

Feasibility study: establishing artificial pollination in Australia

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Artificial Pollination: Review of existing global strategies



Three principal components of the review process

- Literature review (scholarly & popular press)
- Global patent search
- Targeted interviews with:
 - Artificial pollination researchers
 - Pollination tech companies
 - Pollen providers

Two principal areas of focus

- Pollen collection
- Pollen application



Almond growers are thinking about changing strategy



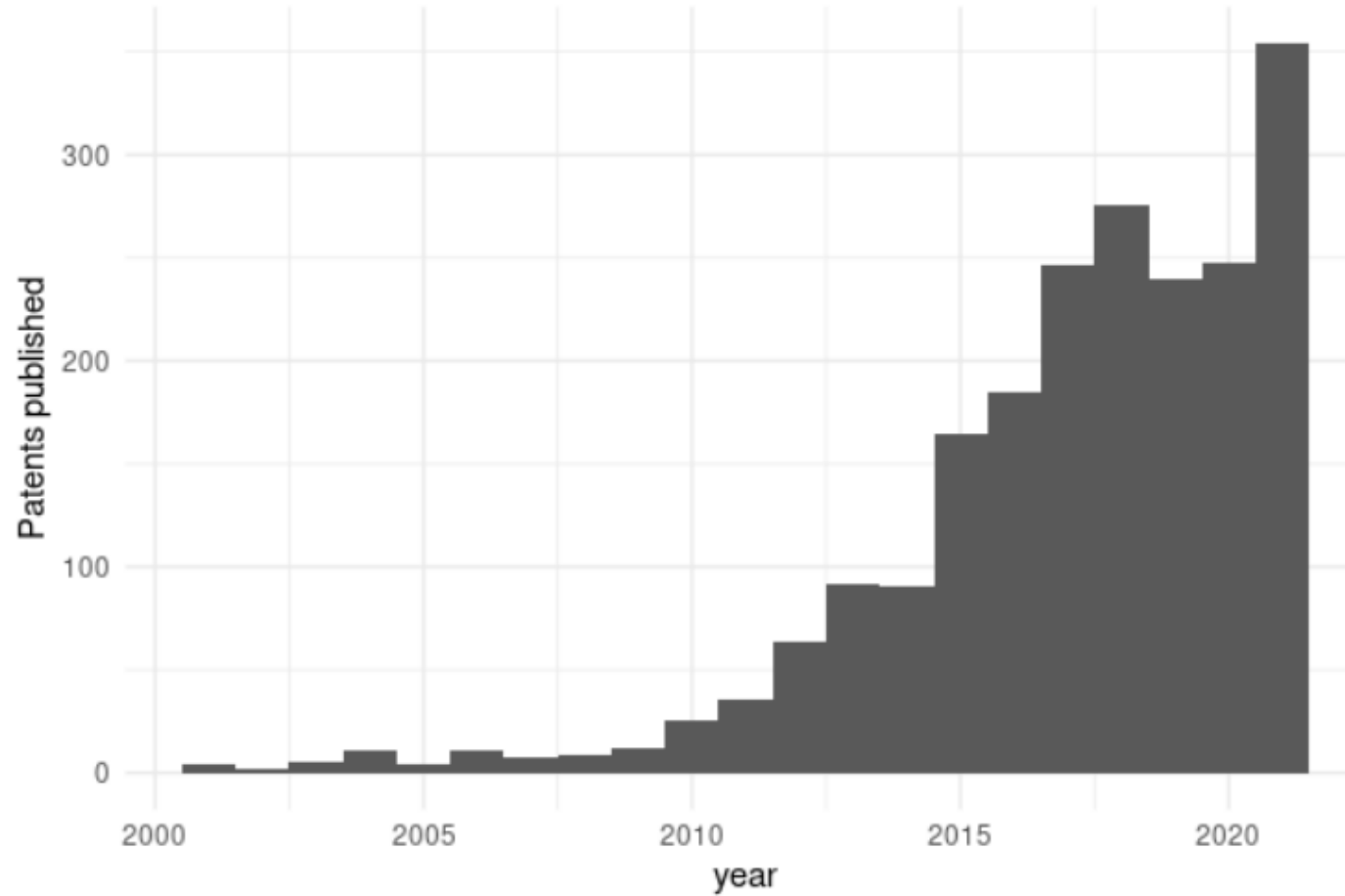
- Major themes in grower surveys:
 - Reducing honey bee stocking rate due to high price
 - Changing hive placement within blocks
 - Auditing colony strength of received hives
 - Moving toward self-compatible varieties
 - Trying to get involved in trials of artificial pollination

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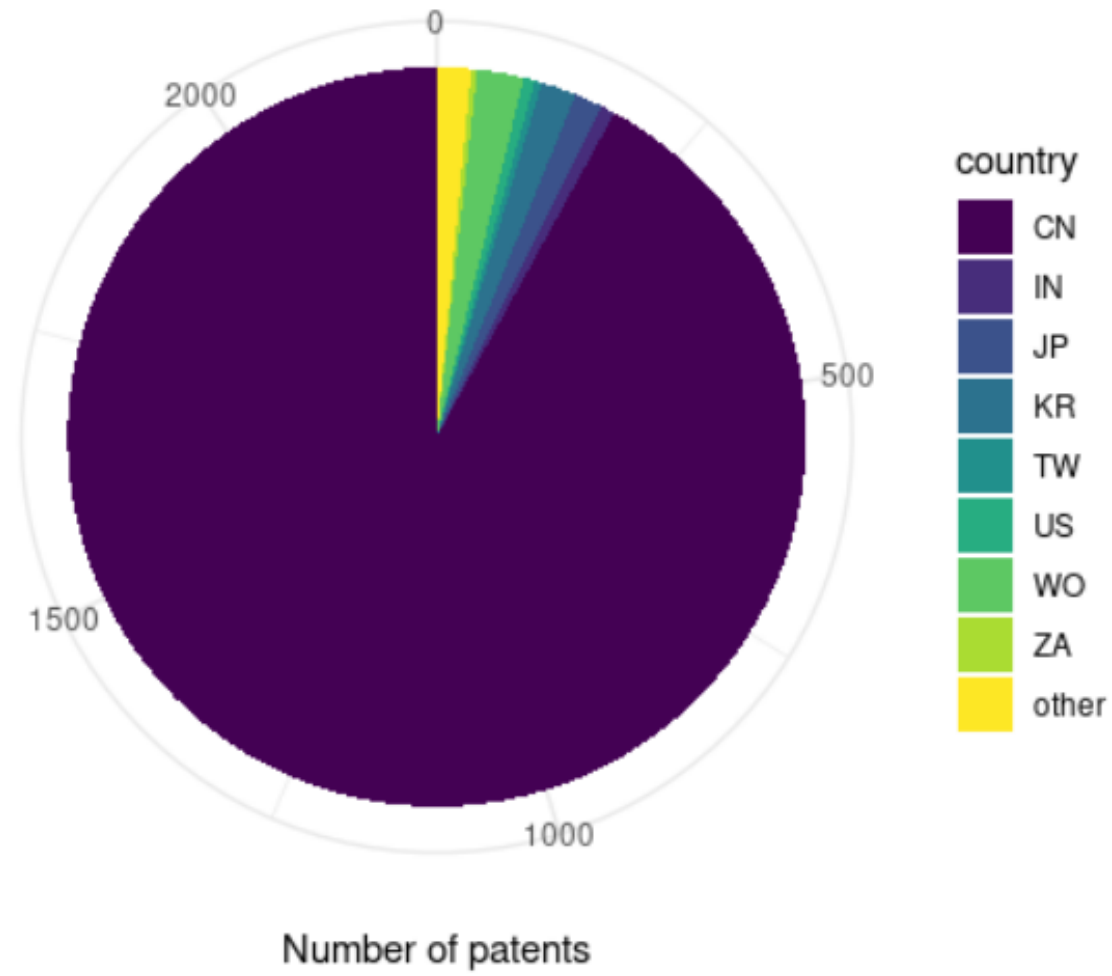


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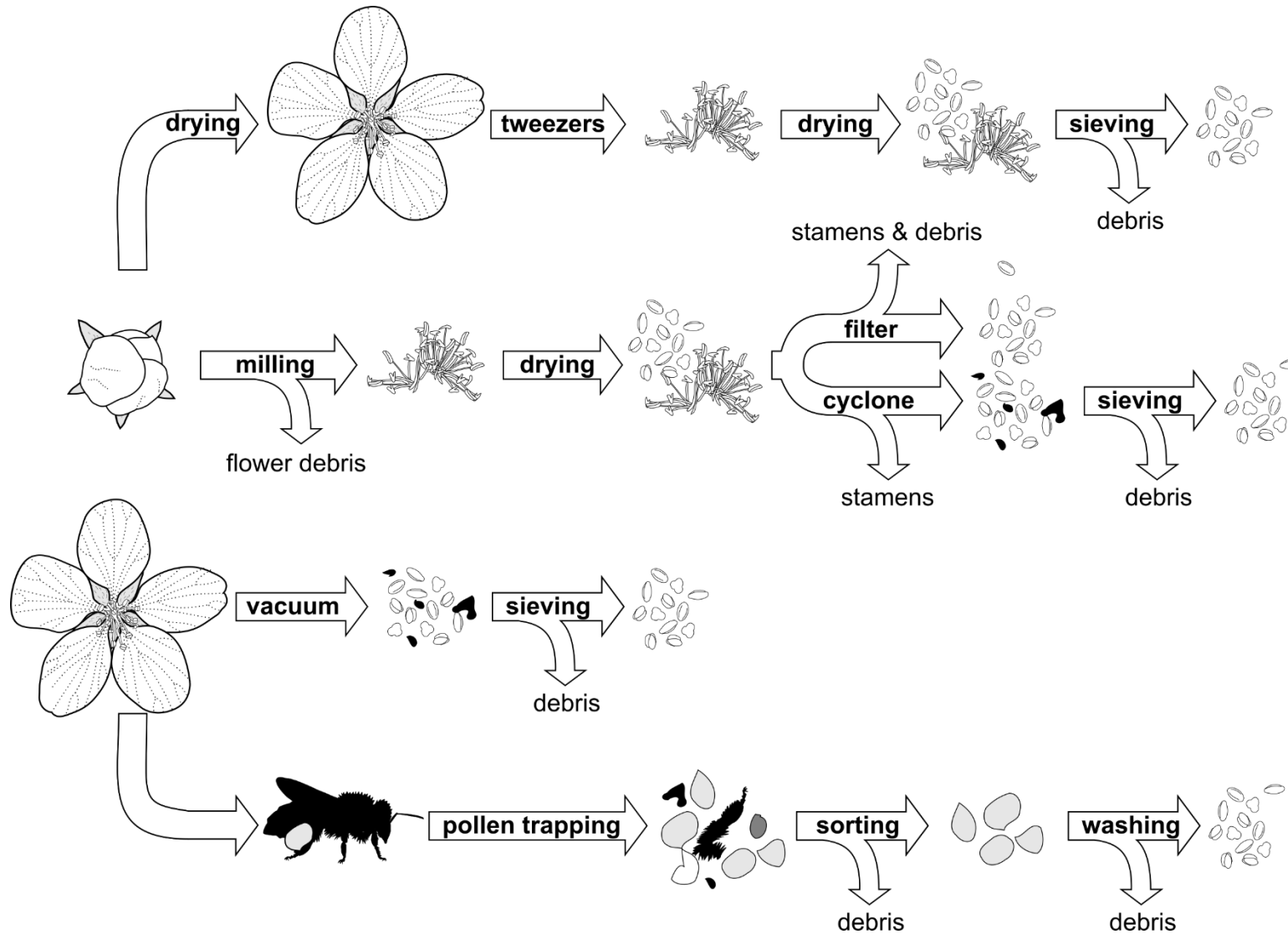
Increasing commercial investment in artificial pollination



Number of patents published for artificial pollination devices worldwide per year between 2001 and 2021.



Pollen harvesting is a complex and intensive process





End-to-end pollination solution

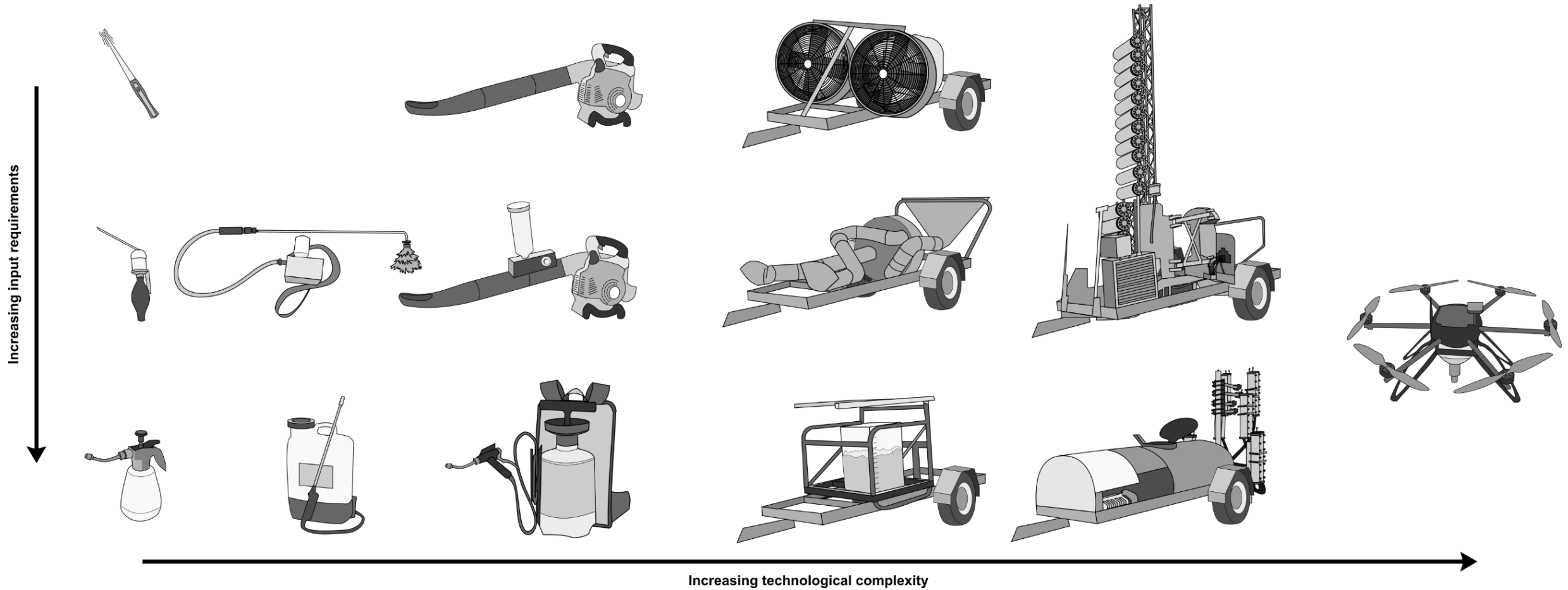
Mechanical pollen harvesting

Edete's almond flower harvesting solution: <https://www.youtube.com/watch?v=0FNQiYOwVnU>



Country	Commercial pollen industry development	Pollen produced	Exporting	Example supply companies
USA	Since 1930s	Almond, -stonefruit, pipfruit	Yes (Chile, Turkey, South Africa, Canada and Mexico)	Firman Pollen, Antles Pollen
New Zealand	Since 1970s	Kiwifruit	Yes	Kiwi Pollen, PollenPlus, No. 1 Road Pollen
China	Since 1990s	Broad range of orchard crops	Yes	Hebei Jiamingliang Pollen.
Italy	Last 20 years	Kiwifruit	Small volumes	Ape Meccanica
Israel	Last 10 years	Almonds, date palm	Small volumes	Edete
Japan	Last 10 years	Stonefruit, pipfruit, kiwifruit	Yes	Hoshino Co. Agricultural Materials
South Korea	Last 10 years	Stonefruit, pipfruit, kiwifruit	Small volumes	Korea Polytech Co.

Artificial pollination technologies



Barriers to technology adoption



Grower	1	2	3	4
	Acceptability of pollination technologies			
Hand-pollination	maybe	no	no	no
Handheld and backpack devices	maybe	no	no	no
Tractor attachments	yes	yes	yes	yes
Drones	maybe	yes	yes	no
Robotics and autonomous platforms	maybe	yes	yes	maybe

Barriers to technology adoption



Grower	1	2	3	4
	Acceptability of pollination technologies			
Full ownership	5	4	5	3
Equipment rental	2	3	1	3
Fee-for-service	2	2	1	4



Saving Bees with Drones: How XAG Harnesses “Electronic Bees” to Fight Against Pollination Crisis?

Updated: Nov 30, 2022



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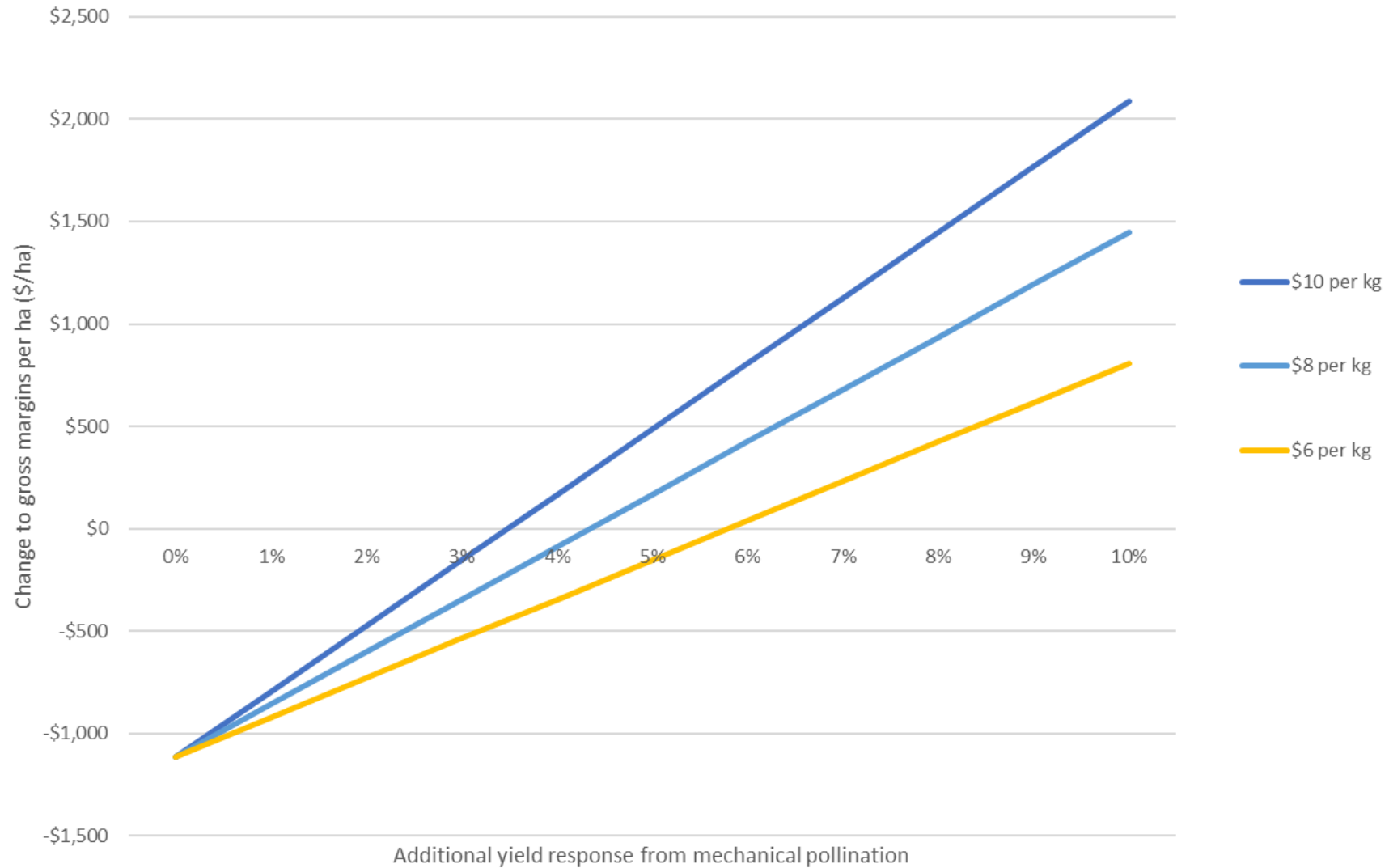
Updated: Nov 30, 2022

Edete's pollination technology for almond market in California and Australia

Almonds - Jan. 17, 2020



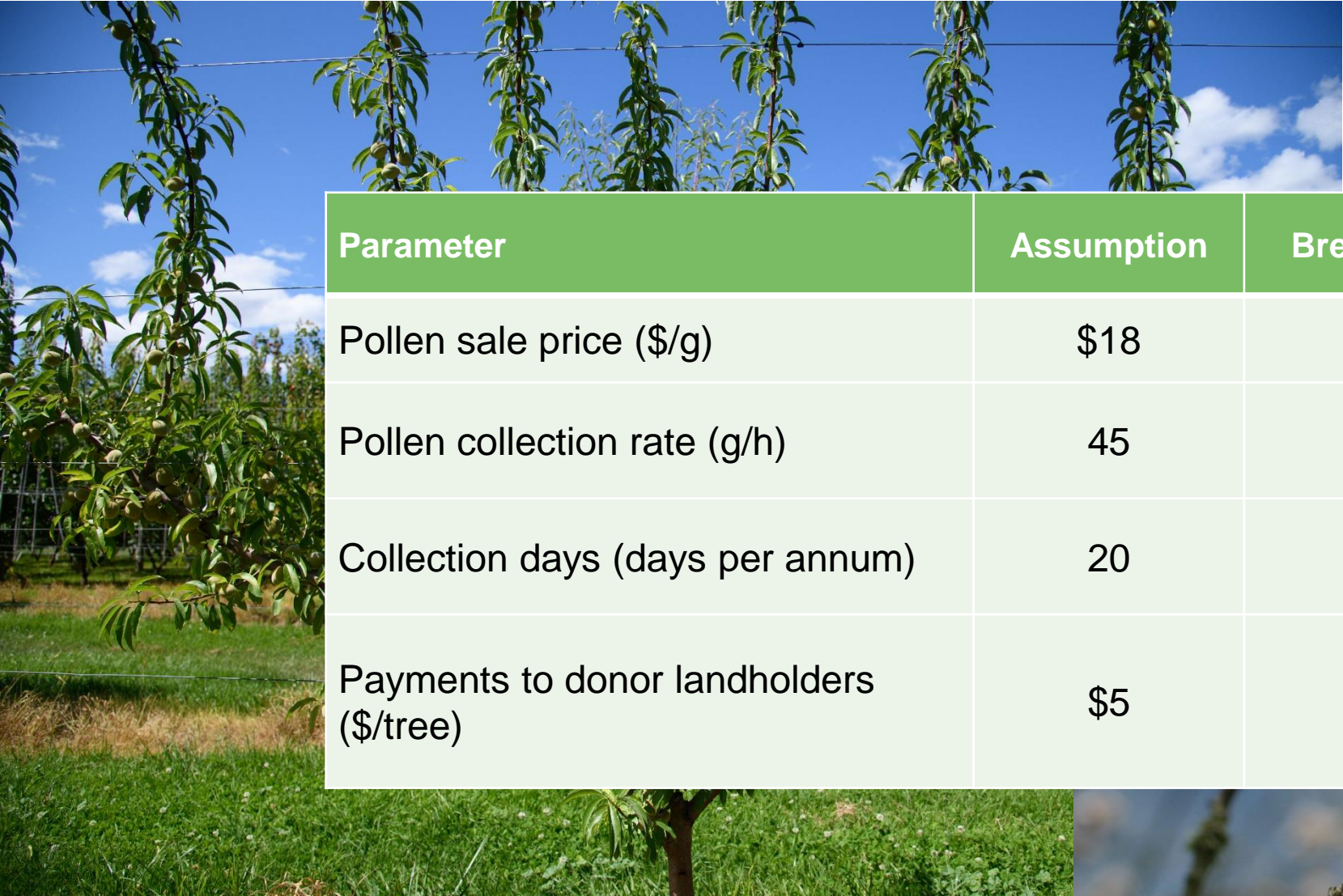
Business case: margins from artificial pollination



Business case: Pollen donor farm



Business case: Pollen donor farm



Parameter	Assumption	Breakeven Value
Pollen sale price (\$/g)	\$18	\$13
Pollen collection rate (g/h)	45	30
Collection days (days per annum)	20	13
Payments to donor landholders (\$/tree)	\$5	\$21



Next steps



- Set up a pilot trial for harvesting and storing pollen (with researchers and/or established businesses)
- Using these initial partnerships to trial small-scale pollen application technologies
 - Tractor-mounted devices favored by growers
 - Test wet vs. dry application systems in Australian conditions



Current work underway at PFR

- Reduce pollen consumption for effective, efficient pollination by:
 - understanding pollen transfer dynamics
 - precision targeting
 - custom nozzle design
 - custom delivery system design
- MBIE-funded Novel Nozzles for Autonomous Pollination programme in collaboration with:
 - Scott Post, Embry-Riddle Aeronautical University
 - Matthew Whiting, Washington State University

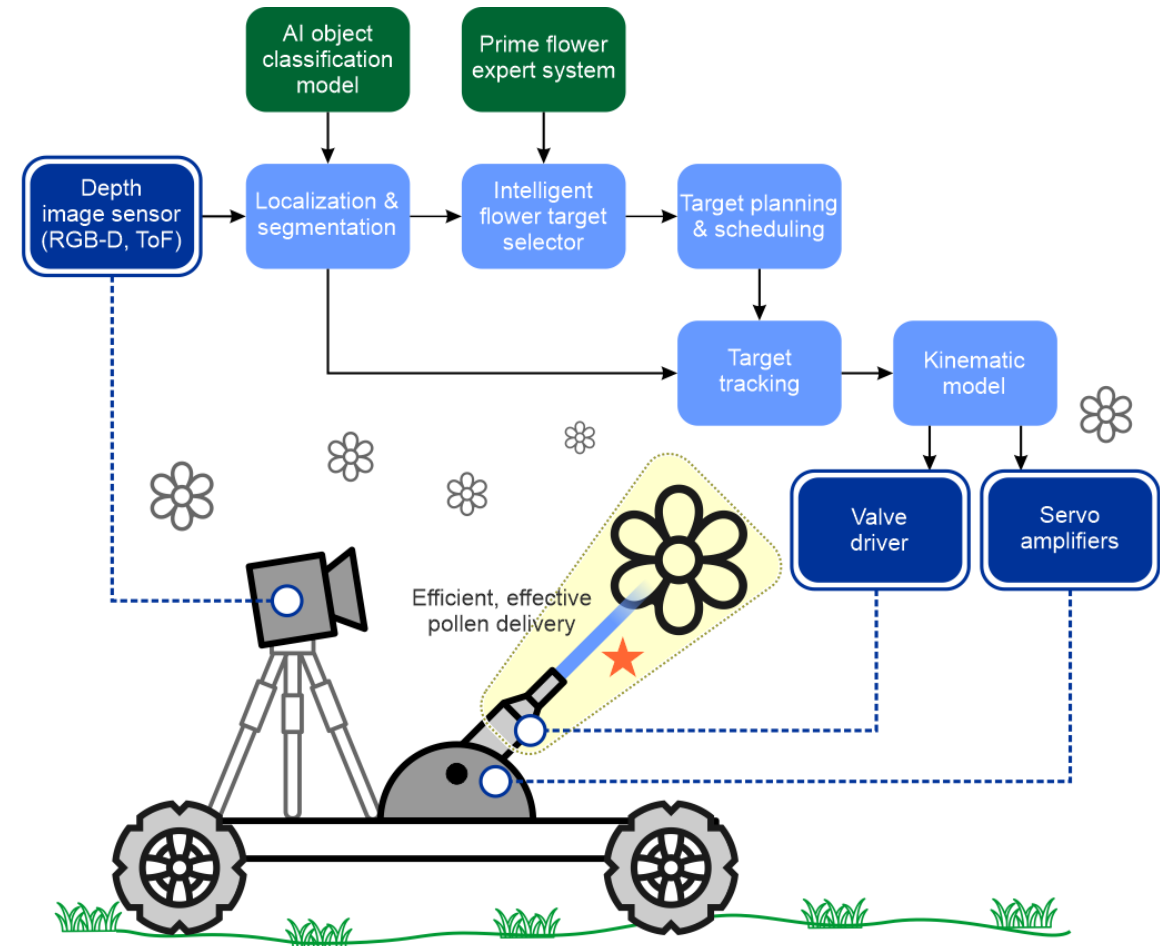


Figure 11. System diagram illustrating intelligent, selective autonomous-pollination. New knowledge is needed for efficient, effective pollen delivery (★, the focus of this research) to complete the system.





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Thank you

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