HISTORIC RESIDUAL RETURNS TO FARM LAND, LABOUR AND MANAGEMENT, SASKATCHEWAN: 1926-2005

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Abstract

One of the more enduring and useful farm business management benchmarks has been the "Residual Return to Land, Labour and Management" (RLLM). Historically, it has been used as a return to the two residual claimants –farmland and family labour and management. It also can be used as a starting point for several other benchmarks. Two measures of RLLM are examined, one based on regional farm level data (microdata approach) and the other based on provincial income and expense statistics (the aggregate approach). While they result in similar 1926-1999 means, they result in somewhat different patterns because of the differing relative impacts of drought and new crops such as canola. Nevertheless, they both show the narrowing margin of the residual, particularly after 1980. Cost shares are also used to delineate a series of agricultural epochs.

Keywords: Residual Return to Land, Labour and Management, farmland, Saskatchewan

Introduction

One of the enduring and useful farm business management benchmarks has been the "Residual Return to Land, Labour and Management" (*RLLM*). Historically, it was used as return to the two residual claimants –farmland and operator labour and management. It also can be used as starting points for several other benchmarks. When divided by gross returns, a margin can be generated and because crop shares are well known, a percentage return to labor and management (*%RLLM*) can also be generated. In more modern times, farm management preferences have tended more toward return on equity (profitability) or cash available for family living (liquidity) or one of the many other financial ratios. Nevertheless, because of the problem of establishing the opportunity cost of labour and management, the *%RLLM* it can be useful in examining changes in cost structure over long periods of time.

In the following sections, the *RLLM* is defined, and because data are unavailable for all years, a procedure for interpolating between years is delineated. Next, using Saskatchewan farm micro-data, the estimates are presented and compared against aggregate provincial income statistics. Finally, the provincial aggregate RLLM is used to estimate cost shares and trends in changing cost shares are examined.

The Residual to Labour, Management and Land

The residual to labour, management and land *(RLLM)* is the residual left from all income, including the value of household consumption of farm products and adjusted for changes in inventories, after all other opportunity costs are deducted.[1] This is then divided by the gross income to give a percent residual return

[1] Opportunity costs should include a charge for equity capital in addition to debt capital on machines and equipment, out-of-pocket costs as well as depreciation. There are difficulties in assigning interest payments among the various machine and

or profit *(%RLLM)*. The actual residual rate of return to labour, management and land are estimated from a variety of farm level accounting and panel data sources, mostly from the black soil zone of Saskatchewan.[2] Unfortunately, there are only 40 years of actual data out of the total of 85 years. The period of 1933 to 1943 and 1945 to 1958 are periods of few data. In order to fill in some of the holes, the remaining 45 years of missing data are estimated based on the statistical relationship between the *%RLLM* and detrended gross wheat returns and a time trend.

The alternative is to estimate the *%RLLM* based on provincial aggregate income statistics.[3] Provincial income and expenses are adjusted in the same fashion as the micro data. Unfortunately, data are only available for 1926 and after. Note that both approaches suffer from specification problems. In the micro data approach, data can be matched to area and farm type but there is potential selectivity bias as farmers cooperating with provincial record keeping programs are likely to be somewhat better managers than the area average, biasing the *%RLLM* upwards. Provincial aggregate statistics suffer in that the provincial aggregate consists of many different types of agriculture and that they include non-commercial farms.

The two approaches to estimating *%RLLM* are compared to each other and to leasing crop shares in figure 1. While one *%RLLM* approach is not consistently higher than the other, there are differences in their overall period means. Using a common period of 1926 to 1999, their mean values are 45.8% and 48.8%, respectively, for the microdata and the aggregate provincial income approaches-- a difference of 3.0%. Thus, they are relatively close in value, given their differences in data sources and farms represented. While over the whole period, the two approaches are not statistically different, they do differ in the 1926-1970 and 1971-1999 subperiods.[4] Their major differences are readily explainable. The 1926-1970 subperiod contains the "dirty thirties" when much of the southern part of Saskatchewan suffered from severe drought and wind erosion (hence, the name "dirty"), the provincial average *%RLLM* is considerably less than that based on the black soil zone microdata. This is because the black soil zone had considerably better yields than the rest of the province. The negative provincial *%RLLM's* in 1931 reflects the extreme and widespread drought in the southern part of the province. This was followed by dramatic improvement in farm incomes during the WW II years and the corresponding strong wheat exporting position increased aggregate returns to increase.

This followed by another period of considerable difference, the 1971- 1999 subperiod. This was a period of structural change in the black soil zone-- canola emerged as a very profitable crop and there was a shift to less fallow. The other soil zones relied much more on the wheat economy which was starting to show deep and chronic profitability problems and hence, a lower *RLL*.

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farmland debt categories. Accordingly, actual cash interest payments are replaced by an opportunity capital charge on machinery. This is calculated as machinery values times the prime lending rates of the year.

[2] Microdata sources include the following:

1918: crop budgets--13th Annual Report of the Saskatchewan Department of Agriculture

1923-1930: Cost of Production Budgets: Indian Head Experimental Farm (Individual farms)

1. Cost of Production Budgets: Indian Head Experimental Farm ((E.S. Hopkins, J.M. Armstrong, H.D. Mitchell, 1932)

1944: Undergraduate thesis (Gordon Haase 1944).

1961-1963, 1965-75: farm accounting association summaries (Saskatchewan Department of Agriculture)

1976-1978: CANFARM farm accounting records (Saskatchewan Agriculture. 1979)

1987-1995, 1999: Top Management Workshop data (Schoney, 1995).

[3] Povincial income statistics are taken from Agricultural Statistics, Saskatchewan Agriculture, Economics Branch.

[4] In a paired *t* test of the two data series, the null hypothesis that there is no difference could not be rejected over the 1926-1999 period (their difference was significant at the 25% level). However, over the 1926 to 1970 and 1971-1999 periods they are statistically significant at the 1% level.

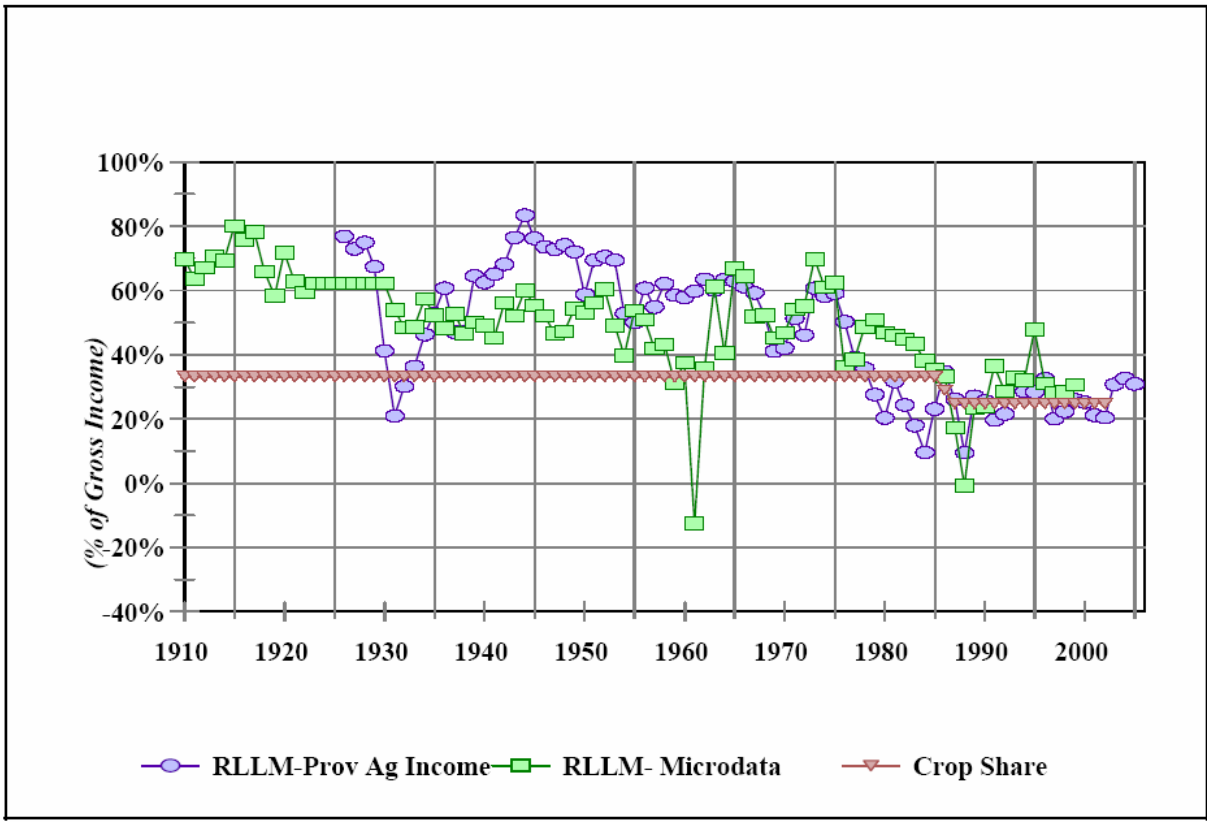
The overall conclusion is that the two data sets differ as they are affected differently by climatic events and structural changes. Nevertheless, both approaches reveal a similar pattern of long-run declining *%RLLM*. In the next section, changes in cost structure are examined as to their potential impact on declining *%RLLM*.

Epochs in Prairie Agriculture and Trends in Cost Shares

In this section, cost shares are examined based on provincial aggregate income. While Saskatchewan agriculture is more homogeneous than many other areas, it still has a number of farm types. The prevailing farm types are grain and livestock farms. Over the period of 1986-2005, crop farms have accounted for approximately 72% of direct market sales, with livestock farms accounting for most of the remaining market sales (Statistics Canada. 2007). In order to show the trends in crop cost shares, fixed and overhead costs are adjusted to remove the influence of livestock. Costs are divided in unshared and shared costs. Unshared costs mostly consist of variable costs while shared costs mostly consist of fixed and overhead costs. Shared costs are allocated to crops based on their relative share of unshared costs.[5] Crop costs are then aggregated into four groups: 1) direct, 2) machine, 3) overhead (OH) and 4) the residual to land, labour and management *(RLLM%)*. Direct costs include: fertilizer, pesticide, seed, irrigation, crop and hail insurance and custom work. Machine costs include machine operating expenses and ownership costs. Overhead costs include telephone, accounting, building repair and ownership costs and other costs. The trends in these relationships are displayed in figure 2 as a cumulative share of total cost; the total must equal 100%. Note that since *%RLLM* is calculated as a residual, the cumulative amount must also equal gross returns.

Fig1: Comparison of Residual Returns by Data Source and Crop Lease

[5] Unshared crop costs are assumed to include machine operating expenses; fertilizer, pesticide, seed, irrigation, crop and hail insurance, custom work and other crop costs. Unshared livestock costs are assumed to include commercial feed, livestock purchases, net artificial insemination and veterinary, twine, wire and containers, repairs to buildings and fences and heating oil costs. The remaining costs are assigned to crops according to their relative share. Crops account for approximately 82 to 90% of total unshared costs.



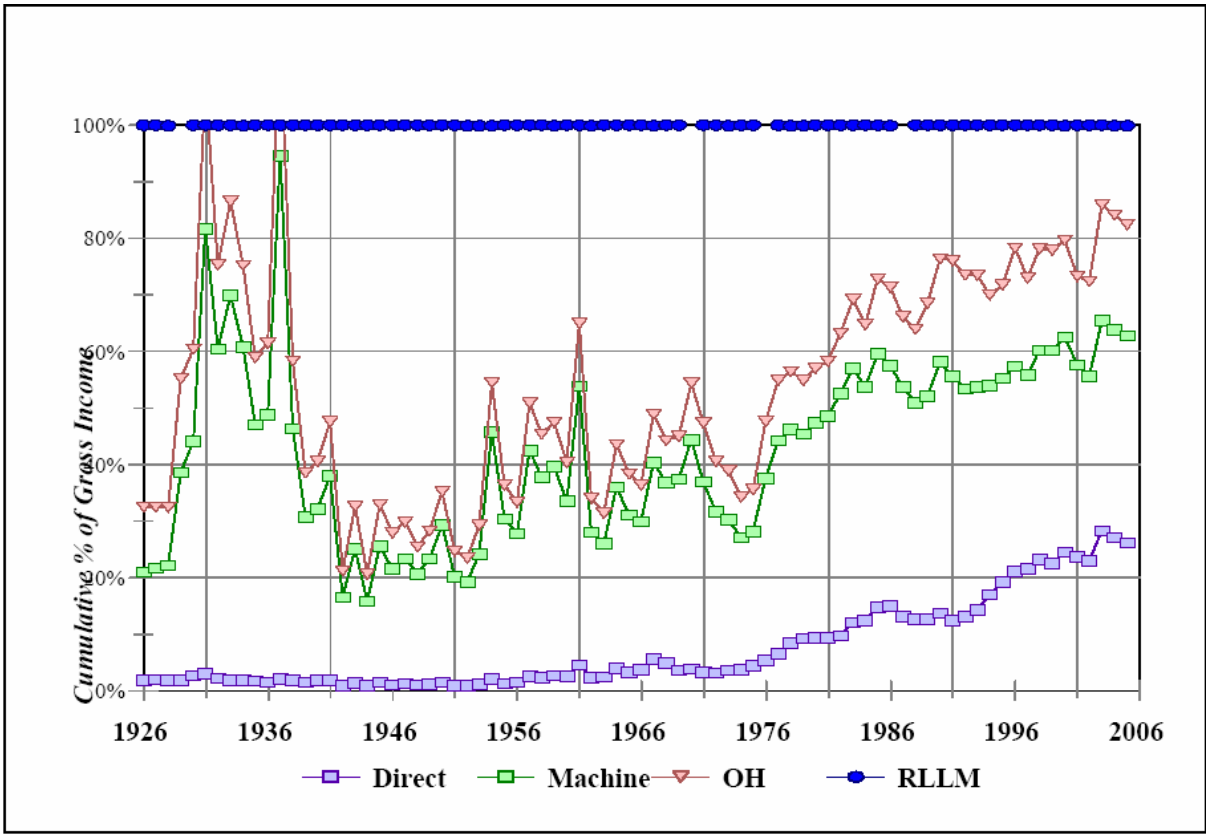
While the period of 1930 to 1940 is relatively chaotic due the depression, the trends of the remaining periods are revealing and can be used to delineate epochs in Canadian Prairie agriculture. Before our data begins, is the pioneer epoch. This represents the beginning of Saskatchewan agriculture and coincides with the signing of the various major Indian Treaties (1871- 1906) and the ending of the Canadian Prairie frontier. During this time, a number of major agricultural advances were established including summerfallowing; the introduction of the press drill that helped solve seeding problems; bluestoning to control wheat smut, the introduction of shorter season, higher yielding and more drought resistant wheat varieties such as Red Fife; and different methods of tilling and plowing to help conserve moisture. These advancements in dry-land farming techniques greatly improved the chances of successful wheat farming and by 1907 Saskatchewan was the largest wheat producer in Canada[6] . During these years, the return to labor and management was roughly comparable to the returns to land.

The next epoch is the "mechanization of agriculture" or "big iron" which took place during 1910-60. During this epoch agriculture became increasing more scientific with new wheat varieties and new pesticides. However, costs were dominated by machinery related costs as farmers increasingly mechanized and substituted machinery for labour.

After 1960, it is the epoch of "chemical agriculture." The increasing importance of pest management and fertilizer caused cost structure to change dramatically. Shifts to greater amounts of pesticides and fertilizer and less fallow caused the labor and management cost share to decline even further. Although machinery became much larger and energy prices increased, their cost share remained relatively constant (the distance between "direct" and "machine" trend lines remains largely unchanged in figure 2) as farmers shifted to fewer operations and no tillage systems and substituted increased herbicide use for less tillage.

[6] Murchie, R.W., W. Allen, J. F. Booth. (1936) p 22

Fig2: Cumulative Share of Crop Costs 1926-2005



Source: CANSIM Statistics Canada

After 2000, it may be the epoch of the "integrated package" where genetics, plant protection and machine systems are integrated into relatively well defined production packages. Control of specific genetic/chemical packages through patents and copyrights held by either a single business entity or a collaborative partnership diminishes input market competition. This epoch features rapidly rising cost shares further squeezing producer margins and causing the *%RLLM* to further decrease.

Summary, Conclusions and Implications

One important indicator of changing cost structure is the "Residual Return to Land, Labour and Management" (*RLLM*). This is divided by gross income to give a percentage amount, *%RLLM*. Two estimation procedures of *%RLLM* are examined, one based on farm level data (the microdata approach) and the other is based on provincial income and expense statistics (the aggregate income approach). While they result in similar 1926-1999 means, they result in somewhat different patterns because of the differing relative impacts of drought and new crops such as canola. Nevertheless, they both show the narrowing margin of the residual, particularly after 1980. After this time, the *%RLLM* hovers around the crop share amount, indicating that the residual to labour and management is very meager and that in order for it to remain positive, crop shares must decline further.

Changing cost shares reflect the shift of Canadian prairie agriculture towards a much more technological agriculture in search of ways to increase profitability and to offset long-run decreases in real commodity prices. The technological epochs of the "Big Iron (1910-1960)" and "Chemical Agriculture (1960-2000)" were mostly based on intensely competitive input markets. While machinery technology clearly continued to advance after 1960, advances tended to not result in a relatively greater cost share. Increased

investment costs of larger and more sophisticated machines were offset by greater capacity. In the case of zero tillage, seeding equipment required high investments and hence, opportunity costs, but these were offset by lower fuel costs per hectare and the ability to farm more acres with the same power units, reducing their per hectare ownership costs. However, this technology further increased reliance on pesticides, further pushing up their cost share.

The last epoch of "Integrated Package" is very different from the previous epochs. The market control of genetic/chemical packages through patents and copyrights results in market integration/consolidation, potentially limiting market competition and increasing costs. Further market integration through designer products for specific markets could include most of the value chain and turn farmers into contract growers. In this case, even more pressure could be placed on the residual return to farmers.

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