toolkits.

The bar and donut representations of data in the 'Between Regions' and 'Within a Region' displays were written and customized using the Flare toolkit [14]. The Flex wrapper for a Flare visualization was included as part of this toolkit. Choice of colour hue encoding was a limitation of the Flare toolkit, for both single-hue and categorical visual representations in the 'Between Regions' and 'Within a Region' displays. I suspect colour palettes can be customized, however this was not immediately apparent from the Flare API documentation.

4.2 Data preparation

A substantial amount of effort was dedicated to preparing and compiling the data set, so that it was compliant with the needs of the two toolkits. Data was manually extracted from the published PDF report containing the tables of food production data, and converted to XML format, which was required by the Mindset Geometrics toolkit. Flare required the data to be in a different format; Flare currently supports data provided in tab-delimited text, JavaScript Object Notation, or GraphML formats, or declared as Flash Object and Array data types. Due to time constraints and personal expertise limitations, a subset of the entire data set was manually re-formatted into arrays for each region.

5 SCENARIOS OF USE

Several scenarios of use for Informed Omnivore are encompassed in the following task flow. See the Video Figure and Figure 10 for an illustration of this scenario.

3 Blue being the default colour of the Flare bar and donut displays

5.1 Comparing all food categories

A user begins by comparing the total number of organic producers across all regions; the 'Between Regions' and 'Within a Region' panels displays the number and type of organic food production between and within regions, respectively. Perhaps the user is interested in organic food production in Alberta. Clicking on this region in the central map panel displays a breakdown of the types of organic food produced within Alberta in the 'Within a Region' display. This donut representation of food producers in Alberta is equivalent to the bar representation for this province in the 'Between Regions' display.

5.2 Comparing within a food category

Let us imagine that the user is interested solely in organic livestock. Clicking on the 'Livestock' tab in the accordion list of food types redraws the contents of the map and 'Between Regions' displays to reflect the number of organic livestock in each region. The 'Within a Region' panel now displays a proportional representation of individual livestock food types in Canada, based on total head count. Once again, the user can select an individual region in the map display; selecting Alberta results in the display of Alberta's organic livestock head count in the 'Within a Region' panel.

5.3 Investigating a single food type

Perhaps the user wants to be really specific, and is interested in determining where organic beef cattle are raised in Canada. The user may have a previously formed hypothesis that Alberta raises the largest number of organic beef cattle. Selecting 'Beef Cattle' from the food type list results in the display of the number of beef cattle in each region, shown in its geospatial representation in the central display, and in its bar or donut representation in the 'Between Regions' display. As a result, the user's hypothesis is confirmed, and in the process they may also discover that the next largest producer of organic beef cattle is Saskatchewan.

5.4 Results

To summarize, Informed Omnivore supports scenarios of exploration or hypothesis validation at three scales: all food categories, single food categories, and individual food types. At each level, the user can view data for the entire country, or for individual provincial regions.

6 DISCUSSION

In this section I discuss the strengths and limitations of Informed Omnivore, some lessons learned in the process of developing the application, and I present opportunities for future work.

6.1 Strengths

6.1.1 Vis for the masses

A strength of Informed Omnivore is in its accessibility to casual users; as a web application, the only requirement users must satisfy is that their web browser must have the flash plugin installed. The use of Adobe Flex to create the user interface has resulted in highly intuitive interactive controls with obvious and familiar affordances. Conducting a usability study with Informed Omnivore would be helpful in confirming these claims. As with the application's target user group, participants of such a study would not require any additional technical or domain knowledge.

6.1.2 Interactivity

An obvious advantage that Informed Omnivore has over the report prepared by Canadian Organic Growers is that it supports exploration and discovery through interaction and visualization,

while a reader of the report must scan through tables and written summaries to locate a particular item of interest for which the reader may already have a hypothesis.

6.2 Limitations

6.2.1 Bidirectional linking between views

A major weakness of Informed Omnivore is that it does not support bidirectional linking between the four panels. As such, the scenario of selecting a region in the map display to highlight food types in the accordion list in the left panel is not supported. Currently, when food types are selected from the accordion panel, regions which produce the selected food type are highlighted using a colour saturation encoding proportional to the amount of that food type produced in the region. A similar behaviour is lacking in the opposite direction.

Another case of missing bidirectional linking is between the 'Within a Region' display and the other displays. Clicking on a wedge in this donut display, a food type, currently has no effect on the other displays. Selecting a food type in this display should ideally change the currently selected food type for the other displays.

Likewise, the 'Between Regions' display is only linked to the currently selected food type, and not to the map display or within regions display. Selecting a region in this display should highlight the region in the map display, and vice-versa; selection of a region should also change the focus of the 'Within a Region' display. The lack of bidirectional or unidirectional linking between the four panels is due to poor architectural choices in designing the application. A greater understanding of software architecture methodologies and best practices with Flex applications, as well as tighter integration with Flare and Mindset components, may help solve this problem.



Figure 6. Map displaying number of acres of organic wheat production in Canada

6.2.2 Colour saturation encoding

Colour saturation for regions in the map display and data sprites in the 'Between Regions' display is currently encoded using a linear scale. A linear or log saturation scale works well when there is a uniform distribution of metric values, however these scales are ineffective for skewed or clustered distributions. For instance, organic wheat is predominantly produced in Saskatchewan, with 155163 acres dedicated to this crop as of 2005. Alberta, Manitoba, and Ontario have a non-zero amount of acres dedicated to organic wheat crops: 20276, 7678, and 3015 acres respectively. Unfortunately, these values are not represented in the geospatial display: all regions other than Saskatchewan appear to have no wheat produced. This cluster of three regions need to be distinguished from the remaining cluster of regions in which no

wheat is produced (See Figures 6,7). This is impossible by visual inspection along with the current encoding scheme. If being the largest producer of wheat is most interesting to the user, then Saskatchewan will immediately stand out, however for questions pertaining to where else wheat is produced in Canada, the answers are not immediately apparent. As such, erroneous conclusions may be drawn on the basis of the current display. The solution may require that a statistical density or clustering function be applied to the data for each food type when constructing a colour saturation encoding scheme. This statistical density encoding technique was demonstrated by Herman et al for node-link graphs [5]; should a similar technique be applied to geospatial data, clusters may become more salient to the user.

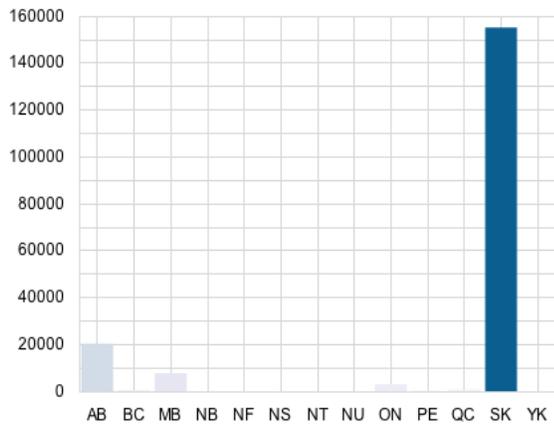


Figure 7. 'Between Regions' display illustrating the number of acres of organic wheat production in Canada.

Currently, the Mindset Geometrics toolkit contains manual and linear colour encoding schemes. While it may be tempting to create a manual encoding scheme, this would require knowing the range and distribution of data for each food type in advance.

Another option for reinforcing the colour saturation encoding of the geospatial display would be to add framed-rectangle charts to each region, as described by Cleveland and McGill [4], however this approach may also suffer from skewed distributions across regions, such as the situation mentioned above.

6.2.3 Colour choices

Colour choice and correspondence between the map display and the 'Between Regions' display is problematic. The hue of blue used is a default colour for data sprites in the Flare toolkit, and to my knowledge this property is not easily customizable. As such, the same colour was used for colour encoding in the map display. Using the same colour in both displays is effective for reinforcing the data, and this colour poses no problem in the 'Between Regions' display, however the use of blue in a geospatial display is misleading as blue is typically used to represent bodies of water.

Categorical colour choice was also predetermined by the Flare toolkit, resulting in the colours selected in the 'Within a Region' display, and in the 'Between Regions' display when 'All Foods (# of Producers)' is the currently selected food type. In this special case, there is colour correspondence between food categories shown in these two displays. Aside from being unaware of how to customize categorical colour palettes in Flare, customizing the colour palette is practically difficult to envision, as the number of categories may change considerably depending on what food category is currently selected.

As a result, the application could be improved for those with colour vision deficiencies. The application was evaluated using Vischeck, a tool for simulating types of colour blindness [15]. Deuteranopes and protanopes have a red-green colour perception

impairment, and may have some difficulty distinguishing between colours in the stacked bar chart in the 'Between Regions', or between colours in the donut chart in the 'Within a Region' display (see Figures 8,9). It appears as though the colours generated by Flare for categorical displays have a non-zero luminance difference already, however I believe this could be further improved by customizing the categorical colour palette.

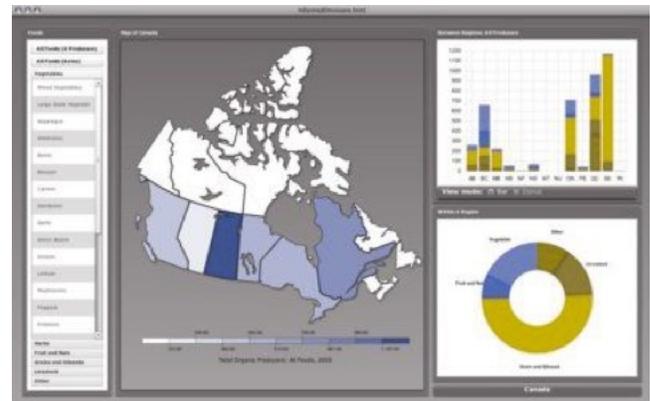


Figure 8. Vischeck simulation of deuteranope colour vision impairment for Informed Omnivore

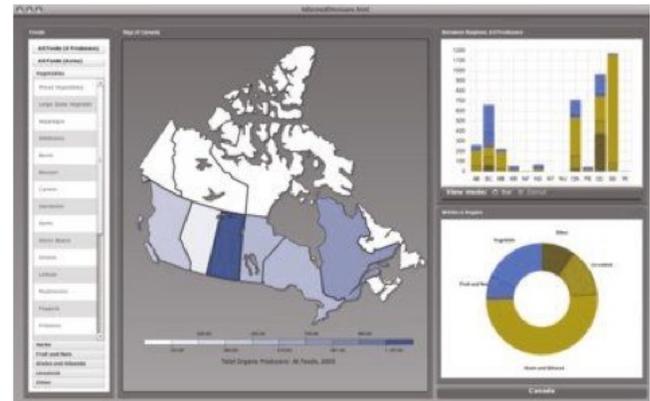


Figure 9. Vischeck simulation of protanope colour vision impairment for Informed Omnivore

6.2.4 Radial labelling

For the donut visualizations in the 'Between Regions' and 'Within a Region' displays, radial labelling can suffer from occlusion issues. Currently, there is an 'all-or-nothing' rule applied to radial labelling the 'Within a Region' display: if there are more than 10 food categories, radial labels are not shown. In other cases where there are less than 10 categories, and a small number of categories dominate, the remaining labels tend to occlude one another. The root of this issue is a limited understanding of Flare filter functions for radial labelling. Improved Flare documentation and a greater understanding of these toolkit features may help solve this problem.

6.2.5 Inconsistencies in metrics used

A limitation of the data set is the inconsistency between metrics for various food types and categories. For food categories, the metric used is the number of organic producers. For individual food types, the metric used is acreage, except in the case of livestock which is measured by head count. Investigation of the Canadian Organic Growers report also reveals substantial inconsistencies and omissions within the data set.

6.3 Lessons Learned

6.3.1 Project scope

A major lesson learned during the course of developing Informed Omnivore pertained to project scope. Initially I had set out to incorporate multiple sources of data, including sub-provincial regional data. Bidirectional linking between views was also initially a high priority. I did not envision running into some of the aforementioned problems and setbacks, including inconsistent and incomplete data between regional scales, having to perform a lengthy search for an appropriate geospatial visualization solution, having to manually encode the data into multiple formats to serve the purposes of the Mindset and Flare toolkits, and having a general lack of understanding of the Flare feature set. As a result, the scope became increasingly narrower as development progressed, and many of my originally proposed ideas went unrealized.

6.3.2 Architectural choices

I would also venture to say that I was not well equipped in terms of software architecture experience prior to starting work on this project. Much of the application architecture was assembled in an ad-hoc manner, and implemented using a depth-first approach. For future projects, and for the eventual re-structuring of Informed Omnivore, a coherent and stable software architecture must be outlined prior to development.

6.4 Future Work

6.4.1 Sub-provincial regional divisions

Pending the availability of suitable and consistent data, I would like to incorporate data from sub-provincial regions, from municipalities or counties. Displaying the location of organic producers within these smaller regions is likely a more effective way to convey to the user where organic food is produced in Canada. As many of the provincial regions in Canada are incredibly large, and with most of the population residing in districts close to the coastal and southern regions, a sub-provincial regional division would be more beneficial to users, as these regions are more reflective of population density and the location of urban centres. As it stands, provincial divisions are artificial and meaningless with respect to the location of population centres. Thus Informed Omnivore currently contains the well-known geospatial statistical bias known as the modifiable aerial unit problem [11], in which food production data is aggregated into the aerial units of provincial divisions. For example, a majority of food production in Ontario occurs in the Southwest of the province, as the province's rocky Northern geography does not lend itself well to agriculture. A regional division representative of townships or counties would help users distinguish parts of the province from one another. I had originally planned to incorporate sub-provincial regional data from Statistics Canada's report on agriculture [13], however the data contained by this report did not distinguish between food types with the same level of detail as the Canadian Organic Growers report.

Another way to approach this statistical bias would be to normalize each region data amount by population density, a suggestion offered by a peer during a presentation of this work.

6.4.2 Scented widgets

As previously mentioned, there is no bidirectional linked highlighting between the map display and the food type menu. If this issue can be resolved architecturally, one option for displaying this linked highlighting would be through the use of scented widgets [18]. Willett et al introduced the idea of scented widgets as embedded visualization navigational cues for menus

and user interfaces. In the case of the Informed Omnivore's accordion menu, a single or combined small colour, glyph, shading, or shape-based cues could be added to accordion headers and list elements when a region in the map view is selected; the cue would represent the amount that food type present in the currently selected region.

6.4.3 Displaying trends over time

The Canadian Organic Growers report also contains data pertaining to growth trends in the number of organic producers in each region over the past several years. It would be interesting to incorporate this data and, ideally, data for all food categories and individual food types to allow for comparison between years, and to visualize trends for specific types of food production. This interaction could be controlled easily by adding a time slider to Informed Omnivore's user interface, permitting the user to move forwards and backwards in time across all displays. This would allow the user to know which food types are produced in a region, and to what extent, before selecting the food type and redrawing the map display.

6.4.4 Visualizing organic infrastructure & shipping

Investigation of sales and cost information for organic food, including the costs for shipping and infrastructure present interesting visualization opportunities, potentially involving established techniques for visualizing geographic movement data over time [3,18,19]. Unfortunately, to my knowledge, such data for the Canadian organic food industry is currently non-existent.

6.4.5 Addressing the current limitations

Additional future work will address the limitations mentioned in section 6.3: implementing a customized colour saturation encoding scheme based on the distribution of the data across regions, adding bidirectional linked highlighting between the four panels, re-factoring the application code into a coherent and consistent architecture.

7 CONCLUSION

This report documented Informed Omnivore, an interactive application for visualizing the Canadian organic food industry. Scenarios of use focus on exploration and discovery of organic food production data between and within provincial regions, and for the country as a whole. Casual users can use the application to form and validate their own hypotheses, and use evidence presented by the application to make informed food choices. The contribution presented here is one of an implementation of information visualization techniques, including overview-and-detail, details-on-demand, and multiple linked views, applied to domain of organic agriculture, allowing users to easily make sustainable and healthy food choices.

VIDEO FIGURE

A video demonstration of Informed Omnivore can be viewed at <http://people.cs.ubc.ca/~brehmer/demo/omnivore.mov>.

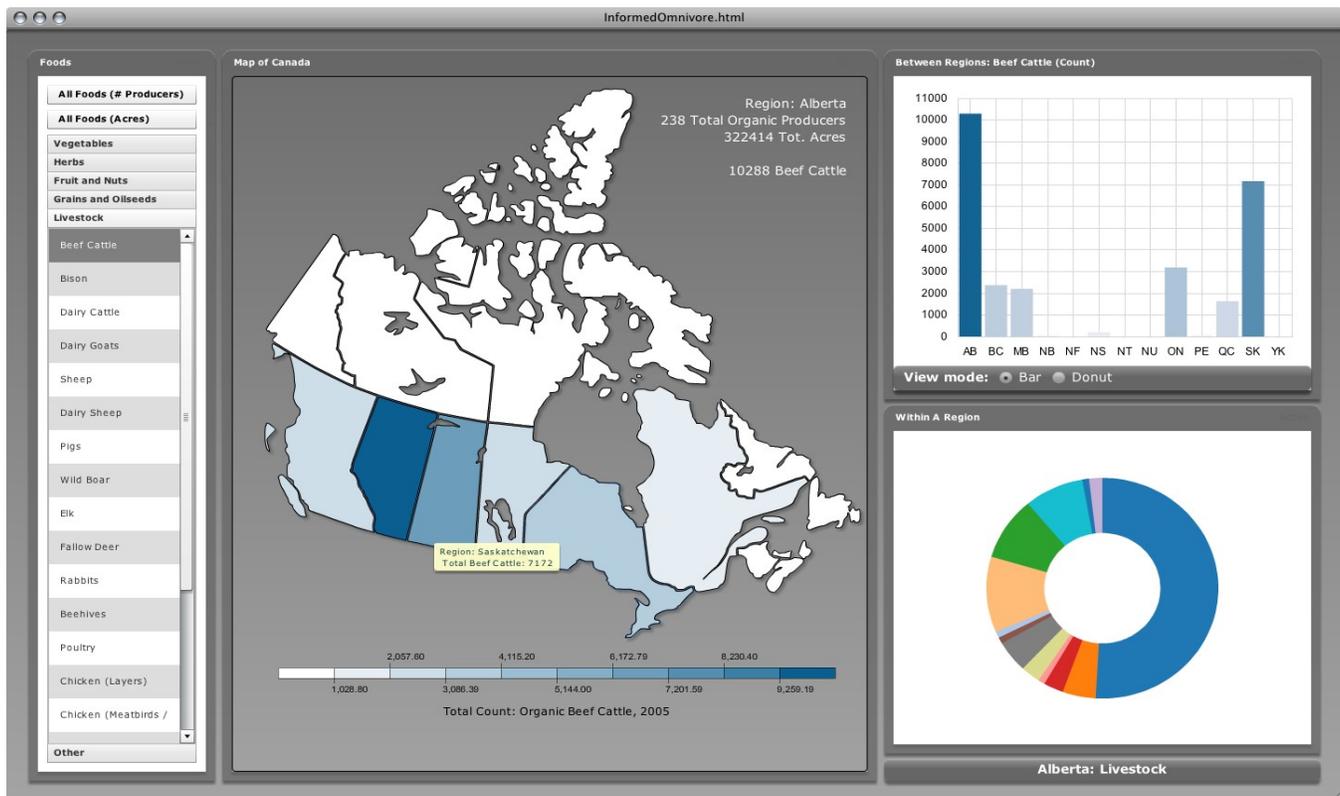


Figure 10. Organic beef raised in Canada (Alberta selected)

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