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ECONOMICS

HOW AUSTRALIAN FARMERS DEAL WITH RISK

by

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DISCUSSION PAPER 12.07

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Abstract

Farm survey data show that the risk aversion of West Australian farmers is comparable to that of other asset holders. An increase in the variability of crop yield by 20%, which may be caused by future climate change, would raise their willingness to pay for crop insurance almost one-to-one by 19%. West Australian farmers can insure against hail, fire and some other perils but not against the greatest risk – drought. The farm survey indicates that adverse selection does not arise in the existing market for crop insurance because insurance premiums reflect the risk of crop failure. However, a future supplier of drought insurance must take into consideration that drought insurance might give rise to moral hazard, changing the risk management practices of farmers.

1. Introduction

There are two main categories of risk associated with growing crops: uncertainty associated with the amount or quality of output generated (yield or production risk) and uncertainty about the price received for output (price risk). This paper is concerned with the production risks associated with dryland broadacre cropping, which relies on rainfall for production. Crop production may be adversely affected by weather conditions - drought, flooding, hail, heavy winds and frost - and by fire, plant disease and pests. The largest cause of uncertainty is variation in rainfall, which is highly variable in Australia. Separate from discrete seasonal variation in rainfall are droughts, which may be defined in an agricultural context as 'a protracted period of deficient precipitation resulting in extensive damage to crops, resulting in loss of yield' (Lindesay 2003, p. 31).

Data from a survey of Western Australian farmers is used to consider two issues in farm risk management. First, the farmers' willingness to pay for insurance that protects against wheat yield variability is modelled as a function of risk aversion, risk of crop failure and government assistance. Second, production data is used to test whether farmers are able to make use of seasonal weather forecasts to tailor their planting strategy and thus manage the risk of crop failure caused by low rainfall. The empirical findings shed light on the prevalence of adverse selection and moral hazard in the market for crop insurance. Section 2 provides a brief introduction to agricultural risk management in Australia. Section 3 sets out the theory of risk aversion, adverse selection and moral hazard, which explains the structure of the market for crop insurance in Western Australia. Section 4 outlines details of the farm survey that was conducted and Section 5 contains the empirical models and estimation results.

2. Agricultural Risk Management in Western Australia

Market based tools for the transfer of production risks are limited in Australian agriculture. Broadacre crops may be insured against hail and fire damage but not against losses of crop yield caused by lack of rain (drought), flood or frost. Most insurance policies combine coverage for losses caused by hail and fire and a number of other perils including damage caused by lightning or spontaneous combustion, explosion, chemical overspray from neighbouring properties and straying livestock. There is no multi-peril crop insurance (MPCI) available that would also cover damages caused by drought, flood and frost. In fact, these risks to crops are uninsurable in Australia. The empirical analysis in this paper is based on the available hail insurance broadly defined to cover hail and all other perils included in a crop hail policy.

Premiums for broadacre hail insurance are based upon the location of the farm and the type of crop being covered. Location ratings relate to weather patterns and are calculated on a shire or postcode basis - shires that have greater prevalence of hail attract higher premiums. Similarly, insurers charge more for crops that are more prone to hail damage. In Australia farm yield history is not taken into account when premiums are set. Premiums generally range from 0.5%-2.5% of the insured crop value with the majority of premiums being under 1% (Multi Peril Crop Insurance Task Force 2003, p. 21).

In Australia agricultural insurance is provided by three private insurers that underwrite crop and livestock policies, nine that offer crop insurance only and three that offer livestock policies only (Mahul & Stutley 2010, p. 11). Yearly premium totals for agricultural insurance are volatile and influenced by seasonal weather, which affects the volume of insured crops, and commodity prices, which affect their value. A World Bank survey estimated that in 2007, 50% of Australian farmers had a crop insurance policy and 50% of the cropped area was insured (Mahul & Stutley 2010, p. 12). Premiums for broadacre crops were estimated to be $US 96 million in 2008. Total premiums for all types of crops are approximately $A 200 million, representing about $A 7 - $A 10 billion worth of crops insured (Kimura & Antón 2011, p. 23). Private sector reinsurance is well developed in Australia with about 85% of exposure being reinsured.

The Australian Federal Government provides limited support to farmers for drought. Under the National Drought Policy (NDP), farmers receive short term financial assistance if they are affected by droughts that are ‘beyond the scope of normal risk management’ (Botterill 2003, p. 71). Less severe droughts are considered by the Government to be an inherent risk of the Australian farming environment that should be left to farmers to manage themselves. Three main programs are available to farmers situated in areas declared as experiencing an ‘Exceptional Circumstance’: EC Relief Payment (ECRP), commonly called ‘income support’, provides payments for basic living expenses; EC Interest Rate Subsidy (ECIRS) provides subsidies on interest payable on loans; and EC Exit Package is designed to assist farmers in financial difficulty to leave the industry and re-establish themselves outside of farming. In 2007-08, 23% of farms received financial support at a cost of $380 million for ECRP, $604 million for ECIRS and $10 million for the EC Exit Package (Productivity Commission 2009, p. xxii). The current policy climate appears to be moving away from providing ex-post financial support and towards helping farmers develop a self-managed risk mitigation approach (Primary Industries Ministerial Council 2011).

3. Risk Aversion, Adverse Selection and Moral Hazard

A crucial determinant of the demand for insurance is risk aversion. A risk averse individual values a risky prospect at less than its expected value and is thus willing to pay for insurance that grants certainty of income. Risk aversion is a property of the utility function that can be measured by calculating the income elasticity of marginal utility:

$$R(Y) = -\frac{dU'(Y)}{dY}\frac{Y}{U'(Y)} = -\frac{YU''(Y)}{U'(Y)} \qquad (1)$$

The measure *R*, which is also known as the coefficient of relative risk aversion, is calculated at a specific level of income *Y* and, as elasticity, is dimensionless. A positive value of *R* indicates risk aversion; the higher the value, the more concave the utility function and the stronger the risk aversion. A value of $R = 0$ indicates that the utility function is linear and the individual is risk neutral.

In the context of insurance, the risk premium ρ is the amount of income that an individual is willing to give up in order to be indifferent between the certain level of income given by insurance and the expected income that would be earned without insurance. The risk premium depends positively on risk (the objective component) and risk aversion (the subjective component). Newbery and Stiglitz (1981, p. 73) show that the risk premium can be related to the coefficient of relative risk aversion by carrying out Taylor expansions of $U(Y)$ at the risky income $\tilde{Y}$ and at the certainty equivalent level of income $\hat{Y}$, which is the mean income $\bar{Y}$ minus the risk premium ρ. The relative risk premium as a fraction of mean income can be expressed as a function of risk aversion and risk in the following manner:

$$\frac{\rho}{\bar{Y}} \approx -\frac{1}{2}\frac{\delta^2}{\bar{Y}^2}\frac{\bar{Y}U''(\bar{Y})}{U'(\bar{Y})} = \frac{1}{2}R\sigma_Y^2 \qquad (2)$$

In the preceding equation, δ is the standard deviation in income and σ_Y is the coefficient of variation of income, $\sigma_Y = \delta / \overline{Y}$. Thus, the relative risk premium is approximately half the squared coefficient of variation multiplied by the coefficient of relative risk aversion *R*. Expressing the risk premium this way is useful because it is dimensionless and can be compared across agents with different mean incomes. The relative risk premium increases with the squared coefficient of variation (greater risk) and with the coefficient of relative risk aversion (greater risk aversion). In Section 5 the relative risk premium is estimated using farm survey data in Western Australia.

Insurance markets differ from traditional goods markets because the distinction between demand and supply breaks down. Adverse selection implies that the cost of providing insurance is directly related to the demand for insurance. Holding other factors constant, buyers with a higher probability of loss will expect a greater return from an insurance policy than low risk buyers and, consequently, will have greater willingness to pay for the policy. Adverse selection arises due to asymmetry of information between buyers and insurance providers. Insurers that do not possess information about differences in buyer risk will offer an average premium rate to a heterogeneous risk pool with high risk buyers tending to purchase greater coverage and low risk buyers being priced out (Rothschild and Stiglitz 1976). Adverse selection may cause underinsurance or complete market failure as low risk individuals exit the market. In a crop insurance market, adverse selection can arise if farmers know more about their chance of crop failure and expected yield than insurers, who may have access to regional yield data but may lack farm level data.

Moral hazard is the change in unobservable behaviour induced by the existence of an insurance contract. It occurs because insurance shifts the risk of loss from the insured to the insurer. Zweifel & Breyer (1997, p. 157) distinguish between ex-post and ex-ante moral hazard. If the size of the loss increases as a result of the contract, the moral hazard is referred to as ex-post. This may be because the policy holder no longer exerts as much effort into taking measures that reduce the severity of a loss when it occurs. If the probability of a loss is increased due to changed behaviour towards the risk, the moral hazard is referred to as ex-ante as it occurs before the loss.

In this paper it is theorised that farmers can avoid losses by planting less in low-rainfall seasons, such as predicted El Nino years. Surveys by the Australian Bureau of Agriculture and Resource Economics (ABARE); the Department of Agriculture, Fisheries and Forestry; and the Bureau of Meteorology found significant knowledge of and use of seasonal weather forecasts in agricultural management decisions (Hayman et al. 2007, p. 977). If farmers can reliably predict the weather for a plant cycle, a positive correlation between area planted and crop yield in t/ha would be expected. Multi-peril crop insurance shifts the risk of crop failure from the farmer to the insurance company, reducing the incentive to behave prudently. As a consequence, less attention will be paid to weather forecasts and the crop area will remain large in years with poor weather conditions. This gives rise to ex-post moral hazard because crop insurance does not increase the probability of a loss but it raises the size of a loss associated with a bigger crop. Moral hazard promotes inefficient farming and will eventually cause premiums to rise as insurance companies have higher expected costs over the longer time frame.

4. Survey Outline

The farm survey was conducted with the cooperation of broadacre farmers belonging to Western Australian grower groups. Surveys were distributed via email to 27 grower groups during June-September 2011. As well as this, hard copies of the questionnaire were handed out at committee meetings of the North Kojonup Production Group and the Liebe Group in Dalwallinu. Respondents were given the opportunity to answer using email, surface mail, fax or an online survey hosting website. A total of 19 usable responses from ten different postcodes were obtained. The Appendix shows the grower groups that were approached, the shire locations of the respondents and the questionnaire sent out to farmers.

The survey was entitled ‘Agricultural Risk Management in Western Australia’ and covered a range of issues on the relevant subject. Growers were asked questions arranged into five sections: farm background, hedging arrangements for price risk, arrangements for hail crop insurance, uninsurable risks, and other risk management tools. Each section included open ended questions that allowed farmers to comment on their exposure to risk and their attitude towards insurance. When asked ‘what are the major risks affecting your farm’s production and income?’ the most common answers were lack of or unpredictability in rainfall, frost, exchange rate and grain price volatility, and increasing input costs. Responses to the question ‘[what] measures do you take to prevent uninsurable losses such as drought, frost or flood?’ included staggered seeding times, planting less crop in predicted low rainfall seasons, diversifying crop types and other best management practices.

In order to obtain a measure of production variability, farmers were asked to give details of their crop production from 2006-2010 in terms of yield in t/ha and hectares planted.[1] The mean area planted over five years was 15,632 ha, while the median was 10,813 ha. The average yield of all crops produced over the five years (total tonnes produced/total hectares planted) had a mean of 1.50 t/ha, median of 1.44 t/ha and standard deviation of 0.26 t/ha. The minimum was 1.13 t/ha and the maximum 2.03 t/ha. Of the 420,880 t produced by the 19 farms in five years, wheat accounted for 354,522 t; consequently, the following analysis will focus on total crop and wheat production.

[1] The survey data are included in a technical Appendix that is available on request.

Wheat production in terms of both hectares planted and tonnes per hectare varied strongly over the five years. 2008 and 2009 were high-producing years with 118,649 t and 103,472 t respectively, while 2006 and 2007 had less than 42,000 t. In general, there were more hectares planted in the higher yielding years, which suggests that farmers took advantage of seasonal weather forecasts. The standard deviation in the total wheat yield of all farms combined over the five years was 0.56 t/ha. In comparison, the mean standard deviation of wheat yield on individual farms over the five years was 0.71 t/ha. Controlling for geographical location, the mean standard deviation of wheat yield between years for the six farms located in Dalwallinu was 0.68 t/ha. The fact that there is greater variability in yield within farms than across farms means that an insurance company setting premiums based on shire yield data for a product that insures against yield loss will set them too low. Farmers who have more variable yields have a greater probability of their yield falling below the insured level and should be charged higher premiums. Charging a premium based on shire level variability will underestimate the probability of loss.

The most noticeable feature from farmers' responses regarding their hail insurance is that although premiums vary, almost all farmers take out full coverage. In terms of percentage of expected crop value, the mean coverage chosen was 87% with 14 out of 19 farmers choosing to cover their entire crop. Three farmers chose between 80% and 95% coverage and two had no insurance policy. The lowest premium paid was 0.49% of the insured crop value while the highest was 2%. The mean premium was 0.75% with a standard deviation of 0.43%. Removing the two farms that did not buy insurance, the mean premium charged was 0.84%. The variation in premiums is to be expected due to the variation in farm locations and types of crop planted, as hail premiums are primarily based on these two factors. The high take up of insurance suggests that adverse selection does not impair the market for hail insurance. There is no asymmetric information because it is unlikely that a farmer has a better predictive ability over the risk of hail damage than an insurance company that has access to the same meteorological information as the farmer.

5. Empirical Results

In this section farmers' willingness to pay for insurance that protects against wheat yield variability is modelled. Hail insurance has the effect of guaranteeing a certain yield in t/ha for the farmer's crop in the event of damage. This is similar to drought insurance or multi-peril crop insurance, which are not available in Australia. The model estimates the coefficient of relative risk aversion and the impact that the Federal Government's ECIRS program has on willingness to pay for hail insurance.

The empirical model is based on equation 2 with an extra term being added that captures the effect of government assistance in the event of crop failure.

$$\frac{\rho_h}{\bar{Y}} = \beta_0 + \beta_1 ECIRS + \frac{1}{2} R \sigma_Y^2 + u \qquad (3)$$

$$\frac{\rho_h}{\bar{Y}} = \beta_0 + \beta_1 ECIRS + \beta_2 \sigma_Y^2 + u \qquad (4)$$

The dependent variable $\rho_h / \bar{Y}$ is the hail insurance premium as a percentage of mean crop value. Risk is measured as the squared coefficient of variation of wheat yield in t/ha, σ_Y^2. The estimated value of the slope parameter β_2 gives an estimate of the coefficient of relative risk aversion *R*, using $R = 2\beta_2$. The risk premium is the amount of income that, when given in exchange for insurance, will equalise utility in the loss and non-loss states. Farmers actually pay an 'unfair' premium that includes an extra loading factor that is determined by the insurance company's administration costs and profit. The intercept term β_0 may be interpreted as the loading factor that farmers pay to the insurance company independent of risk. *ECIRS* is a dummy variable that is set equal to 1 if the farm has ever received emergency aid in the form of an Exceptional Circumstances Interest Rate Subsidy. This variable is used to test whether access to government support reduces the willingness to pay for insurance. *u* is the error term.

Equation 5 was estimated using OLS, corrected for heteroscedasticity. The full regression output is included in the technical Appendix.

$$\frac{\rho_h}{\bar{Y}} = \underset{(0.14)}{0.39} - \underset{(0.12)}{0.22}\, ECIRS + \underset{(0.47)}{1.3}\, \sigma_Y^2 \tag{5}$$

$R^2 = 0.25$, df = 15

The regression results indicate that the farmers' willingness to pay for hail insurance strongly depends on the variability of crop yield. The estimated parameter β_2 equals 1.3 with a standard error of 0.47. The mean value of the coefficient of variation σ_Y is 0.48 in the regression sample. An increase by 20%, which might be caused by future climate change, would raise the squared coefficient of variation from 0.23 to 0.33, adding 0.13 percentage points to the relative insurance premium. Since the mean premium is 0.69%, this amounts to an increase in the relative insurance premium of 19%. The estimated value for β_2 implies that the coefficient of relative risk aversion R is 2.6, suggesting that farmers are moderately strongly risk averse. When modelling aggregate consumption and saving, macroeconomists work with a coefficient of relative risk aversion between 1 and 2. Financial economists, who focus on the behaviour of individual investors, typically find somewhat larger coefficients of relative risk aversion, between 2 and 4 and sometimes even higher. This study is in line with those of financial economists because it focuses on individual asset holders - here farmers.[2]

The estimated value of β_1 is -0.22 with a standard error of 0.12. The negative value implies that receiving ECIRS payments from the government reduces willingness to pay for insurance. This finding is consistent with the view of the Productivity Commission (2009) that ECIRS payments create a perverse incentive for producers to be less self-reliant and manage the risk of drought less effectively in the knowledge that they will receive government support. The ECIRS program is effectively a substitute for holding drought insurance and as a result reduces willingness to pay for insurance. The policy is one of the contributing factors for the failure of a private drought insurance market to develop in Australia. Removing the *ECIRS* variable from the model yields an R of 2.1.[3]

The positive value of R indicates that farmers are risk averse. With risk aversion, the willingness to pay for yield insurance depends positively on the variation in crop yield; that is, higher risk farmers are willing to pay more for insurance. This may give rise to adverse selection in markets for insurance that protect against losses in yield caused by hail or other events. Farmers who have greater variation in their wheat yield are more likely to suffer crop failures and are more likely to claim. They are associated with higher expected costs to cover and should be charged higher premiums. In Western Australia insurance companies collect average yield data for entire shires. Nevertheless, adverse selection does not appear to be a major problem in the market for hail insurance because the estimated equation 5 indicates that insurance companies are able to charge premiums that reflect the objective risk of the insured farmers.

[2] Warren (2007) provides a meta-analysis of the coefficient of relative risk aversion. Bond and Wonder (1980) found that Australian farmers are only moderately risk averse.

[3] In demand analysis the inverse of R is called the income flexibility. Gao (2012) and Clements (2008) show that the income flexibility is close to 0.5.

The potential for moral hazard can be gauged by considering the effort of farmers to avoid crop losses. One risk management strategy involves the use of seasonal weather forecasts to determine the optimal crop area to be planted. Insurance may give rise to ex-post moral hazard because it reduces the incentive to pay attention to seasonal weather forecasts, increasing the size of the loss should adverse weather conditions arise during the planting cycle. A positive correlation between hectares planted and crop yield in t/ha indicates that forward looking farmers take advantage of seasonal weather forecasts.

For the empirical analysis a panel data set was compiled using the five years of production data collected from each farm. A fixed effects panel regression removes time invariant data, allowing assessment of the predictor's net effect (in this case the effect of yield in t/ha on hectares planted). It should be noted that while it is theorised that a farmer's decision to plant is based on the season's predicted or expected yield, the data regressed on is the actual t/ha produced. The fixed effects panel regression model is:

$$Crop\ Area_{it} = a\ Crop\ Yield_{it} + u_{it} \tag{6}$$

The crop area is measured in hectares and crop yield is tonnes per hectare. u_{it} is the error term. There is no intercept term as it is wiped out as a time invariant variable. The estimated model for wheat is:

$$\underset{}{Crop\ Area_{it}} = \underset{(152.13)}{434.26}\ Crop\ Yield_{it} \tag{7}$$

$R^2 = 0.96$, df = 75

The estimated parameter *a* is 434.26 with a standard error of 152.13. Thus, it can be concluded that a significant positive relationship exists between the area planted and wheat yield. The regression was also run for the composite value of all crops as well as barley with similar results. These findings show that farmers plant more crops in higher yielding years, suggesting that they are able to predict weather conditions by using meteorological information and to manage the risk appropriately. There exists the potential for moral hazard as the introduction of drought insurance would reduce the incentive to behave prudently.

6. Conclusion

The findings in this paper shed light on the provision of crop yield insurance in Western Australia. First, there is a demand for insurance as the degree of risk aversion of Western Australian farmers is similar to that of other asset holders. Second, adverse selection plays a minor role in the market for hail insurance because observed insurance premiums reflect farm specific risks. Third, government emergency assistance reduces the willingness to pay for insurance. Fourth, there arises the potential for moral hazard because with no drought insurance farmers manage the risk of crop failure by using meteorological information. A future supplier of drought insurance must take into consideration that the introduction of drought insurance will change the risk management practices of farmers.

It remains an open question to what degree the findings on hail insurance carry over to multi-peril crop insurance that also covers drought and frost. In analysing the stability of risk preferences across five different types of insurance, Einav et al. (2012) found that an individual's choice in one insurance market has substantial predictive power for their choices in other insurance markets. Insurance domains that are 'similar' such as prescription drug insurance and health insurance are particularly good predictors of each other. It is reasonable to assume that the same applies for hail insurance and drought insurance because the loss caused by damage from hail and drought is the same – they both affect farm income by way of damaging crops. However, there is no reason to believe that insurance companies have access to the same information even in similar markets. In particular, it seems that there exists less private information that is hidden from insurance companies in the market for hail insurance than the market for drought insurance. The hail risk is a given quantity that is based on historical observations whereas the drought risk changes from one planting season to the next in a predictable manner. Insurance companies do not know how skilfully farmers use seasonal weather forecasts and meteorological information, if at all. For this reason, drought insurance is more prone to asymmetric information than hail insurance, which may explain the failure of the market for drought insurance in Australia.

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Appendix

Table 1. Grower Groups

Region	Group Name
Northern Agricultural Region	Liebe Group Mingenew-Irwin Group Morawa Farm Improvement Group North East Farming Futures Northern Agri Group West Midlands Group Yuna Farm Improvement Group
Avon Region	Bodallin Catchment Group Corrigin Farm Improvement Group Duli Farm Improvement Group Evergreen Farming Facey Group Greenhills Production Group Holtrock Group
South West Region	Bugs and Biology North Kojonup Production Group Nyabing Farm Improvement Group Southern DIRT Tambellup/Broomehill Farmers West Wagin Top Crop Group
South Coast Region	Esperance Regional Forum Fitzgerald Biosphere Group Gillamii Centre Jerdacuttup Top Crop and Pasture Group Munglinup Local Farmer Group North Mallee Farm Improvement Group South East Premium Wheat Growers Association

Table 2. Farm Location and Size

Farm #	Shire	Post Code	Farm Area	Crop Area
			hectares	hectares
1	Dalwallinu	6609	6,260	5,200
2	Corrigin	6375	3,332	1,300
3	Kojonup	6395	1,300	300
4	Morawa	6623	4,250	4,250
5	Morawa	6623	1,950	1,634
6	Mullewa	6630	10,000	10,000
7	Morawa	6623	6,680	5,050
8	Bruce Rock	6418	2,240	1,100
9	Wickepin / Kirk Rock	6372	6,500	4,470
10	Dalwallinu	6609	5,100	4,000
11	Dalwallinu	6612	10,200	8,500
12	Dalwallinu	6612	8,000	6,000
13	Dalwallinu	6612	4,800	3,400
14	Kojonup	6395	1,150	470
15	Kojonup	6395	1,100	250
16	Wickepin / Dumbleyung	6361	4,139	2,141
17	Wickepin	6370	2,200	1,000
18	Dalwallinu	6609	33,400	27,600
19	Corrigin	6375	2,300	900

Farm Survey

Agricultural Risk Management in Western Australia

Contact

Amy Khuu, Department of Economics, University of Western Australia,
Email: khuua03@student.uwa.edu.au (Please email completed questions to this address.)

Privacy Policy

The information collected will be treated as strictly confidential and will not be used for any other purpose apart from research conducted by the principal investigator Amy Khuu. In your answers do not include any information that would identify you personally or your farm.

Supervisor

Associate Professor E. Juerg Weber, Department of Economics, University of Western Australia, Email: juerg.weber@uwa.edu.au

Questions

Please answer all questions, partial answers will also be helpful.

1. **Farm background**

   a) Where is your farm located?

      Shire/District: …………………………

      Post code: ……........

   b) What is the area of your farm?

      In total (hectares): ………………………

      Area of land devoted to crops (hectares): ………………………

   c) Please record the crops that you have grown for the past five years. What has been the yield of each crop for each year?

Year	Crops	Area (ha)	Yield (t)
2010	Wheat		
	Barley		
	Canola		
	Lupins		
	Other: ………….		
2009	Wheat		
	Barley		
	Canola		
	Lupins		
	Other: ………….		

2008	Wheat		
	Barley		
	Canola		
	Lupins		
	Other: ………….		
2007	Wheat		
	Barley		
	Canola		
	Lupins		
	Other: ………….		
2006	Wheat		
	Barley		
	Canola		
	Lupins		
	Other: ………….		

d) What are the major risks affecting your farm's production and income? Please give details:

2. Hedging arrangements for price risk

a) What percentage of your crops do you usually hedge?

Wheat ………………

Barley ………………

Canola ……………...

Lupins ………………

Other: ………………

Average for total crop: ………………

b) Percentage of crop sold using the following methods? (average)

Forward contracts: ………………

Futures contracts: ………………

Commodity swaps: ………………

Basis Contracts: ………………

Options: ………………

Grain pools: ………………

Other: ………………

c) What hedging instruments do you use for each crop type? Give company and product name if possible.

Wheat

……………………………………………………………………………………

Barley

………………………………………………………………………………………………

Canola

………………………………………………………………………………………………

Lupins

………………………………………………………………………………………………

Other

………………………………………………………………………………………………

3. Insurance arrangements (normal yield type insurance, i.e. hail, fire, etc.)

a) Do you currently have a crop insurance policy?

Yes/No: …………………

If no, why not? (please explain)

- Too expensive: ………………
- Not necessary: ………………
- Other: ……………………………………………………………………………

If yes, how much do you pay each year for crop insurance (average)?

In $ terms: ………………

As a percentage of expected crop value: ………………

b) What amount are you insured for?

In $ terms: ………………

As a percentage of expected crop value: ………………

c) What is the highest premium as a percentage of expected crop value that you would be willing to pay for your existing crop insurance? ………………

d) Please give details of any insurance claims you have made in the past ten years:

Year	Reason for claim	Amount

e) Please give details of any crop failures that you did not claim for, or where unable to claim for in the past ten years:

Year	Reason for failure	Size of loss, i.e. total crop failure or percentage reduction in yield.

4. Uninsurable Risks

This question deals with potential crop insurance for drought, frost and flood which currently does not exist in Australia or is hard to get.

1. Would you be interested in insurance that protects against losses in production due to drought, frost or flood?

   Yes/No: ………………

   If no, why not?

   - Availability of assistance from the government is sufficient: ………………
   - Other – please give reason: ………………

   If yes, how much would you be willing to pay for such insurance (as a percentage of expected crop value)? ………………

2. Are you taking other measures to prevent uninsurable losses caused by drought, frost and flood? Please give details:
   ………………………………………………………………………………………

5. Other risk management tools

a) Government Support

Have you ever received government support as a result of your farm being declared as experiencing an 'Exceptional Circumstance' (EC)? Please give details:

- Exceptional Circumstances Relief Payments (ECRP) – commonly called 'Income Support'

  Years received: ………………………………………………………………..

  Amount received:………………………………………………………......

- Exceptional Circumstances Interest Rate Subsidies (ECIRS)
  Yes/No: ……………..

- Other, please state:……………..……………..……………..……………..…...

Are you participating in the pilot of drought reform being conducted by the WA and Australian government?

Yes/No: ………………

b) What other farm risk management strategies do you use?

- Store crop and spread sales over the year or longer time
  Yes/No: ………………

- Farm Management Deposit account (FMD)

  Yes/No: ………………

- Credit line with a bank on which you may draw in an emergency (overdraft facility)?

  Yes/No: ………………

- Non-farm income (please give detail)

- Yearly income smoothing through grower co-production (Investor backed farming)
  AACL (Yes/No): ………………
  Other (give detail):

- CBH Mutual Fund (Yes/No): ………………

End of questions. Thank you.

Appendix: Data and Regression Output

Table 1 – Farm Production Data: All Crops

Farm #	Total Area Planted	Mean Area	Average Yield	Mean Annual Yield	St. Dev of Annual Area Planted	St. Dev of Annual Yield	Coefficient of Variation
	ha	ha	t/ha	t/ha	ha	t/ha	sd/mean
1	11,363	2,273	1.38	1.29	665	0.720	0.559
2	7,034	1,407	1.44	1.40	192	0.593	0.423
3	1,017	203	1.84	1.88	68	0.523	0.279
4	11,816	2,363	1.86	1.81	402	0.839	0.465
5	4,662	932	1.17	1.03	375	0.580	0.560
6	21,500	4,300	1.13	1.02	1,095	0.580	0.568
7	10,813	2,163	1.27	1.10	1,201	0.698	0.633
8	5,240	1,048	1.49	1.54	169	0.936	0.607
9	17,010	3,402	1.37	1.44	694	0.530	0.367
10	13,217	2,643	1.40	1.29	650	0.616	0.477
11	31,660	6,332	1.64	1.50	2,244	0.691	0.462
12	30,250	6,050	1.61	1.61	0	0.603	0.373
13	13,822	2,764	1.78	1.73	375	0.738	0.428
14	2,032	406	1.80	1.91	96	0.789	0.414
15	1,089	1,089	2.03	2.07	19	0.637	0.308
16	4,200	2,100	1.47	1.50	141	0.784	0.524
17	3,875	775	1.26	1.28	232	0.588	0.458
18	101,671	20,334	1.28	1.20	3,941	0.643	0.537
19	4,740	948	1.24	1.30	207	0.703	0.540

Notes: All figures use five years of data from 2006 to 2010. Average yield = total tonnes from 2006 to 2010/total hectares planted from 2006 to 2010.

Table 2 – Farm Production Data: Wheat

Farm #	Total Area Planted	Mean Area	Average Yield	Mean Annual Yield	St. Dev of Annual Area Planted	St. Dev of Annual Yield	Coefficient of Variation
	ha	ha	t/ha	t/ha	ha	t/ha	sd/mean
1	8,081	1,616	1.50	1.39	424	0.644	0.464
2	5,713	1,143	1.37	1.37	144	0.575	0.420
3	130	65	2.20	2.20	0	1.273	0.579
4	5,562	1,112	2.20	2.09	210	0.876	0.420
5	3,992	798	1.22	1.12	267	0.658	0.588
6	21,500	4,300	1.13	1.02	1,095	0.698	0.684
7	8,769	1,754	1.41	1.18	1,208	0.925	0.787
8	3,200	640	1.54	1.52	54	0.482	0.317
9	11,732	2,346	1.50	1.57	420	0.587	0.373
10	12,235	2,447	1.39	1.30	473	0.617	0.475
11	21,475	4,295	1.83	1.65	1,511	0.768	0.467
12	25,500	5,100	1.68	1.68	0	0.626	0.373
13	8,349	1,670	2.08	1.98	375	0.774	0.391
14	110	55	1.75	1.78	4	0.742	0.418
15	na	na	na	na	na	na	na
16	3,000	1,500	1.45	1.45	0	0.495	0.341
17	2,400	480	1.35	1.36	157	0.567	0.415
18	101,671	20,334	1.28	1.20	3,941	0.643	0.537
19	2,949	590	1.36	1.43	137	0.900	0.628

Notes: See Table 1.

Table 3 – Panel Set of Yearly Production

Farm #	Year	All Crops		Wheat		Barley		Canola		Lupins	
		t/ha	ha	t/ha	ha	t/ha	ha	t/ha	ha	t/ha	ha
1	2006	0.81	1975	0.98	1510	0.00	0	0.00	0	0.21	315
	2007	0.61	1270	0.67	918	0.70	152	0.00	0	0.00	0
	2008	2.38	2501	2.33	1919	2.93	305	0.00	0	2.55	122
	2009	1.63	2655	1.67	1914	1.97	290	0.00	0	1.36	321
	2010	1.02	2962	1.29	1820	0.60	15	0.51	422	0.64	555
2	2006	1.87	1320	1.81	1068	2.13	252	0.00	0	0.00	0
	2007	1.66	1522	1.60	1318	2.08	204	0.00	0	0.00	0
	2008	1.68	1439	1.68	989	1.69	450	0.00	0	0.00	0
	2009	1.40	1625	1.37	1275	1.51	350	0.00	0	0.00	0
	2010	0.38	1128	0.38	1063	0.43	65	0.00	0	0.00	0
3	2006	1.90	94	0.00	0	0.00	0	0.00	0	0.00	0
	2007	2.63	190	0.00	0	2.90	60	1.70	60	0.00	0
	2008	1.76	230	0.00	0	2.10	50	1.10	120	0.00	0
	2009	1.92	273	3.10	65	2.30	38	0.80	120	0.00	0
	2010	1.16	230	1.30	65	1.40	45	0.00	0	0.00	0
4	2006	1.31	2000	1.40	800	2.00	600	0.00	0	0.50	600
	2007	0.85	1970	1.20	1000	0.81	370	0.00	0	0.30	600
	2008	2.60	2290	2.80	1250	3.26	460	1.83	30	1.64	550
	2009	2.77	2706	3.20	1312	3.18	471	1.64	366	2.15	557
	2010	1.49	2850	1.83	1200	2.00	550	0.82	550	0.91	550
5	2006	0.73	536	0.73	536	0.00	0	0.00	0	0.00	0
	2007	0.20	582	0.20	582	0.00	0	0.00	0	0.00	0
	2008	1.46	959	1.68	740	0.82	170	0.43	49	0.00	0
	2009	1.63	1185	1.76	959	1.14	146	1.02	80	0.00	0
	2010	1.15	1400	1.23	1175	1.03	135	0.23	90	0.00	0
6	2006	0.30	4000	0.30	4000	0.00	0	0.00	0	0.00	0
	2007	0.40	2500	0.40	2500	0.00	0	0.00	0	0.00	0
	2008	2.00	5000	2.00	5000	0.00	0	0.00	0	0.00	0
	2009	1.30	5000	1.30	5000	0.00	0	0.00	0	0.00	0
	2010	1.10	5000	1.10	5000	0.00	0	0.00	0	0.00	0
7	2006	0.39	957	0.54	578	0.00	0	0.00	0	0.08	180
	2007	0.13	1140	0.21	581	0.10	284	0.00	0	0.00	75
	2008	2.41	1878	2.50	1625	2.33	121	0.00	0	0.89	56
	2009	1.67	3300	1.70	2980	1.56	222	0.00	0	0.00	0
	2010	0.91	3538	0.93	3005	1.30	140	0.00	0	0.43	240
8	2006	2.03	900	2.00	600	2.10	300	0.00	0	0.00	0
	2007	1.83	1000	1.80	700	1.90	300	0.00	0	0.00	0
	2008	1.89	1000	1.80	700	2.10	300	0.00	0	0.00	0
	2009	1.11	1000	1.00	600	1.50	300	0.60	100	0.00	0
	2010	0.84	1340	1.00	600	1.20	300	0.32	200	0.43	240

9	2006	1.46	2694	1.59	2037	1.73	213	0.56	248	0.99	196
	2007	2.28	2710	2.45	1781	2.74	303	1.27	203	1.68	423
	2008	1.32	3521	1.33	2512	1.08	374	1.25	270	1.53	365
	2009	1.43	3807	1.64	2617	1.59	290	0.63	543	0.90	357
	2010	0.73	4278	0.84	2785	0.91	337	0.30	711	0.58	445
10	2006	0.74	1900	0.74	1900	0.00	0	0.00	0	0.00	0
	2007	0.66	1982	0.66	1982	0.00	0	0.00	0	0.00	0
	2008	2.10	3209	2.10	2915	2.06	294	0.00	0	0.00	0
	2009	1.70	3181	1.70	2803	1.67	378	0.00	0	0.00	0
	2010	1.26	2945	1.29	2635	0.00	0	0.00	0	1.00	310
11	2006	0.89	3167	0.98	2185	1.08	437	0.00	0	0.38	545
	2007	0.74	4920	0.72	3280	0.78	1498	0.00	0	0.63	142
	2008	2.30	6993	2.40	4920	2.70	745	1.68	758	1.75	570
	2009	2.06	8409	2.33	5810	2.53	260	1.00	1257	1.70	972
	2010	1.50	8171	1.80	5280	1.87	407	0.57	1392	1.13	850
12	2006	1.34	6050	1.40	5100	1.40	100	0.00	0	1.00	850
	2007	0.95	6050	1.00	5100	1.00	100	0.00	0	0.63	850
	2008	2.48	6050	2.60	5100	2.50	100	0.00	0	1.75	850
	2009	1.96	6050	2.00	5100	2.00	100	0.00	0	1.70	850
	2010	1.35	6050	1.40	5100	1.50	100	0.00	0	1.00	850
13	2006	0.96	2583	1.21	1470	1.04	440	0.00	0	0.38	673
	2007	1.11	2273	1.26	1133	0.98	700	0.00	0	0.91	440
	2008	2.76	2946	3.05	1761	2.59	650	0.00	0	2.02	535
	2009	2.10	3268	2.35	2088	1.84	289	1.22	325	1.84	566
	2010	1.69	2752	2.04	1897	0.00	0	0.69	330	1.17	450
14	2006	1.95	285	0.00	0	2.40	60	1.10	107	0.00	0
	2007	2.96	337	0.00	0	3.70	100	1.35	87	0.00	0
	2008	2.16	416	0.00	0	3.00	141	1.20	185	0.00	0
	2009	1.70	482	2.30	52	2.40	140	0.95	240	0.00	0
	2010	0.78	512	1.25	58	1.15	171	0.18	133	0.00	0
15	2006	2.46	215	0.00	0	2.30	45	0.00	0	0.00	0
	2007	2.68	200	0.00	0	2.20	40	0.00	0	0.00	0
	2008	2.29	210	0.00	0	1.80	40	0.00	0	0.00	0
	2009	1.85	214	0.00	0	1.60	50	1.50	24	0.00	0
	2010	1.07	250	0.00	0	1.50	24	0.28	62	0.00	0
16	2006	na	na	na	na	na	na	na	na	na	na
	2007	na	na	na	na	na	na	na	na	na	na
	2008	na	na	na	na	na	na	na	na	na	na
	2009	2.05	2000	1.80	1500	0.00	0	0.00	0	1.00	200
	2010	0.94	2200	1.10	1500	0.00	0	0.00	0	0.60	300
17	2006	0.93	430	1.05	230	1.05	80	0.50	40	0.00	0
	2007	2.08	681	2.10	420	2.20	95	1.60	40	1.10	40
	2008	1.42	800	1.51	580	1.00	120	1.00	60	0.00	0
	2009	1.46	964	1.56	570	1.76	215	0.40	40	0.50	84
	2010	0.52	1000	0.60	600	0.50	200	0.25	80	0.20	60

18	2006	0.86	19926	0.86	19926	0.00	0	0.00	0	0.00	0
	2007	0.56	18380	0.56	18380	0.00	0	0.00	0	0.00	0
	2008	2.14	24000	2.14	24000	0.00	0	0.00	0	0.00	0
	2009	1.56	24365	1.56	24365	0.00	0	0.00	0	0.00	0
	2010	0.87	15000	0.87	15000	0.00	0	0.00	0	0.00	0
19	2006	1.56	681	1.65	497	2.40	63	0.76	121	0.00	0
	2007	2.14	995	2.41	705	2.55	58	1.20	232	0.00	0
	2008	0.79	1222	0.44	709	2.03	116	1.06	397	0.00	0
	2009	1.64	817	2.12	397	2.66	60	0.93	360	0.00	0
	2010	0.39	1025	0.55	641	0.00	0	0.11	384	0.00	0

Table 4 – Insurance Data

	Hail and Fire Insurance									Uninsurable Risk
	Premium paid		Coverage		Highest Premium Willing to Pay	Claims (Ten Years)			Loss Ratio	Max Willing to Pay for Insurance
Farm #	$	% of Expected Crop Revenue	$ Coverage	% of Expected Crop Revenue	% of Expected Crop Revenue	Number	$ Received	Unclaimed Losses	%	% of Expected Crop Revenue
1	8,500	0.90	951,905	100	1.50	2	15,330	0	7.6	na
2	na	0.60	na	100	0.88	1	30,000	0	Na	1
3	1,200	1.00	120,000	95	1.50	1	8,600	0	71.7	0
4	16,000	0.80	2,000,000	100	0.80	2	9,000	0	48.5	0
5	2,000	0.50	600,000	100	0.50	0	0	0	0.0	0.5
6	15,000	1.00	1,400,000	100	10.00	1	10,000	0	6.7	10
7	9,000	1.00	1,300,000	100	1.00	0	0	1	0.0	2
8	3,600	0.60	600,000	100	0.70	0	0	0	0.0	1
9	6,400	0.50	1,280,000	100	na	1	40,000	0	62.5	2
10	12,000	0.60	2,000,000	100	2.00	1	27,000	0	22.5	na
11	35,000	1.00	3,500,000	80	1.00	1	32,000	0	9.1	0
12	0	0.00	0	0	5.00	0	0	0	Na	na
13	15,000	1.00	1,500,000	100	na	0	0	0	0.0	0
14	na	0.70	na	100	na	0	0	1	Na	1
15	600	2.00	300,000	100	5.00	1	2,000	0	33.3	1
16	0	0.00	0	0	0.00	0	0	0	Na	10
17	1,000	0.66	150,000	100	0.66	0	0	0	0.0	0
18	80,000	1.00	8,000,000	100	1.00	2	13,000	0	1.6	na
19	2,130	0.49	350,000	80	0.53	1	na	1	na	na

Notes:

All figures are for one year, except for claims data which is a record of the past ten years.

Highest Premium Willing to Pay: Farmers were asked for maximum amount they would be willing to pay for their existing insurance policy.

Unclaimed losses: Losses caused by insurable events like hail and fire that were not claimed due to lack of insurance or other reason.

Uninsurable Risk: Farmers were asked for the maximum premium they would be willing to pay for insurance against drought, frost and flood.

Loss Ratio = ($ Claims received / ($ yearly premium*10)) * 100

Table 5 - Insurance Summary Statistics

	Premium paid		Coverage		Highest Premium Willing to Pay	Claims (past ten years)			Loss Ratio	Maximum Willing to Pay for Drought Insurance
	$	% of expected crop	$ coverage	% of expected crop	% of expected crop	Number	$ Received	Unclaimed Losses	%	% of expected crop
n	17	17	18	19	16	19	18	19	14	14
Mean	12,202	0.75	1,414,818	87.1	2.00	0.7	10,385	0.2	16.5	2
St. Dev	19,625	0.43	1,930,590	31.3	2.58	0.7	13,228	0.4	23.8	3
Median	6,400	0.70	951,905	100.0	1.00	1.0	5,300	0.0	6.2	1
Min	0	0.00	0	0.0	0.00	0.0	0	0.0	0.00	0
Max	80,000	2.00	8,000,000	100.0	10.00	2.0	40,000	1.0	71.7	10

Econometric Work

1. Risk Aversion

*RATS Program:

```
allocate 19
open data
data(format=XLS,org=col) / postcd farmarea croparea wheatprod wheatyield wheatprodsd $
wheatyieldsd hedge forward insprmpct wlpins claimsdls wtpunins ecpay ecirs pilot $
sellyear fmd crdline nonfarminc cbh

print / postcd farmarea croparea wheatprod wheatyield wheatprodsd $
wheatyieldsd hedge forward insprmpct wlpins claimsdls wtpunins ecpay ecirs pilot $
sellyear fmd crdline nonfarminc cbh

set coefvar = wheatyieldsd/wheatyield
set coefvarsq = coefvar^2

print / coefvar coefvarsq

linreg(robusterrors) insprmpct / residual1
# constant coefvarsq ecirs

print / residual1

compute cutoff=3*sqrt(%seesq)
linreg(robusterrors,smpl=abs(residual1)<cutoff) insprmpct / residual2
# constant coefvarsq

print / residual2
```

*RATS Output:

ENTRY	COEFVAR	COEFVARSQ
1	0.463904899135	0.215207755442
2	0.420321637427	0.176670278889
3	0.578545454545	0.334714842975
4	0.420000958359	0.176400805023
5	0.587857142857	0.345576020408
6	0.684215686275	0.468151105344
7	0.786904761905	0.619219104308
8	0.316907894737	0.100430613747
9	0.373329940196	0.139375244247
10	0.475423728814	0.226027721919
11	0.466767922236	0.217872293228
12	0.372678571429	0.138889317602
13	0.390565085772	0.152541086224

14	0.418309859155	0.174983138266
15	NA	NA
16	0.341361894366	0.116527942925
17	0.415327595459	0.172497011550
18	0.537160580151	0.288541488868
19	0.627549198466	0.393817996495

*Including ECIRS variable:

Linear Regression - Estimation by Least Squares
With Heteroscedasticity-Consistent (Eicker-White) Standard Errors
Dependent Variable INSPRMPCT

Usable Observations	18
Degrees of Freedom	15
Total Observations	19
Skipped/Missing	1
Centered R**2	0.252500
R Bar **2	0.152833
Uncentered R**2	0.873755
T x R**2	15.728
Mean of Dependent Variable	0.6856611111
Std Error of Dependent Variable	0.3180483262
Standard Error of Estimate	0.2927369466
Sum of Squared Residuals	1.2854237985
Log Likelihood	- 1.78734
Durbin-Watson Statistic	2.618618

Variable	Coeff	Std Error	T-Stat	Signif
1. Constant	0.391065472	0.140579565	2.78181	0.00540569
2. COEFVARSQ	1.339585472	0.470012674	2.85011	0.00437048
3. ECIRS	-0.222801800	0.123261739	-1.80755	0.07067651

ENTRY	RESIDUAL1
1	0.213545345885
2	- 0.027730410408
3	0.160555387659
4	0.172630572868
5	- 0.131192288066
6	- 0.018193890809
7	0.002239412308
8	0.074399137385
9	- 0.077770523834
10	0.128952875758
11	0.317075969778
12	- 0.577119583561
13	0.404592705530
14	0.074529658659

15	NA
16	-0.547164610916
17	0.037860037889
18	0.222408542002
19	-0.429618338128

*Not including ECIRS variable:

Linear Regression - Estimation by Least Squares
With Heteroscedasticity-Consistent (Eicker-White) Standard Errors
Dependent Variable INSPRMPCT

Usable Observations	18
Degrees of Freedom	16
Total Observations	19
Skipped/Missing	1
Centered R**2	0.198329
R Bar **2	0.148225
Uncentered R**2	0.864606
T x R**2	15.563
Mean of Dependent Variable	0.6856611111
Std Error of Dependent Variable	0.3180483262
Standard Error of Estimate	0.2935320636
Sum of Squared Residuals	1.3785771574
Log Likelihood	-2.41702
Durbin-Watson Statistic	2.785509

Variable	Coeff	Std Error	T-Stat	Signif
1. Constant	0.4307271262	0.1391445300	3.09554	0.00196456
2. COEFVARSQ	1.0294715915	0.3941417030	2.61193	0.00900320

ENTRY	RESIDUAL2
1	0.240622603352
2	-0.012604159329
3	0.224693451755
4	0.187673256361
5	-0.286487821862
6	0.087324610372
7	-0.068195602945
8	0.065882410080
9	-0.074209980661
10	-0.063416244757
11	0.344979537397
12	-0.573709732985
13	0.412236159045
14	0.089132704013
15	NA
16	-0.550689333008

17	0.051692100841
18	0.272227608092
19	- 0.347151565761

2. Moral Hazard

*****Panel regression

```
calendar(panelobs=5,a) 2006:1
allocate 19//2010:1

open data
data(format=excel,org=col) / allcropsyield allcropsarea wheatyield wheatarea $
barleyyield barleyarea

print / allcropsyield allcropsarea wheatyield wheatarea $
barleyyield barleyarea

*pregress is panel data regression
*fixed effects: the intercept is dropped from the fixed effects regression as it is
*wiped out as a time-invariant variable


*ALLCROPS

pregress(method=fixed) allcropsarea
# allcropsyield


*WHEAT

pregress(method=fixed) wheatarea
# wheatyield


*BARLEY

pregress(method=fixed) barleyarea
# barleyyield
```

RATS Output:

*ALLCROPS

Panel Regression - Estimation by Fixed Effects
Dependent Variable ALLCROPSAREA
Panel(5) of Annual Data From 1//2006:01 To 19//2010:01

Usable Observations	95
Degrees of Freedom	75
Centered R**2	0.953878
R Bar **2	0.942194
Uncentered R**2	0.968775
T x R**2	92.034
Mean of Dependent Variable	3132.1157895
Std Error of Dependent Variable	4558.5689894
Standard Error of Estimate	1096.0125780
Sum of Squared Residuals	90093267.841
Regression F(19,75)	81.6381
Significance Level of F	0.00000000
Log Likelihood	-788.51692

Variable	Coeff	Std Error	T-Stat	Signif
1. ALLCROPSYIELD	557.15001040	186.07010747	2.99430	0.00372464

*WHEAT

Panel Regression - Estimation by Fixed Effects
Dependent Variable WHEATAREA
Panel(5) of Annual Data From 1//2006:01 To 19//2010:01

Usable Observations	95
Degrees of Freedom	75
Centered R**2	0.960429
R Bar **2	0.950405
Uncentered R**2	0.970186
T x R**2	92.168
Mean of Dependent Variable	2592.8105263
Std Error of Dependent Variable	4556.4170164
Standard Error of Estimate	1014.7133843
Sum of Squared Residuals	77223243.926
Regression F(19,75)	95.8076
Significance Level of F	0.00000000
Log Likelihood	- 781.19503

Variable	Coeff	Std Error	T-Stat	Signif
1. WHEATYIELD	434.25926100	152.12673808	2.85459	0.00556907

* BARLEY

Panel Regression - Estimation by Fixed Effects
Dependent Variable BARLEYAREA
Panel(5) of Annual Data From 1//2006:01 To 19//2010:01

Usable Observations	95
Degrees of Freedom	75
Centered R**2	0.626816
R Bar **2	0.532276
Uncentered R**2	0.784504
T x R**2	74.528
Mean of Dependent Variable	189.44210526
Std Error of Dependent Variable	222.63550575
Standard Error of Estimate	152.26127946
Sum of Squared Residuals	1738762.2916
Regression F(19,75)	6.6302
Significance Level of F	0.00000000
Log Likelihood	-601.00250

Variable	Coeff	Std Error	T-Stat	Signif
1. BARLEYYIELD	36.292489097	21.834312161	1.66218	0.10065165

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