

FARE Share

What's Inside?

This *FARE Share* Special Issue is full of student research, starting with our cover story about the adoption of supplements to address micronutrient malnutrition in Malawi.

Inside, you'll learn about land ownership inequality in Pakistan, dairy quota auctions in Ontario, and the opportunities and challenges facing food processors in Canada.

This edition concludes with an analysis of the relationship between precipitation and corn yield.

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The *FARE Share* Newsletter features research and analysis from faculty and students in the Institute for the Advanced Study of Food and Agricultural Policy in the Department of Food, Agricultural and Resource Economics (FARE).



Willingness to Pay for Infant Nutrient Supplements

*By: Anissa Collishaw, M.Sc. Graduate, FARE.
This research is from an M.Sc. thesis supervised by Spencer Henson, Professor, FARE.*

Micronutrient malnutrition is a widespread and persistent challenge that is particularly acute amongst the poor in developing countries. Food-based approaches that promote consumption of nutrient-rich foods by nutritionally vulnerable populations are a key component of the global strategy to improve nutrition and alleviate micronutrient malnutrition. Increasingly, attention is given to how markets can be leveraged to deliver nutrient-dense foods to vulnerable populations. Of particular interest is the potential role of private sector actors in enacting large-scale, market-based solutions targeted at nutritionally vulnerable low-income consumers.

This study examines the determinants of the adoption of small-quantity lipid-based nutrient supplements (LNS-SQs). These are peanut and milk-based food products fortified with micronutrients designed to prevent under-nutrition amongst vulnerable populations, including pregnant and lactating women and infants six to 24 months of age. Ensuring these populations have access to a constant supply of LNS-SQs is a significant challenge. Ensuring successful access will involve distribution through public institutions

and retail outlets. The researchers ask: what are mothers in Malawi willing to pay for Ready-to-Use Complementary Food (RUCF) for their infants, and what are the factors that influence mothers' valuations of RUCF?

In Malawi, nearly half of all children below the age of five are stunted because of chronic undernutrition and micronutrient deficiencies. Valid Nutrition Malawi is a social enterprise involved in the local production of RUCF, a LNS-SQ product for infants. By producing RUCF, Valid Nutrition Malawi aims to affect an improvement in the nutrition of infants in Malawi in a way that is both sustainable and profitable. To accomplish this, Valid Nutrition Malawi envisions selling RUCF through institutional buyers and retail markets. The choice of delivery platform and specific distribution and marketing strategy is contingent on household-level demand for the product, and their willingness to pay (WTP) a price equal to or greater than the company's breakeven cost of 90 Malawian kwacha (MWK). As RUCF is a novel product not yet sold directly to consumers, household WTP for the product is not yet known.

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Land Ownership and Inequality in Rural Pakistan

By: Edwige Tia, incoming PhD Student, FARE. This research is from an M.Sc. thesis supervised by Brady James Deaton, FARE Professor and McCain Family Chair in Food Security, and Getu Hailu, FARE Associate Professor.

Land access remains one of the most sensitive issues in Pakistan, especially in rural areas where 80 percent of the poor live. Agriculture is the primary source of livelihoods yet it is estimated that 60 percent of households in rural Pakistan are landless. Land access is critical for several reasons including food security, equity and national security. Since independence in 1947, successive governments have attempted three redistributive land reforms that have largely failed due to weak implementation and political disputes. More recent efforts to address land issues in Pakistan have shifted from coercive redistribution to softer measures including the modernization of land records and administration.

This study explores the structure of farmland ownership, perceptions of tenure security, land distribution, and the distributive influence of the farmland rental market in rural Pakistan. Data used in this research was collected by IFPRI Pakistan in 2014-2015 in three provinces of Pakistan (i.e., Punjab, Sindh and Khyber Pakhtunkhwa).

This study shows that inheritance remains the primary pathway to land ownership in rural Pakistan. Approximately 86 percent of owned land is inherited, 13 percent is purchased and the remaining 1 percent is acquired through other means (e.g., gifts, government grants, illegal settlements). In addition, irrespective of how the land rights are recognized – e.g., formally titled, registered, or communally owned – landowners perceive themselves as tenure secure with respect to their rights to use, rent, or alienate land. This finding has an important implication for current government efforts to register land: given the already strong perceptions of tenure security, registration of land is unlikely to engender greater levels of tenure security and associated increases in farm level investment.

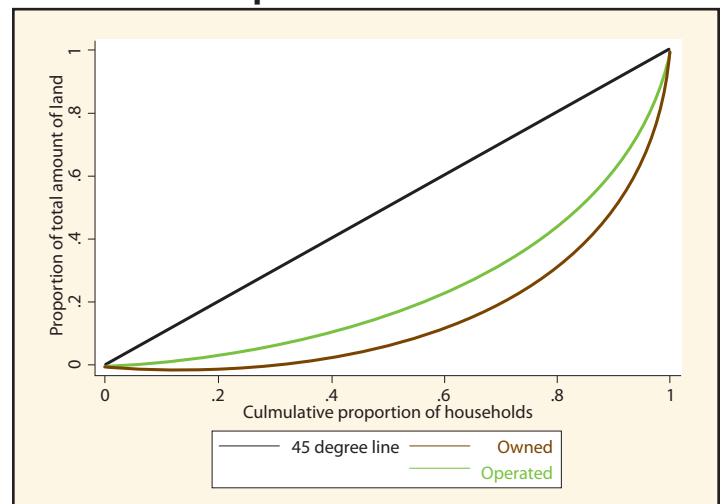
Rental arrangements also appear to be an important pathway by which land is redistributed to enable agricultural production. Forty percent of households rent in farmland, half of these are landless. Using regression analysis, the researchers assessed the equity and efficiency characteristics of the rental markets in rural Pakistan. They find that land-scarce households are more likely to rent in

land. This indicates that the rental market is contributing to transfer land from land-rich to land-poor households. The size of the household also appears to positively influence the decision to rent in more farmland. Results also suggest the presence of significant transactions that might be impeding the allocative efficiency of rental markets in rural Pakistan.

This study contributes to a better understanding of current land issues in rural Pakistan and to inform current policy efforts to improve land governance, equity and agricultural production in rural areas of Pakistan.

Financial support for this project was provided by The McCain Foundation.

Comparison of the Distribution for Owned and Operated Land



The curve for operated land is closer to the line of perfect equality in landholdings than the curve for owned land. Therefore, the distribution of operated land appears to be less unequal than that of owned land.

Learning Dynamics in the

By: Rebecca Elskamp, PhD Graduate, FARE. The research is from a thesis supervised by Alan Ker, Professor and Director, Institute for the Advanced Study of Food and Agricultural Policy, University of Guelph, and René Kirkegaard, Professor of Economics and Canada Research Chair (Tier 2) in Risk Management and Regulation, Department of Economics and Finance, University of Guelph. This thesis won the 2017 Canadian Agricultural Economics Society Outstanding PhD Thesis Award.

The Ontario dairy quota auction pricing rule recently changed from uniform to discriminatory. Under the new rule, successful bidders pay their submitted bid price for units purchased, whereas bidders paid the clearing price for units purchased under the former rule. As a result, bidding strategies that were optimal under the uniform pricing rule

were no longer optimal under the discriminatory pricing rule. This rule change creates a unique setting to test the presence of a learning process as bidders discover their new optimal bidding strategy.

The study uses a data set obtained from Dairy Farmers of Ontario containing bid histories of all bidders in the Ontario dairy quota



Investment Needed to Grow Food Processing Sector

By: Natalia Piedrahita, PhD Candidate, and Zili Lau, M.Sc. Graduate, FARE. This research is from two M.Sc. theses supervised by Getu Hailu, FARE Associate Professor.

A look at the competitiveness and productivity of our nation's food manufacturing sector shows a high level of technical efficiency in Canadian firms – but more innovation investment is needed to grow and diversify the industry.

Natalia Piedrahita, Zili Lai and Getu Hailu have been studying the opportunities and challenges facing food processing businesses in Canada.

"We are seeing food processors and canners downsizing, merging and closing, while at the same time new plants are starting, and existing ones are also expanding, so we're looking at how the sector is faring," said Hailu, whose work is funded by the Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA) — University of Guelph Partnership.

The research finds that productivity levels are directly connected to firms' participation in export markets.

"Companies that export have higher productivity levels on average than non-exporting companies," Piedrahita said. "We did find that the higher the level of productivity of a business is, the more likely that business is to export. However, we also found that entering export markets has no influence on the growth in productivity in the short-run."

Overall, the top 10 percent of food manufacturing businesses were over three times more productive than those in the bottom 10 percent. And exporting food manufacturing businesses were found to be approximately eight percent more productive than non-exporters.

A key issue that concerns Hailu is long-term investment. When food processors struggle with squeezed margins, one of the first ways they respond is to focus less on long-term investment, he said, a short-term response that is understandable, but has implications for future production.

"The Canadian sector is behind in investment in technology – for every dollar invested per worker in the United States, we invest 62 cents," Piedrahita said. "Government and

businesses should work together to increase investment in research and development, and should be a priority for the food processing sector."

In Ontario, the food and beverage sector lags behind the province's manufacturing sector as a whole in research intensity (spending on R&D as a proportion of Gross Domestic Product).

Food processing is a low-margin, high-risk business, so finding funds can be challenging, but Hailu and Piedrahita encourage small and medium-size enterprises to focus on technology and investment in innovation, to collaborate with universities, and make use of incubator programs that provide start-up or expansion support.

"Government and businesses should work together to increase investment in research and development, and should be a priority for the food processing sector."

The sector does present opportunities, though. It was the only sector to see growth in productivity and employment during the last recession and the coming free trade agreement with the European Union will open up new markets. That's important to a country like Canada.

"Canada only has 35 million people, and our market is small and geographically dispersed, but if we are exporting more, we are producing more, using more farm inputs, and hiring more people – and that will help firms explore the benefits of economies of scale," Hailu said, adding this will help meet the Premier's challenge of doubling growth and adding 120,000 new Ontario jobs by 2020.

Original article: <https://www.uoguelph.ca/oac/news/innovation-investment-needed-grow-canada%20%99s-food-processing-sector>

Ontario Dairy Quota Auction

auction, immediately following this change in pricing rule from uniform to discriminatory. Given the multi-dimensional strategy space bidders have available to them, two dimensions of bidding behaviour are examined in the study — bid price and the number of price-quantity bid pairs submitted.

Consistent with other studies, the findings confirm the presence of a dynamic learning process as adjustments in bidding behaviour are found to diminish as bidders gain additional experience under the new discriminatory pricing rule. In other words, despite the added complexity of a multi-dimensional strategy space, this study confirms that Ontario dairy farmers learn from their past experiences and converged to optimality over time, in a manner consistent with ex post rationality. In terms of the bid price dimension, results indicate that following an auction loss (win) in the previous auction, bidders were found to increase (decrease) bid prices in the next auction,

i.e., adjustments were consistent with higher profits. In addition to confirming bidders increase their bid price following a loss, this study also finds that the magnitude of this increase is positively correlated with the difference between their bid price and the clearing price, i.e., the amount they lost by. In terms of variations in the number of price-quantity bid pairs, bidders' past wins or losses had no explanatory power on this strategic bidding dimension; rather adjustments in this dimension appear to be random.

The results of this study have implications for auctioneers of real-life auctions considering making a change to the design of their multi-unit auctions, e.g., change in pricing rule. This study highlights the importance of allowing bidders sufficient time to adjust their bidding behaviour as they learn their optimal profit-maximizing bidding strategy under the new auction design.

Nutrient Supplements

A stated preference contingent valuation survey was conducted in late 2016 with 504 mothers of infants aged six to 36 months in the Zomba region of Malawi. The researchers find that

77 percent of the respondents have a positive WTP for the product. Average WTP, when controlling for household heterogeneity, was 112 MWK, equivalent to approximately USD 0.15 or CAD 0.21, for a 20 grams sachet. Approximately 71 percent of the respondents would be willing to pay the breakeven price of 90 MWK.

The values of WTP for RUCF were negatively related to mother's age, and positively related to both nutrition education through a year-long intervention and prior experience with fortified infant cereals. The price of RUCF has a negative effect on the probability of purchasing RUCF.

The results indicate that business-based solutions such as Valid Nutrition Malawi's RUCF have the potential to contribute to addressing the problem of micronutrient malnutrition amongst low-income populations. However, there remain segments of the population that lie outside the reach of market-based approaches – in this case, representing approximately 30 percent of the survey population. These sub-populations may be most appropriately targeted by public sector nutrition initiatives. To identify consumer segments and to delineate the respective roles of private and public sector actors in such a way that achieves maximal nutritional impact, an understanding of WTP and household heterogeneity is critical.

Relationship Between Precipitation and Corn Yield

By: Regan Arntz-Gray, M.Sc. Graduate, FARE. This research is from an M.Sc. thesis supervised by Alan Ker, Professor and Director, Institute for the Advanced Study of Food and Agricultural Policy, University of Guelph. This thesis won the 2017 Canadian Agricultural Economics Society Outstanding Master's Thesis Award.

Over the past 60 years, agricultural technology has aimed to boost mean yields, resulting in a roughly three-fold increase in corn yields in both Iowa and Ontario. The significant growth in mean yield since the 1950s was driven by several factors including: greater attention to farm management practices such as time of planting; large increases in nitrogen application; modifications to plant genetics; and a steady rise in plants per acre.

This increase in yield, and in particular in plants per acre, suggests greater demand for inputs per acre. Given the dependence on weather, producers cannot control all agricultural inputs. In particular, water is largely out of producer control as almost all corn acres are rain fed in both Iowa and Ontario. The large changes in plants and yield per acre suggest the relationship between precipitation and yield may have changed over time.

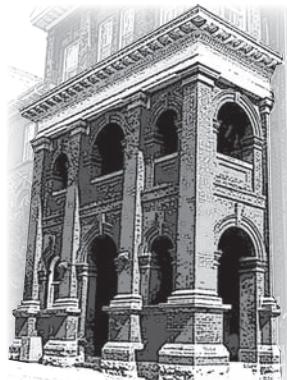
The purpose of this study is to test the hypothesis that the precipitation-yield relationship has changed through time. This is evaluated by estimating a dynamic yield-weather model using historical data. The precipitation-yield effect was represented as a piecewise linear function with a single threshold (break point). This threshold indicated the level at which precipitation exceeded the level that was beneficial for corn yield and was allowed to change linearly through time. The model is estimated for various thresholds through time. We find that the yield-weather relationship has changed through time in both Iowa and Ontario.

To consider the potential economic impact of our result, we estimate crop insurance premiums assuming a static and a dynamic yield-weather relationship using simulated weather data. We find that the premiums from the static and dynamic models are significantly different. In addition, the yield response to a potential future climate situation was estimated based on simulated future weather data for the 2080-2099 period. The results show a slight increase in mean yield in Ontario

and a decrease in mean yield in Iowa, while variability increased in both locations under this climate change scenario.

The research findings are relevant as they illuminate a feature of the yield response function that appears to have significant consequences not previously considered. The yield forecasts under climate change could aid producers in making adaptive changes to their production systems. Since crop insurance premia are set, in part, based on estimates of crop yield distributions, improved understanding of the yield-weather relationship may lead to more accurate estimates of expected losses that would aid financial planning. This is desirable for the general public as well as the insurance providers due to the subsidization of crop insurance programs by the government. Finally, increased understanding of how food systems are affected by weather could help inform the best way to adapt agricultural systems to the changing underlying conditions that may arise due to the intersection of climate change and changes in agricultural technology.

Further research could consider the implications of these results on the profitability of irrigation and techniques that increase the soil's water-holding capacity. Furthermore, a wider variety of climate change scenarios could be considered under this framework.



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