Public private partnerships as response to IPR challenges in global agri-food system:
The case of pulse research

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Institutional economics of research

- Features
  - Low programmability
  - Variable separability
  - High asset specificity
- Holdups as private IPRs and markets costly
- Theory suggests long-term contracts, ex-ante commitments or 'clans'—P3s?

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Research PPPs

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3 Types of Centrality

- **Degree Centrality**: # links; index of exposure and opportunity to directly influence or to be influenced by its relationships
- **Betweenness centrality**: gate keeper role—controlling flow of information along shortest path between other actors
- **Eigenvector centrality**: weighted links; influence based on central position and connections to well-connected nodes

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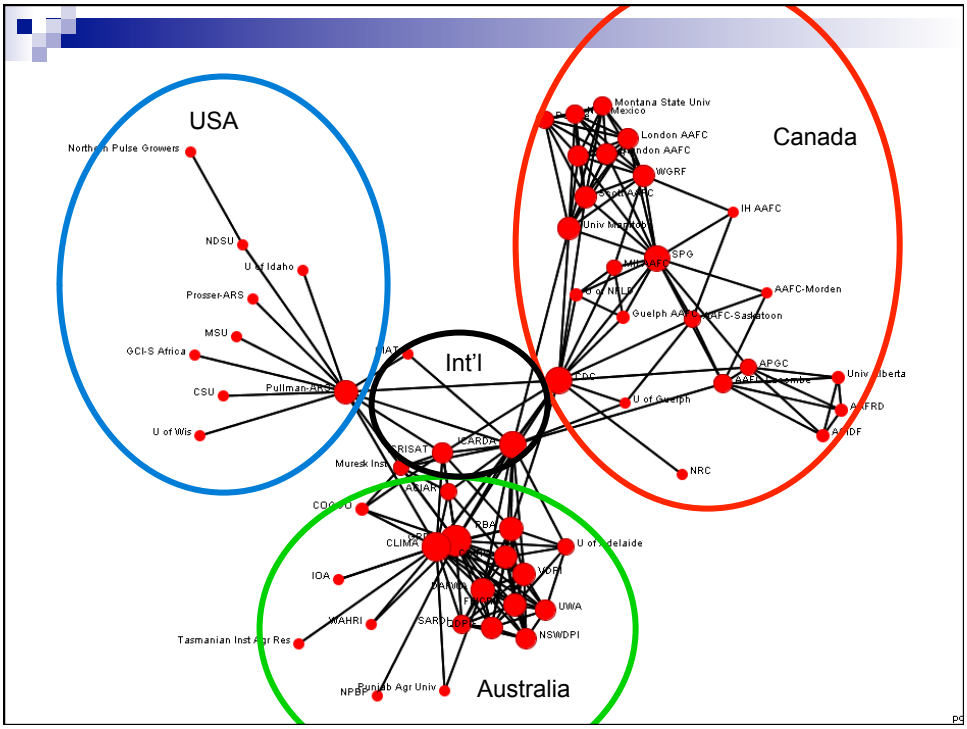
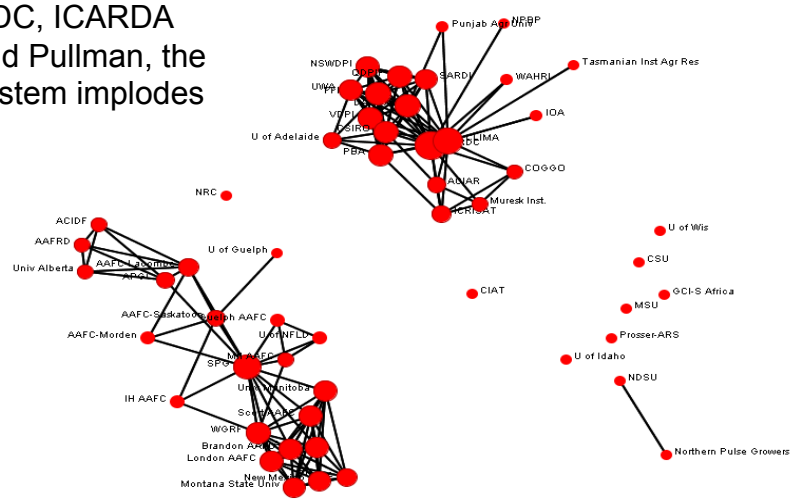


With loss of only CDC, ICARDA and Pullman, the system implodes



Vulnerability of the global pulse network	
	% effect of loss of CDC, ARS and ICARDA
# nodes	-5%
# links	-22%
Density	-13%
Network centralization	-7%
Betweenness centralization	-71%
Closeness centralization	-99%
Fragmentation (# units)	+1000%
Characteristic path length	-29%

Source: Authors' calculations.

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Conclusions

- R&D P3s driving global pulse industry
- Using non-competitive or more often non-market structures
- Australia key user of P3s
- Networks highly vulnerable to disruption among single actors

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IPR Roundtable

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Network method

- 'make visible the invisible'
- "Describe and measure properties of *actor location* in a social network" (Wasserman and Faust 1994);
- **Density**: % of all possible linkages effected

$$Density_{Local} = \frac{2L}{N(N-1)}$$

- **Centrality**: position of a particular actor

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Pulse Innovation Network/Sub networks					
			# central actors based on centrality measures one standard deviation or more above the mean		
Network	N	Density	Degree	Betweenness	Eigenvector
Global	**56**	**.123**	**15**	**7**	**2**
Australia	19	**.404**	**7**	2	**1**
Canada	21	.281	2	**4**	**1**
US	11	.182	1	1	4

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Positively correlated centrality & degree of partnership in global system and Australia				
	Global	**Australia**	**Can**	**USA**
Size	56	19	21	11
Total Degree Centrality	0.371 (99%)	0.272 (75%)	-	-
Eigenvector Centrality	0.315 (95%)	0.197 (50%)	-	-
Betweenness Centrality	0.331 (95%)	0.474 (95%)	-	-
(%) represents level of statistical significance Source: Authors' calculation.				

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