An open padlock is shown on a sandy surface. The padlock is metallic and has the number '4014110' engraved on its body. The background of the slide is a gradient from yellow to blue.

Luck versus management: an alternative method to model the impacts of stochastic variables on production functions for efficiency analysis.

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Objective

- ◆ Estimate production efficiency more accurately
- ◆ Identify farmers that adapt to the levels of stochastic variables
- ◆ Break the production process into discrete time periods
- ◆ Sum efficiency in each time period for total efficiency



Efficiency

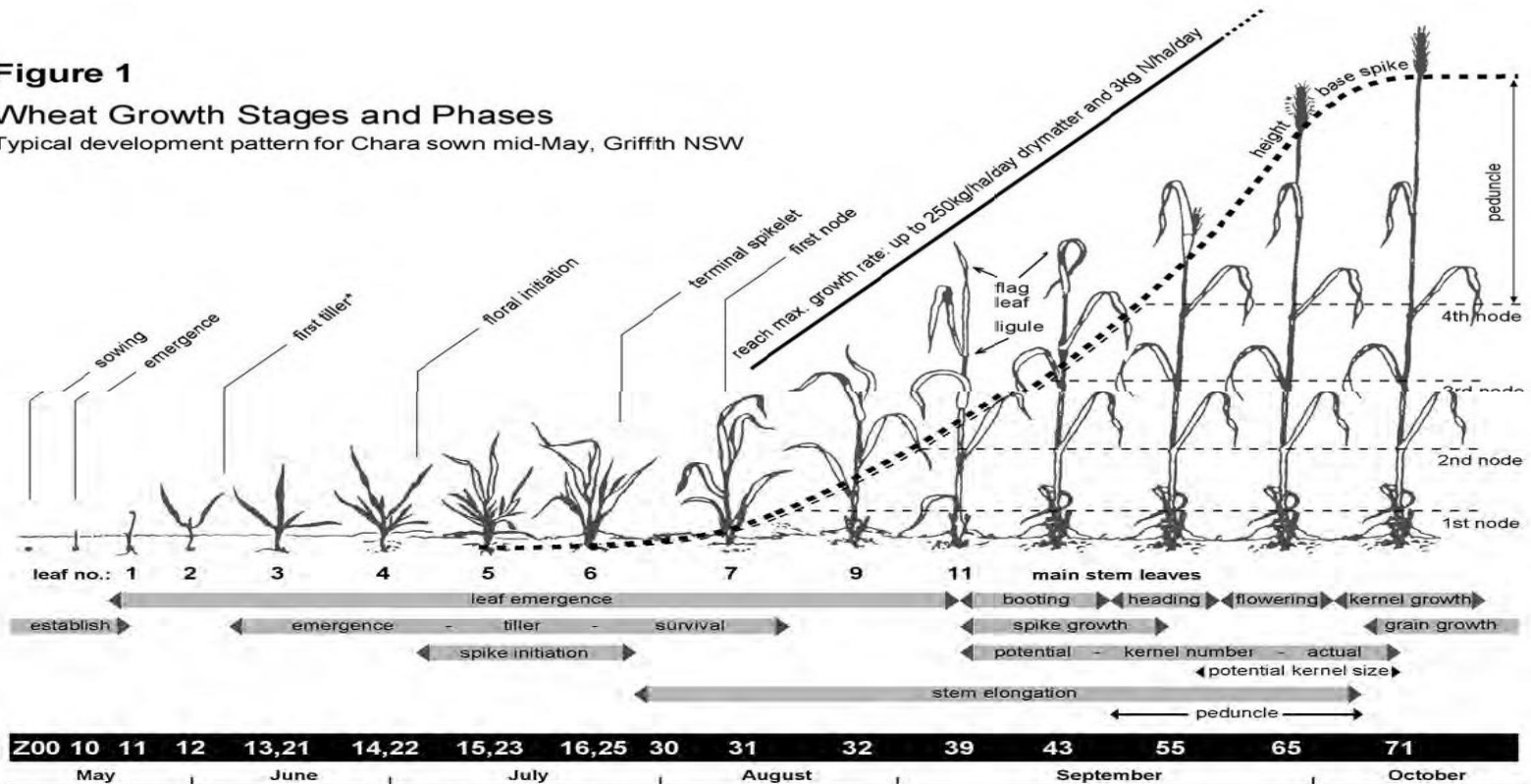
- ◆ Production function
- ◆ Stochastic frontier analysis
- ◆ Have been used to analyse efficiency over several time periods rather than within a production phase
- ◆ Does not allow for tactical management within a production period

Zadoks' scores

Figure 1

Wheat Growth Stages and Phases

Typical development pattern for Chara sown mid-May, Griffith NSW



* under good condition some plants will have a colepile tiller appearing between Z11 and Z12.



Z32 model

DV = z32perm2

Source	DF	Pr > F
Water at establishment	1	0.6355
In-crop rainfall	1	0.0343
(In-crop rainfall) ²	1	0.7716
Sowing rate	1	<.0001
Opening device	2	0.0001
Closing device	6	<.0001
Wheat variety	31	<.0001
Pre-sowing nitrogen	1	<.0001
Year	7	<.0001
Region	3	0.3144
Soil class	7	0.0863
Stubble management	7	0.0001
Previous crop	10	<.0001

$R^2 = 0.527$, Pr > F = <0.0001.



Yield and Z32 relationship

Parameter	Estimate	Pr > t
Intercept	-0.31569	<.0001
Z32perm2	0.002432	<.0001
(Z32perm2) ²	-1.2E-06	<.0001
In-crop rainfall	0.009586	<.0001

$R^2 = 0.530$, $\text{Pr} > F = <0.0001$.

Summary Groups A & B 05/08

Variable	Sowing rate	Annual rainfall	Soil water holding capacity	Yield	Screenings	Grain protein
Mode A	50	295	15	2.3	3	15
Mode B	50	414	15	2	1	12
Average A	48.4000	355.750	13.5714	2.6821	6.1240	13.6107
Average B	53.4615	429.538	12.6154	3.2885	3.8043	12.4192
T-test	0.0193	0.0604	0.0911	0.1356	0.1306	0.0237
T result	Sig	Sig	Sig	NS	NS	Sig



Model

- ◆ $y_1 = x_t \beta + v_t - u_t$

- ◆ $y_2 = x_{(tn)} \beta - y_1 \beta + v_{(tn)} - u_{(tn)}$

- ◆ $Y = a_1 y_1 + a_2 y_2$



Efficiency

- ◆ $TE_1 = OA_1/OB_1$ for period t_1
- ◆ $TE_2 = OA_2/OB_2$ for period t_2
- ◆ $TE = TE_1 + 2 TE_2$



Elasticity of substitution

- ◆ $\sigma_{jk} = d \ln (x_j/x_k) / (d \ln (f_j (X) / f_k (X)))$
- ◆ where f_j and f_k are the marginal products of j and k



Conclusions

- ◆ Model allows for efficiency of input tasks such as seeding, fertilizer and chemical application
- ◆ Correlates inputs with partial outputs
- ◆ Takes account of tactical input use
- ◆ Supports dual intermediate revenue and cost functions