

**RESULTS OF A SURVEY OF FARM LEVEL PRODUCTION INFORMATION AND BMP
PREFERENCES FOR THE BRAS D’HENRI SUB-WATERSHED**

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Introduction

Non-point source pollution from agricultural production can be a problem in watersheds that are intensively farmed. An example of such a watershed is the Chaudière watershed in Québec. This watershed has one of the highest concentrations of animal production in the Province (AAFC, 2007). The Bras d'Henri sub-watershed is located within the Chaudière watershed. The animal intensity in this sub-watershed is 84.24 animal units per square kilometre and approximately 32 percent of the land is in crop production (Ministère du développement durable, de l'environnement et des parcs du Québec (MDDEP), 2006). The intensity of agricultural production in this sub-watershed has resulted in a substantial deterioration of the surface water quality and the largest source of this deterioration has been identified as agricultural non-point source pollution (MDDEP, 2006). This watershed has been selected for study under AAFC's Watershed Evaluation of Best Management Practices (WEBs) project because of the intensity of agricultural production and the substantial decrease in surface water quality that this has caused.

The WEBs project is undertaking a biophysical-hydrological-economic evaluation of Best Management Practices (BMPs) in the watershed. The BMPs being investigated include: riparian zones, precision feeding, alternative manure applications, reduced pesticide applications, and alternative crop mixes. The study includes hydrologic modelling, economic modelling and the integration of both the economic and hydrologic models. The goal is to be able to identify the economic and environmental impact of adopting BMPs in the sub-watershed. This will allow for the estimation of abatement cost curves that will be used in the experimental economics component of the project.

The LEARN funding was requested to undertake a survey of the producers in the Bras d'Henri sub-watershed to identify the cropping practices and animal units in the sub-watershed. This survey was a follow up to a previous survey that was undertaken in May 2007. The objectives of the survey were to: (1) update the economic and environmental model designed in phase I of Webs project, and (2) refine the data and validate information from phase I.

The survey was conducted by René Roy under the supervision of Professor Thomassin and the assistance of Dr. Laurie Baker. In addition, Mathieu Goulet-Vachon, Catherine Bossé, and Yves Roy took part in the surveying process to ease and speed up the interviews.

Method

The survey was distributed to producers who had their site of production located in the sub-watershed by hand. To locate the producers, the surveyors went to where the agricultural buildings were located. In most cases the producers were living on site. When producers were not living on site, information about their residential address was found by questioning the occupants of the house, the neighbours or the workers at the production site.

At the initial meeting with the producer, the surveyors identified themselves and explained the purpose of the research. If the producer agreed to participate, the surveyor provided a copy of the consent form (Appendix 1) and asked the producer to sign a copy. This copy of the consent form is kept with the original survey. The questionnaire (Appendix 2) consisted of simple questions regarding the number and type of animals on the farm, the cultivated area for each crop, and the production practices:

- Question 1 asked for the breakdown of the animals in the inventory on the farm.
- Question 2 was answered using a map. A producer located their fields on the map and the type of crops they had in each field. This question also included the description of their crop rotation and type of tillage practice that was adopted.
- Question 3 was designed to evaluate the level of adoption of the different BMPs on the farm. For the reduced use of pesticide question, it was modified to ask if glyphosate was the main herbicide used, since the active ingredient is one of the least environmentally damaging currently available on the market.
- Questions 4 and 5 were follow-up questions to question 3. They asked more details if some BMP were not adopted on the farm.
- Question 6 evaluated if the land owned by the producer was large enough to receive all the manure produced by the animal production. This question supplies the information about the amount of manure that is exported outside of the watershed. As the survey was performed, the questions gradually encompassed any manure spreading agreement that might exist between producers. This was because the surveyors realized that several producers did not rent land but had agreements with other producers concerning the spreading of manure on fields that are in deficit relative to acceptable nutrient limits.
- Question 7 asked the producers if they had other comments. In addition, the percentage of the land own by the producer that was tile drained was also added to this question. This latter information was not expected to be used for

the modelling activity but was included following comments from Mathieu Goulet-Vachon.

The time spent with the producers to present the research and introduce its purpose was between 5 and 15 minutes. The time to fill the survey varied from 5 to 20 minutes depending on the size of the business and the knowledge of the producer. Overall, the time spent with the producer was between 10 and 35 minutes. The response rate was excellent, with 98% of the producers approached to answer the survey agreeing to participate. Therefore, a total of 69 producers answered the survey.

Preliminary Results

According to the data collected, the number of producers in the sub-watershed has decreased since the last survey. In addition, several of the producers who are still in business today have specialized their operation to one type of production. Over the last decade, farm revenue in the region has been low and this has substantially affected the vigour of the agricultural activity in the region. Table I shows the number of producers involved in each type of animal production. Since some producers have more than one type of production on the farm, the total number of production types exceeds the number of producers surveyed. The number of producers surveyed that have more than one type of animal production is 11. Therefore, 18% of the producers with animal production have mixed animal production. This characteristic is positive in most cases, because it diversifies farm animal revenue and also provides a diversification in crop rotation since most of the animal production requires pasture or hay in their rotation. As a result, producers with more than one type of animal production on their farm make greater use of crop rotations for practical considerations and thus decrease the likelihood of soil erosion. According to the survey, the most popular production is still pig production followed by milk production. A minority of producers do not have animal production and exclusively produce crops. The producers in this situation dedicate their land to annual crops that are prone to soil erosion and the use of pesticides.

Table I : Animal Production in the Bras d'Henri Sub-Watershed

Animal production	Number of producers involved in the production
Milk	24
Beef	8
Pig (all type confounded)	38
Poultry	3
Without animal production	8

Concerning the size of the farm operations, Table 2 provides an overview of the number of animals per farm. The most important observation is the variance within each animal production. Milking cows and poultry have a small variance, while pork and beef production have a much greater one. Table 2 provides the number of animals per farm and when the size of the animal numbers is very large, this usually occurs with production units on several sites within the sub-watershed. Although the size of some farm operations is relatively large, their geographical dispersion in the watershed decreases the impact of some adverse environmental concerns, such as odours.

Table 2 : Animal Inventory in the Bras d'Henri Sub-Watershed

Type of animal	Total number in inventory in the watershed	Mean	Maximum	Standard Deviation
Cows	1787	81	300	56.99
Veals (0-6 months)	167	33	45	10.45
Génisses (7-15 months)	72	14	26	9.94
Taures (>15)	99	20	54	20.05
Bulls	3	1	2	1.00
Cow Beef	432	72	250	88.97
Beefs	2892	482	1500	714.02
Pork	62095	1774	14000	2669.64
Sows	10007	303	2300	404.38
Piglets	25453	878	7000	1504.10
Verrat	48	2	12	2.58
Chickens	91000	30333	52000	18929.69
Hens	0	0	0	0.00

For the BMPs studied during the survey, a large number of them were adopted by producers. Table 3 shows the level of adoption of each BMP. Some of them are now compulsory and as a result this has increased their rate of adoption by producers. For example, the 3m buffer strip is now mandatory and subject to a fine if they are found to be absent. Similarly, low spreading ramps are also mandatory for spreading pig manure. Although an increasing number of producer are using no till or zone till,

especially for soybean production, conventional tillage is still the most popular tillage practice. The information concerning field size and cultivated area has not been analyzed yet, but comments from the producers indicate that the cultivated area devoted to soybeans and corn has increased in the region. The production of these two crops can induce higher rates of soil erosion, especially when conventional tillage practices are used. The cultivated area dedicated to annual crops; i.e. corn and soybean, seems to have increased, the majority of producers still have pasture and/or hay in their rotation. A producer's crop selection is closely related to the number and type of animals on the farm. If the producer exclusively produces pork, they are more likely to have a crop rotation of annual crops because these are more profitable than perennial crops. In addition, pork producers can use the corn they produce to feed their pigs and decrease their input cost. However, since producers are aware of the negative impact monoculture has on their soil productivity, they increasingly exchange fields with producers who have pasture in their rotation to mitigate the negative effect of annual crops on their land. Discussions with producers would indicate that this practice of field exchange is becoming more popular in the sub-watershed.

Table 3 : Level of adoption of BMPs by the producers in the watershed

Best Management Practice	Percentage of adoption
Buffer Strip (3m)	84%
Low manure spreading ramps	78%
Use of Glyphosate	52%

Producer comments were also gathered and some general observations follow. Several of the producers commented that there seemed to be a general improvement in the water quality in Bras d'Henri waterways. Many of these producers linked this increase in water quality to the adoption of the 3m buffer strip, which is now a requirement, and new manure storage facilities. The new manure storage facilities seem to provide better storage control with fewer leaks. Many of the producers commented that residential sewage facilities in rural areas should be improved if further improvements in water quality are expected.

Producers also commented that communication between producers and researchers in the watershed needs to be improved, in that they felt that there was a lack of dissemination of results from the researchers to the producers. Since the collaboration

of producers is necessary for gathering data, some means of informing the producers about the results from the research should be planned.

Utilization of Results

The information gathered from the producers' survey is being incorporated into the economic model of the watershed. The original economic model contains 63 farms that are spatially allocated in the sub-watershed. Each farm contains information on animal numbers, number of fields, cropping patterns, animal nutrient requirements, environmental coefficients, and a number of environmental constraints. The economic model is an inter-regional optimizing model where each farm is a region and maximizes their profits.

The results from this survey were used to verify the spatially location of fields and farms in the sub-watershed as compared to the original survey carried out in 2007. It also provides for changes in farm ownership or business practices that have occurred over the intervening 3 years. In addition, it provides information on changes in animal inventories, cropping practices, and the adoption of BMPs in the watershed.

This survey provided information on 3 additional producers who were not included in the original survey. One of these producers was an integrator. This provides a substantial addition to the economic model that is being developed.

The information gathered from this survey will make a substantial contribution to the modification of the existing economic model of the watershed. Once these modifications have been undertaken, the model will be used to estimate pollution abatement cost curves for environmental constraints placed on the watershed and on individual producers. This information will be used as an input into further research into the development of new agricultural policies.

Conclusion

A survey was undertaken of the producers in the Bras d'Henri sub-watershed. A total of 69 producers participated in the survey, which was 98 percent of producers who were initially contacted. The survey was undertaken in coordination with the agro-environmental club that operates in the sub-watershed.

A number of changes have occurred over the 3 years since the previous survey. The number of producers in the sub-watershed has decreased and many of them have changed their operations. There seems to be more specialization in production by the producers in the watershed. As expected, the rotations undertaken on the farm was

often determined by the type of animal production undertaken. The most common type of animal production in the sub-watershed was pig production followed by dairy production.

The variation in the number of animals on a farm, and therefore farm size, was determined by the type of production that was undertaken. Supply managed production, for example dairy and chickens, had relatively small variance when compared to non-supply managed production, such as pigs and beef. The majority of producers had some type of animal production on their operations.

BMP adoption of some practices has increased in the sub-watershed. This is partly due to new regulations that are mandating practices. For example, 3m wide buffer strips were adopted by 84% of the producers and 78% of producers used a low ramp to spread manure. It was also found that 52% of the producers using pesticides used the active ingredient glyphosate, which has a lower environmental impact than other pesticides that could be applied. Producers are also using novel institutional arrangements to address soil management issues. Several producers have started to exchange fields in order to break monoculture cropping patterns. This allows for better soil management and increase crop productivity.

References

AAFC. 2007. Watershed Evaluation of Beneficial Management Practices. Bras d'Henri and Fourchette Watersheds, near St. Foy, Quebec. Web site : http://www.agr.gc.ca/env/greencover-verdir/pdf/QC_e.pdf Retrieved August 2007.

Ministère du développement durable, de l'environnement et des parcs du Québec (MDDEP). 2006. Bassin versant de la rivière Chaudière. Web site: http://www.mddep.gouv.qc.ca/milieu_agri/agricole/synthese-info/synthese-info-enviro-agricole.pdf (retrieved December 2006).

APPENDIX 1: RESEARCH CONSENT FORM

FORMULAIRE DE CONSENTEMENT

Titre de la recherche: Sondage concernant la préférence des agriculteurs face aux Pratiques de Gestion Bénéfique (PGB)

Chercheurs: Professeur Paul J. Thomassin and Mr. René Roy M. SC., Université McGill.

Contacts: Tel: 514-398-7956, paul.thomassin@mcgill.ca

But de la recherche: Cette recherche a pour but de collecter des données au sujet de la production agricole dans le sous-bassin versant du Bras d'Henri. Les données collectées sont par exemple le type de culture et d'animaux et information sur les PGB. Ces informations sont collectées par des chercheurs du programme d'Agroéconomie de l'Université McGill pour construire un modèle de pratiques agricoles dans le sous-bassin versant. Le modèle sera utilisé pour estimer les coûts d'adoption des PGB afin d'améliorer la qualité de l'eau dans le bassin versant. Les données collectées seront croisées aux moyennes des coûts de production régionales et provinciales.

Le modèle des coûts de production sera partagé avec Dr. Rousseau, hydrologue au INRS-Centre ETE (U. du Québec) et estimera les changements de qualité de l'eau lors de l'adoption des PGB. Les nom et adresse des producteurs ne seront pas divulgués, cependant les pratiques seront identifiées à l'intérieur du sous-bassin versant.

Les bénéfices de la recherche sont les suivants: 1- Il informera les producteurs des coûts reliés à l'adoption des PGB, 2- Les résultats seront présentés à Agriculture et Agroalimentaire Canada (AAC) pour les informer l'organisme du coût que les producteurs ont à supporter afin d'améliorer la qualité de l'eau, 3-Les informations seront utilisées pour influencer l'élaboration des politiques reliés à l'adoption des PGB. Les résultats seront distribués par des présentations aux producteurs, présentation à des conférences professionnelles, présentation à AAC, l'élaboration d'une thèse de maîtrise et la publication d'articles dans des journaux scientifiques.

Quelles sont les implications de ma participation? Nous vous demanderons quelques questions concernant vos pratiques agricoles. Par exemple, la superficie en culture, nombre de champs et le nombre d'animaux sur votre entreprise. La méthode, le temps et la durée de l'entrevue sera à votre convenance.

Votre signature servira comme preuve de consentement à cette étude.

Votre participation est entièrement volontaire et vous pouvez refuser de répondre à certaines questions ou vous retirer du projet à tout moment. Votre participation dans ce projet permettra le développement des politiques agricoles.

Cette recherche a été approuvée par le Bureau de recherche éthique de la faculté de Science de l'Agriculture et de L'Environnement de l'Université McGill et une copie de ce formulaire leur sera envoyée. Si vous avez des questions concernant vos droits en tant que participant à la recherche, ou si vous voulez vérifier la certification éthique de cette étude, s'il vous plait contacter avec le Bureau de recherche éthique de McGill, Faculté des sciences de l'Agriculture et de l'Environnement c/o Bureau de la Recherche de Macdonald au 514-398-8716, ou par courriel au research.macdonald@mcgill.ca.

Le chercheur vous donnera une copie de ce formulaire.

Consentement: Je désire être identifié dans le rapport ____ Oui ____ Non

J'ai lu le formulaire et accepte de participer à cette étude.

Signature: _____

Signature du Chercheur: _____

Nom: _____

Date: _____

APPENDIX 2: QUESTIONNAIRE

Numéro de la ferme: _____ Date: _____ Heure: _____

Adresse du répondant : _____

1) Combien d'animaux avez-vous sur votre ferme?

	Nombre d'animal
Bovin laitier/Bovin de boucherie	
Vache laitière ou Vache à bœuf.	
Veau (0-6 months)	
Génisse (7-15 months)	
Taure (>15 months)	
Taureaux	
Autre	
Engraissement/ Maternité/ Pouponnière	
Engraissement	
Maternité	
Pouponnière	
Verrat	
Poultry Producer	
Coq	
Poule	

2) Identifiez sur la carte les champs dont vous êtes le gestionnaire (propriétaire ou locataire).

3-a) Tracez le contour de votre ferme.

3-b) Indiquez sur la carte quelle était la culture sur chaque champ en 2009.

(A-Avoine, O-orge, M-Maïs, S-Soya, B-Blé, F-Foin, ME-Maïs Ensilage, paturage, X-Aucune production, AU-Autre (spécifiez) : _____)

3-c) Indiquez le nombre d'ha et leur production qui n'on pas été identifié sur les cartes. _____

