Measuring and Valuing Operator (Holder) Labour Services in the AAFC Production Account for Canadian Agriculture

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• Negative environmental externalities are an outcome of operator decisions about the type/mix of inputs to use and outputs to produce.

• Lower releases of materials such as N,P and C will require changes in operator labour input (relative to the status quo).

• The contribution of operator labour to TFP growth is relevant to any policy that addresses N,P,C pollution/emissions.

• Alternative measures of operator and unpaid family labour are presented here in the context of the AAFC production account for Canadian agriculture, 1961-2011 along with insights from the data.
I'm an operator and I work about 25 hours off (on) farm each week...

I earn more because I'm well-educated and...
To estimate hours of work must examine vast amounts of information ...

**Census of Agriculture**

**DATA**
- total days off farm
- range of hours off farm (number of operators)
- range of hours on farm (number of operators)
- quinquennially since 1961

**ASSUMPTIONS NEEDED**
- hours off farm vs. total hours available
- days worked in a week
- number of weeks in year

**Labour Force Survey**

**DATA**
- hours worked in main job per week
- annually since 1976

**ASSUMPTIONS NEEDED**
- main job
- weeks per year
- operator vs family

from responses to questions that never ask, annually: how many hours did you work on your farm this year?
## 2011 CENSUS OF AGRICULTURE

### 4. Name
- Surname or family name
- Given name and initial(s)

<table>
<thead>
<tr>
<th>OPERATOR 1</th>
<th>OPERATOR 2</th>
<th>OPERATOR 3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</tbody>
</table>

### 5. Did this operator live on this agricultural operation at any time during the last 12 months?
- No
- Yes

<table>
<thead>
<tr>
<th>OPERATOR 1</th>
<th>OPERATOR 2</th>
<th>OPERATOR 3</th>
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</tbody>
</table>

### 6. Farm work
- In **2010**, what was each operator’s **average** time contribution to this agricultural operation? *(Include custom work done for others.)*

*(Fill in one circle only per operator.)*

- On average, more than 40 hours per week
- On average, 30 to 40 hours per week
- On average, 20 to 29 hours per week
- On average, fewer than 20 hours per week

<table>
<thead>
<tr>
<th>OPERATOR 1</th>
<th>OPERATOR 2</th>
<th>OPERATOR 3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</tbody>
</table>

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Statistics Canada  Statistique Canada  1501  Canada
Canada is not alone ... the United States, France and other countries ask the same type of questions in their censuses...

**UNITED STATES 2012 CENSUS OF AGRICULTURE**

<table>
<thead>
<tr>
<th>Principal Operator or Senior Partner</th>
<th>Operator 2</th>
<th>Operator 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>1835</td>
<td>1852</td>
<td>1872</td>
</tr>
<tr>
<td></td>
<td>1931</td>
<td>1931</td>
</tr>
<tr>
<td><strong>Mark one answer only.</strong></td>
<td><strong>Mark one answer only.</strong></td>
<td><strong>Mark one answer only.</strong></td>
</tr>
<tr>
<td>0929</td>
<td>1831</td>
<td>1931</td>
</tr>
<tr>
<td>1 □  None</td>
<td>1 □  None</td>
<td>1 □  None</td>
</tr>
<tr>
<td>2 □  1 - 49 days</td>
<td>2 □  1 - 49 days</td>
<td>2 □  1 - 49 days</td>
</tr>
<tr>
<td>3 □  50 - 99 days</td>
<td>3 □  50 - 99 days</td>
<td>3 □  50 - 99 days</td>
</tr>
<tr>
<td>4 □  100 - 199 days</td>
<td>4 □  100 - 199 days</td>
<td>4 □  100 - 199 days</td>
</tr>
<tr>
<td>5 □  200 days or more</td>
<td>5 □  200 days or more</td>
<td>5 □  200 days or more</td>
</tr>
</tbody>
</table>

f. How many days did the operator work off the farm in 2012? Include days in which the operator worked at least 4 hours per day in an off-farm job. Include work on someone else’s farm for pay.
Some calculations are needed to obtain an hours datum for 2011

Estimated hours of on-farm work: census year 2011

<table>
<thead>
<tr>
<th>type of operator</th>
<th>hours/week</th>
<th>operators</th>
<th>on-farm work</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;20 hours</td>
<td>18.1</td>
<td>64,775</td>
<td>60,798</td>
</tr>
<tr>
<td>20&lt;=hours&lt;=29</td>
<td>28.6</td>
<td>30,765</td>
<td>45,674</td>
</tr>
<tr>
<td>30&lt;=hours&lt;=40</td>
<td>39.5</td>
<td>27,609</td>
<td>56,708</td>
</tr>
<tr>
<td>&gt;40 hours</td>
<td>58.1</td>
<td>82,581</td>
<td>249,279</td>
</tr>
<tr>
<td>all operators</td>
<td>-</td>
<td>205,730</td>
<td>412,459</td>
</tr>
<tr>
<td>average hours/operator</td>
<td>-</td>
<td></td>
<td>2,005</td>
</tr>
</tbody>
</table>

- calculations needed to obtain a datum for 2011
- assuming working 52 weeks/year
- interpolate between estimates to obtain time series 1961-2011
- how random is this number?

\AG_Operator2014\Input_dataOPERATOR2014.xls, sheet 'onfarm_der2'
So should we do a little further adjustment?

SNA 2008: “Calculating a quality-adjusted labour input measure ... is very data intensive and only those countries that have highly developed statistical systems are likely to have the detailed data required” (19.57 – emphasis added)

OECD Measuring Productivity manual 2001: “Note that even when only a simple trait such as occupation is chosen to differentiate labour input, information requirements are severe ... such rich data sets are normally both difficult and costly to collect and are therefore not readily available in practice” (para. 94 – emphasis added)

Perhaps not.
Comparison of Operator/Unpaid Family Input Measures, Canadian Agriculture, 1961-2011

Annual growth 1961-2011
- hours: -2.5%
- operators/equivalents: -2.0%
The AAFC Production Account for Canadian Agriculture
1961-2011

output
83+ outputs

capital
3 types of fixed capital
10 types of land (provincial, by tenure)
10 types of livestock capital

intermediate inputs
18 within-sector feed types
11 within-sector seed types
6 within-sector livestock types
10+ inputs purchased from outside sector

labour
operator and unpaid family labour
hired labour
### Average Annual TFP growth, Canadian Agriculture, 1961-2011

Effect of Differences in Operator Input Measures and Balancing Item

<table>
<thead>
<tr>
<th>Balancing Item</th>
<th>Operator/Unpd Family Labour Measure</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Operator labour</td>
<td>1.9%</td>
</tr>
<tr>
<td></td>
<td>Fixed Capital</td>
<td>TFP3</td>
</tr>
</tbody>
</table>
TO SUM-UP

• All measures of operator labour input are imperfect and vary in reliability.

• The number of operators measure is simple, transparent and observable.

• Canadian TFP growth in agriculture between 1961 and 2011 averaged 1.6% using number of operators and 1.9% annually using hours.

• These results suggest that it may suffice to use the number of operators to measure this input when developing EATFP measures.

• Available operator labour detail may nevertheless prove useful for examining possible responses to mitigation policies.