



Production and management features of ARGOS kiwifruit orchards

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Rationale

- ARGOS wants to better understand the social, environmental and financial consequences of farming and different production systems.
=> pathways to more sustainable/resilient systems
- These things are related to orchard management and production
- The focus has been to identify and learn from differences and similarities between systems



Research design

- Three panels of 12 orchards:
 - Green
 - Green Organic
 - Gold
- A total of 36 orchards
- Clusters: three of each orchard type close together
- Management, financial, environmental and social data collected.

Kiwifruit Orchards



prepared by Tania Maegli, CSAFE, University of Otago / June 2006



Katikati

Tauranga

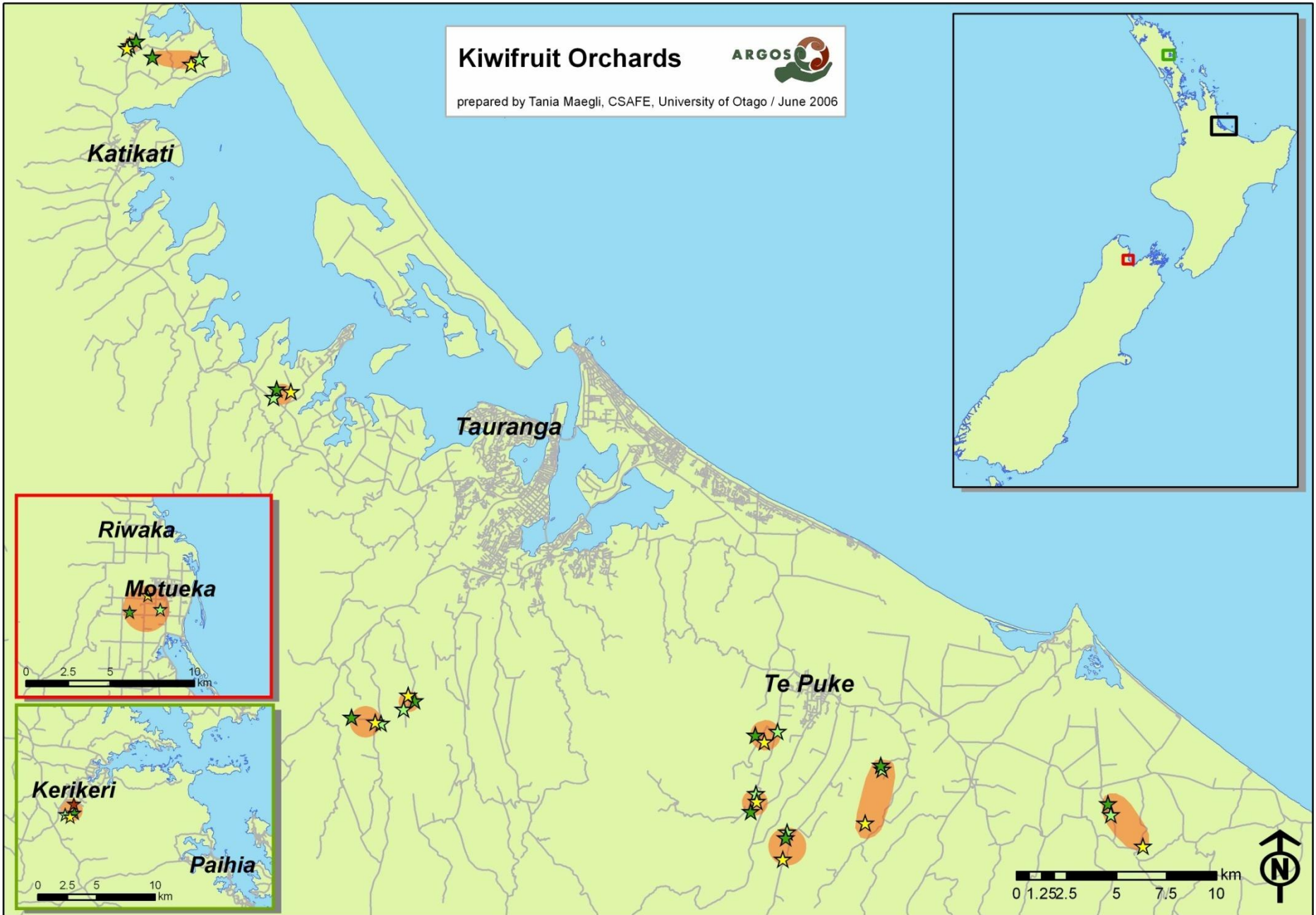
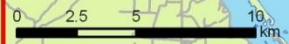
Riwaka

Motueka

Te Puke

Kerikeri

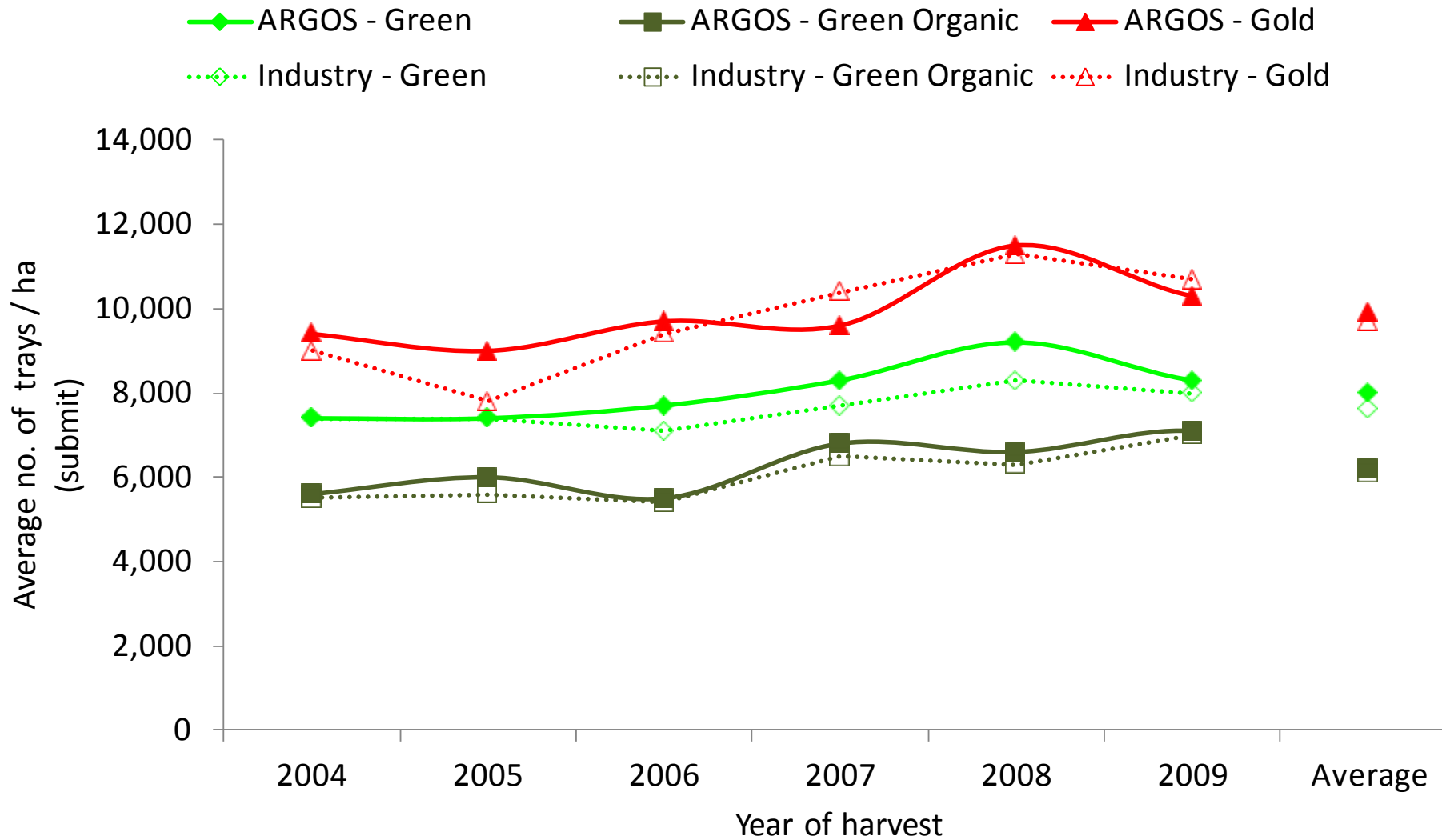
Pahia



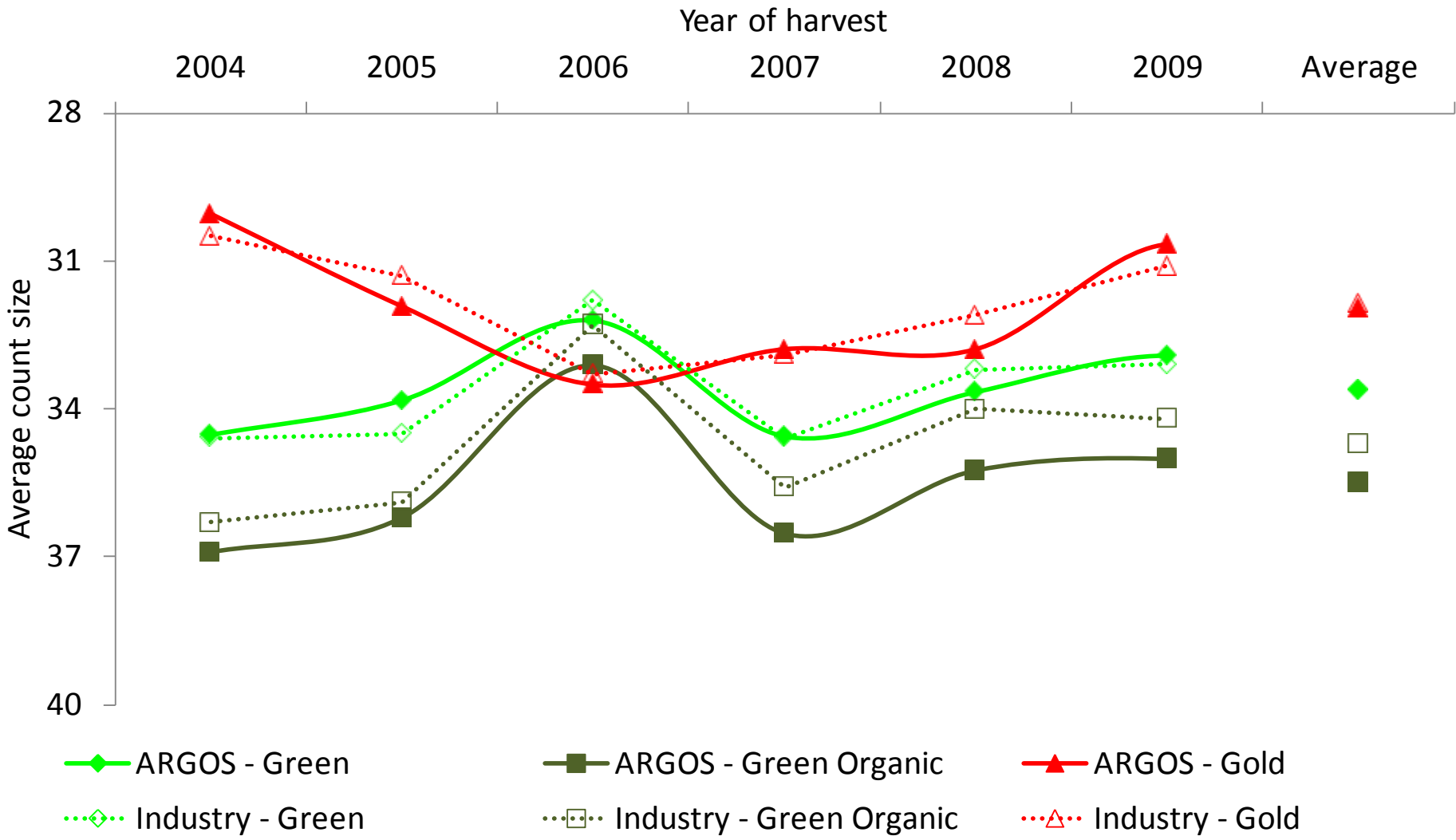


Production outcomes

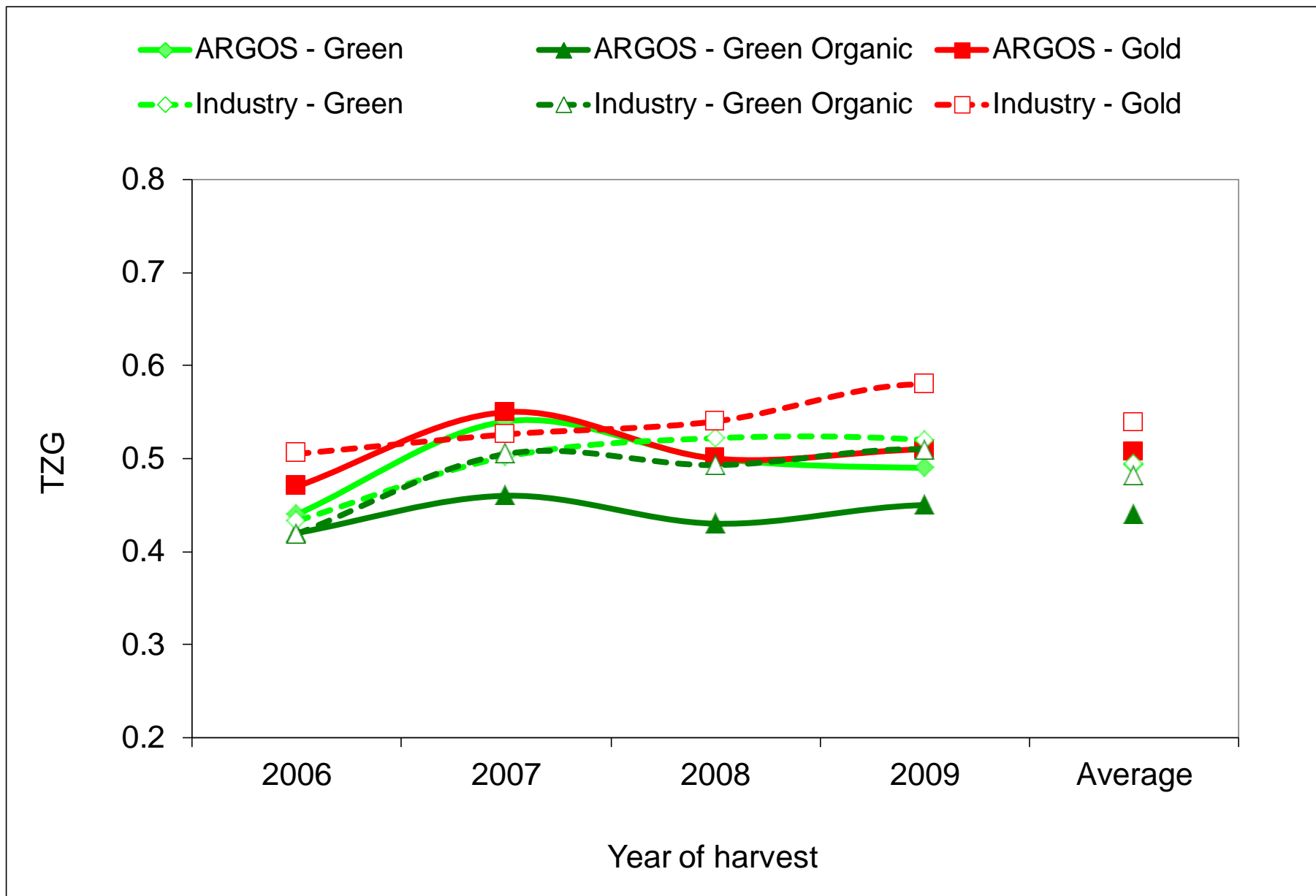
Tray numbers



Fruit size



Fruit Quality





Production summary

- There have been consistent production differences between our systems over time i.e.
Gold > Green > Organic (for trays & fruit size)
- These differences may be related to other orcharding outcomes e.g. financial, social...explored later on today!



Orchard management



Management structure

	Green	Green Organic	Gold
Owner-operated	9	8	6
Managed	3	4	6
Owners live off orchard	4	2	8

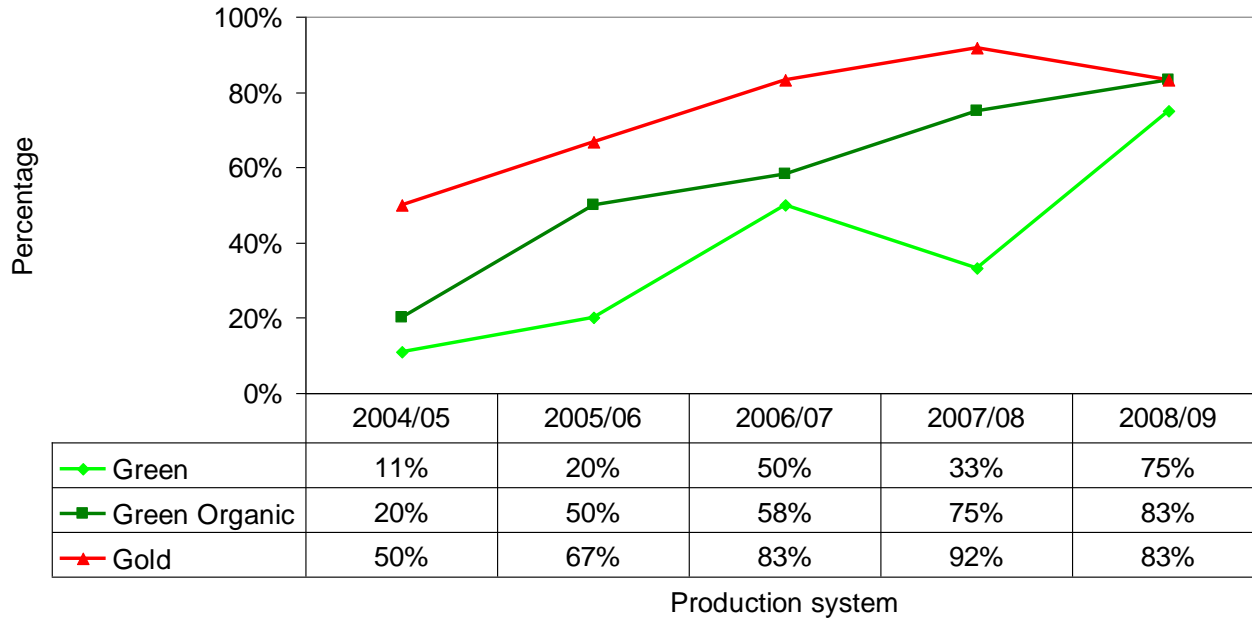
- Greater proportion of Gold orchards are managed and have absentee owners; fewer organic live off orchard.
- Might this explain production (and other) differences between orchards?

Winter pruning

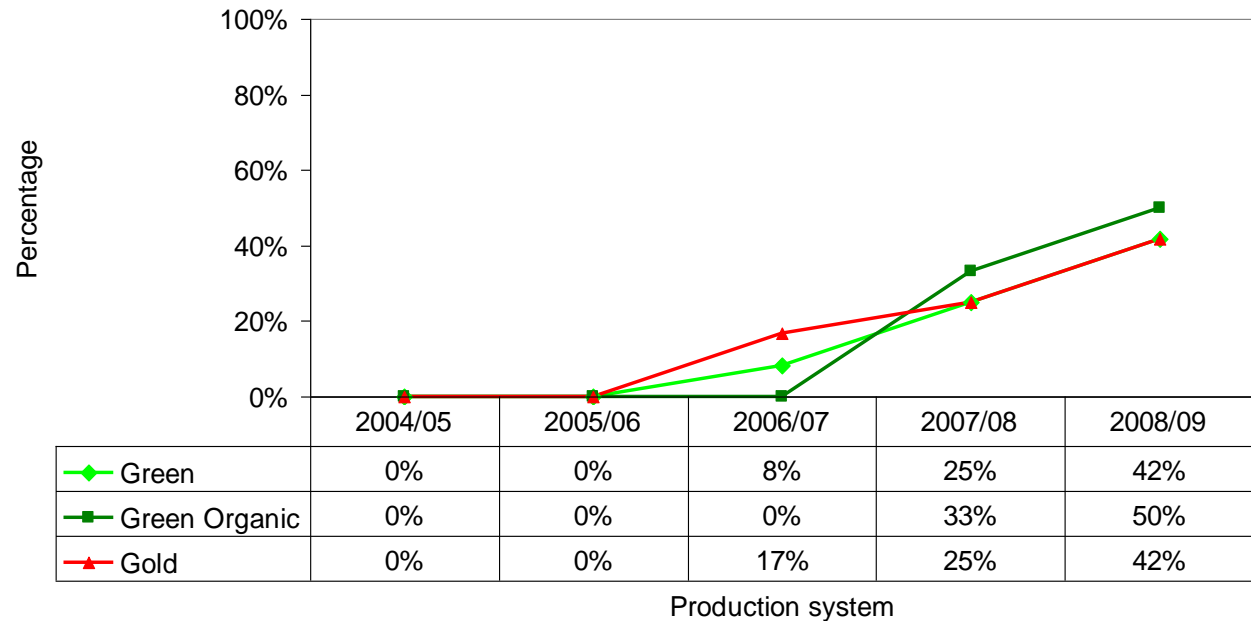
(no. of orchards out of 12)

		2006/07	2007/08	2008/09	Average
Green	Cane replacement	3	3	2	2.7
	Low vigour	6	5	5	5.3
	Mix	3	4	5	4.0
Green Organic	Cane replacement	7	8	6	7.0
	Low vigour	2	2	2	2.0
	Mix	3	2	4	3.0
Gold	Cane replacement	4	5	8	5.7
	Low vigour	7	5	4	5.3
	Mix	1	1	0	0.7

Single/double trunk girdling

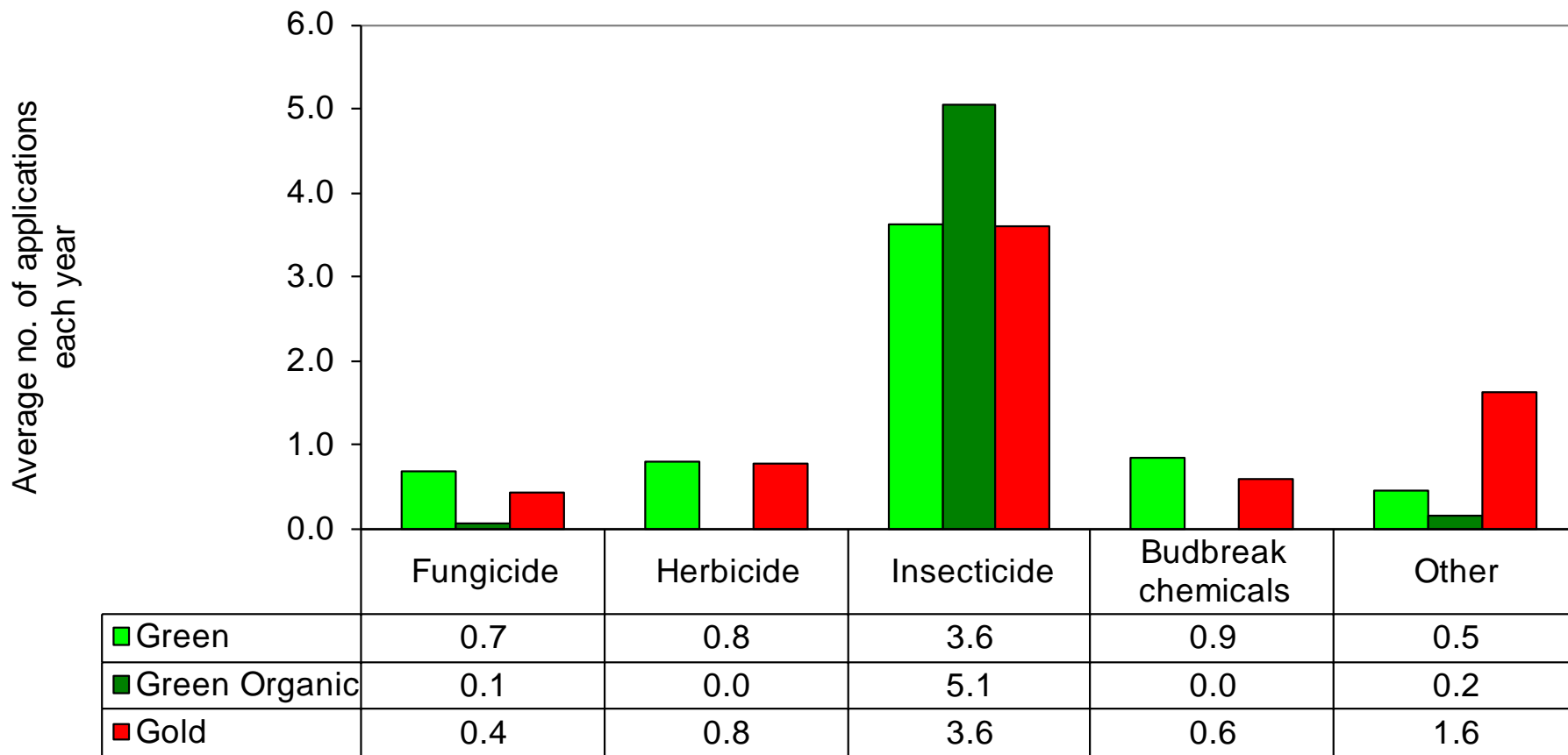


Double trunk girdling



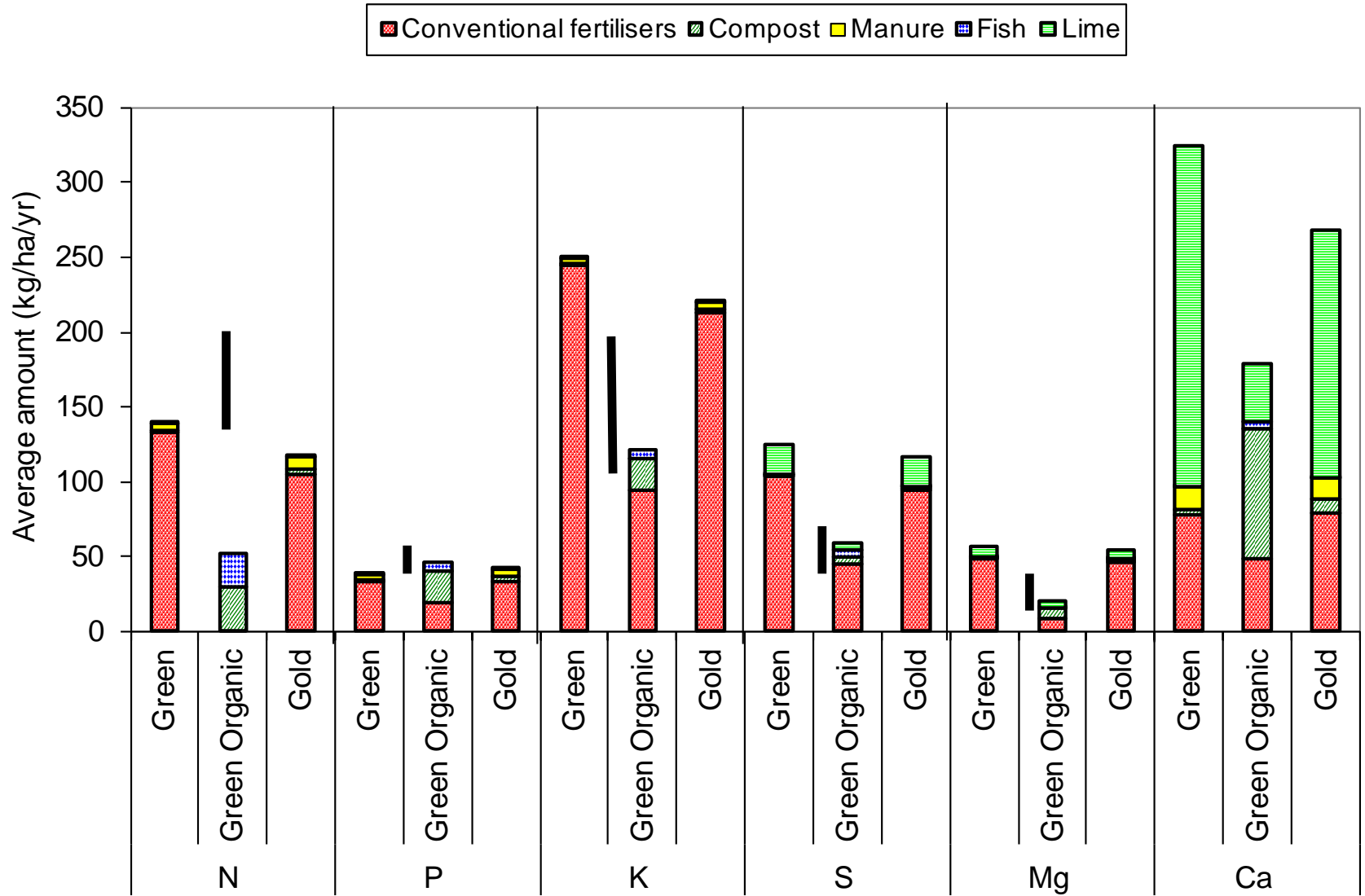
Average number of sprays per year

(1999/00 to 2008/09)



Fertiliser inputs

(6-year averages: 2003/04 to 2008/09)



Commonly applied mineral fertilisers (kg / ha / yr for 2003/04 to 2008/09)

Product	Approx. nutrient content	Green	Green Organic	Gold
Lime	37% Ca	430	70	320
Dolomite	11% Mg, 23% Ca	50	40	50
Gypsum (calcium sulphate)	18% S, 24% Ca	100	20	100
Nitrophoska Blue	12% N, 5% P, 14% K, 6% S	20	0	100
Calcium Ammonium Nitrate (CAN)	27% N, 8% Mg	320	0	190
Urea	46% N	10	0	40
Sulphate of Potash (SOP, potassium sulphate)	40% K, 17% S	250	120	170
Muriate of Potash (MOP, potassium chloride)	50% K	130	30	110
30% Potash Serpentine Super	5% P, 15% K, 6% S, 4% Mg	30	0	110
Patent Kali	25% K, 17% S, 6% Mg	0	70	20
Kieserite	20% S, 15% Mg	70	20	60
Reactive Phosphate Rock (RPR)	12% P	0	110	0

- Lime typically applied in large amounts every few years.
- A range of P fertilisers used – no one product is dominant.

Plant & animal based fertilisers
(kg or L/ha/yr for 2003/04 to 2008/09)

	Green	Green Organic	Gold
Compost	100	5,700	500
Fish	0	1,000	0
Chicken manure	400	0	600

Fertiliser efficiency

ARGOS GREEN (2004 – 2006)	Kg/ha In (fert applications)	Kg/ha Out (exported in fruit)
Production (trays/ha)		7,500
Nitrogen	140	40
Phosphorus	40	10
Sulphur	120	5
Potassium	240	70
Magnesium	50	5

Apparent surplus allows for soil interactions but is there an indiscriminant aspect?

Will environmental concerns (incl. carbon footprints), rising costs and unavailability drive change?



Other practices

- Pollination – similar average numbers; 6 – 12 per ha; fewer Gold orchards use artificial
- Orchard floor management – organic mow 1 – 2 times less often in a year
- Irrigation – a third to a half have irrigated (expect an increase this year)
- Frost control - about a half
- Soil cultivation – not common



Orchard management summary

- Green and Gold have a number of similarities.
- Green Organic is the most different.
- How is management related to production, environmental, financial, and social outcomes?



Which orchards/orchardists have
improved their dry matter?
(2006-09 period)



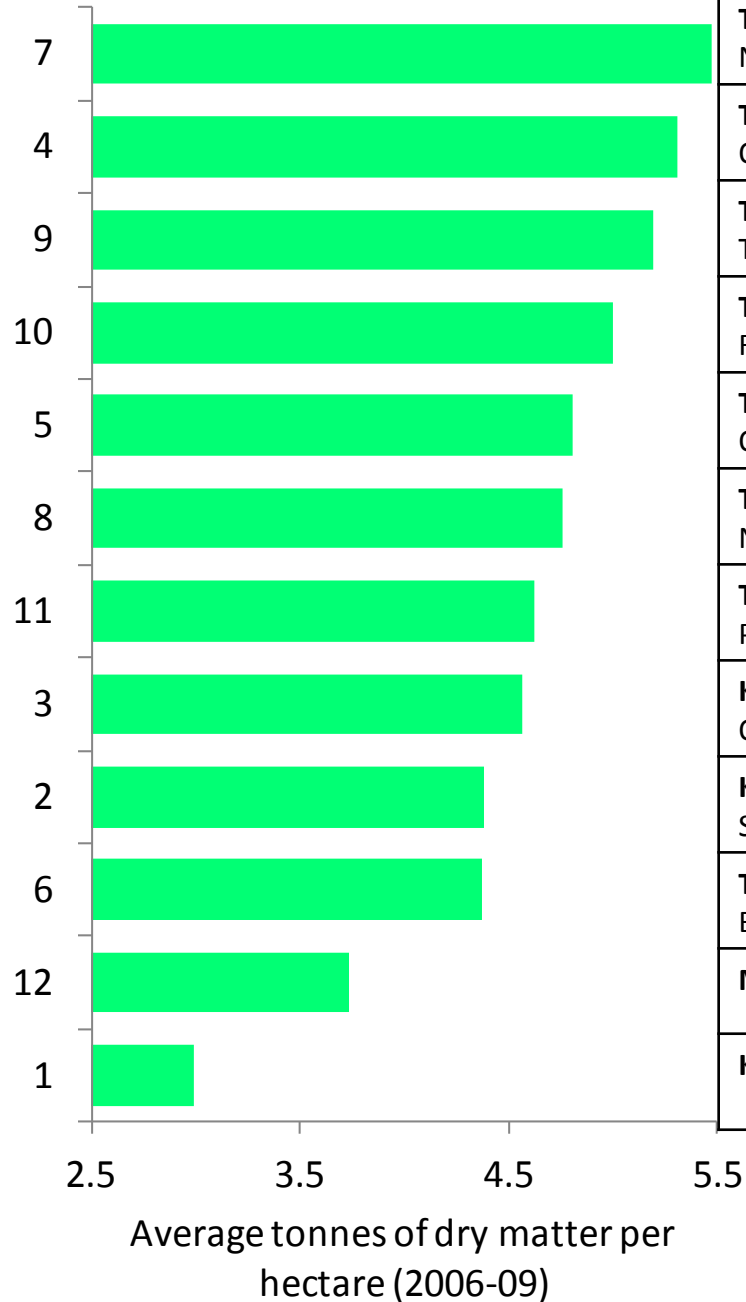
TZG changes

- Of the 36 orchards we've been monitoring, only 2 have had significant changes in TZG (2006, 2007, 2008, 2009)
- One has increased (organic, Kerikeri) and one has decreased (organic, Tauranga)
- Despite all the attention on lifting TZG, it largely hasn't worked (on the ARGOS orchards)



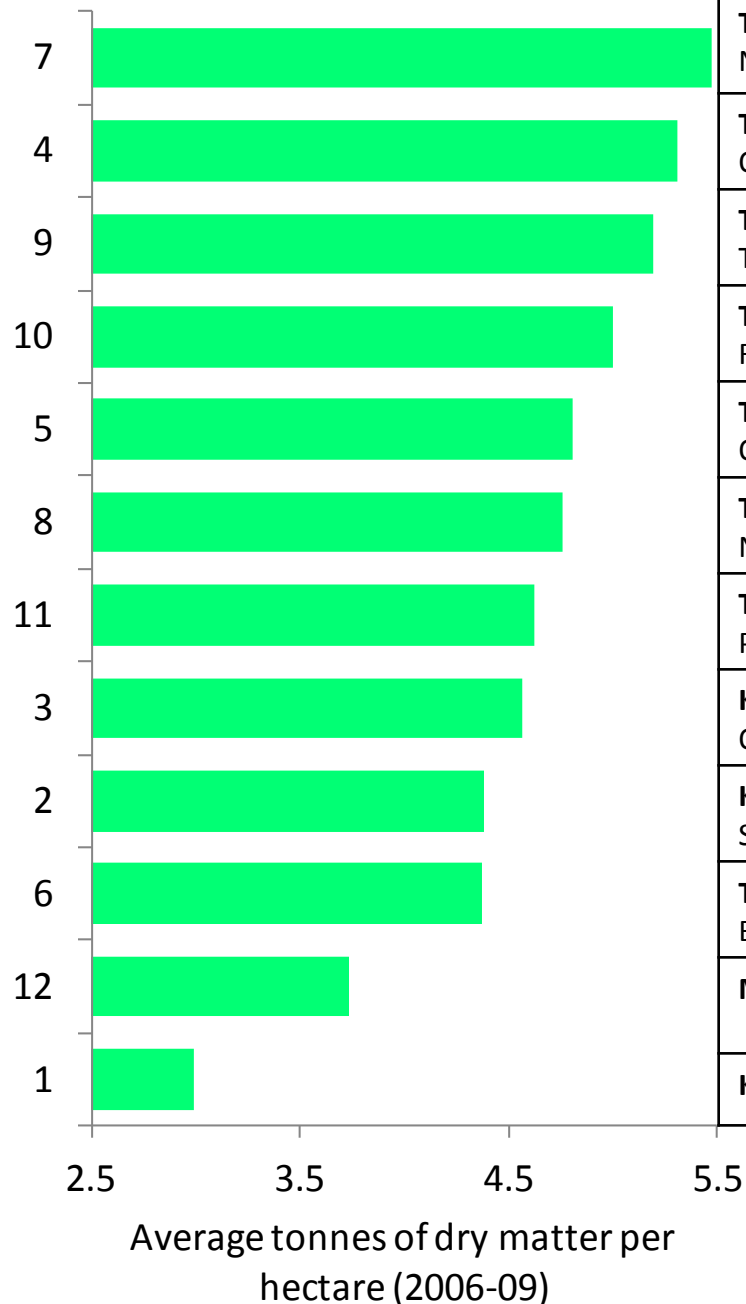
Which orchards/orchardists
produce the most or the least?
(2006-09 period)

Green



Location	Alt	Canopy area	Type of operation	Year of purchase	
Te Puke No 3 Rd	80	3.0	Owner-operator	1991	
Tauranga Omokoroa	25	2.3	Owner-operator	1999	
Te Puke Te Matai Rd	175	4.7	Owner-operator	1999	
Te Puke Rangiuru Rd	40	5.8	Managed	2005/6	
Tauranga Omanawa	160	6.1	Owner-operator	80s (?)	
Te Puke No 3 Rd	160	2.2	Managed	Changed	
Te Puke Pongakawa	20	2.4	Managed	2004	
Katikati Ongare Pt	20	4.5	Owner-operator	2002	
Katikati Sh2, Nth	10	2.5	Managed	2002	
Tauranga Belk Rd	140	2.3	Managed	1996	
Motueka	5	2.5	Managed	1992	
Kerikeri	100	6.0	Owner-operator	1993	

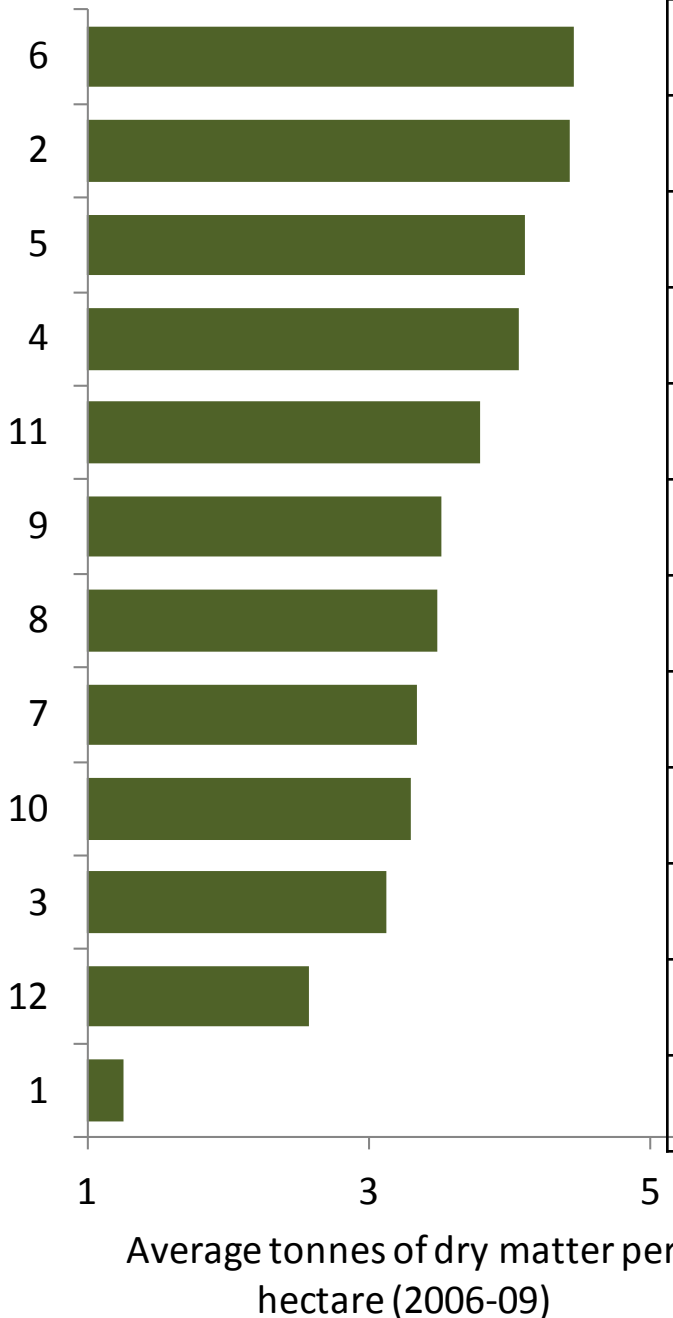
Green



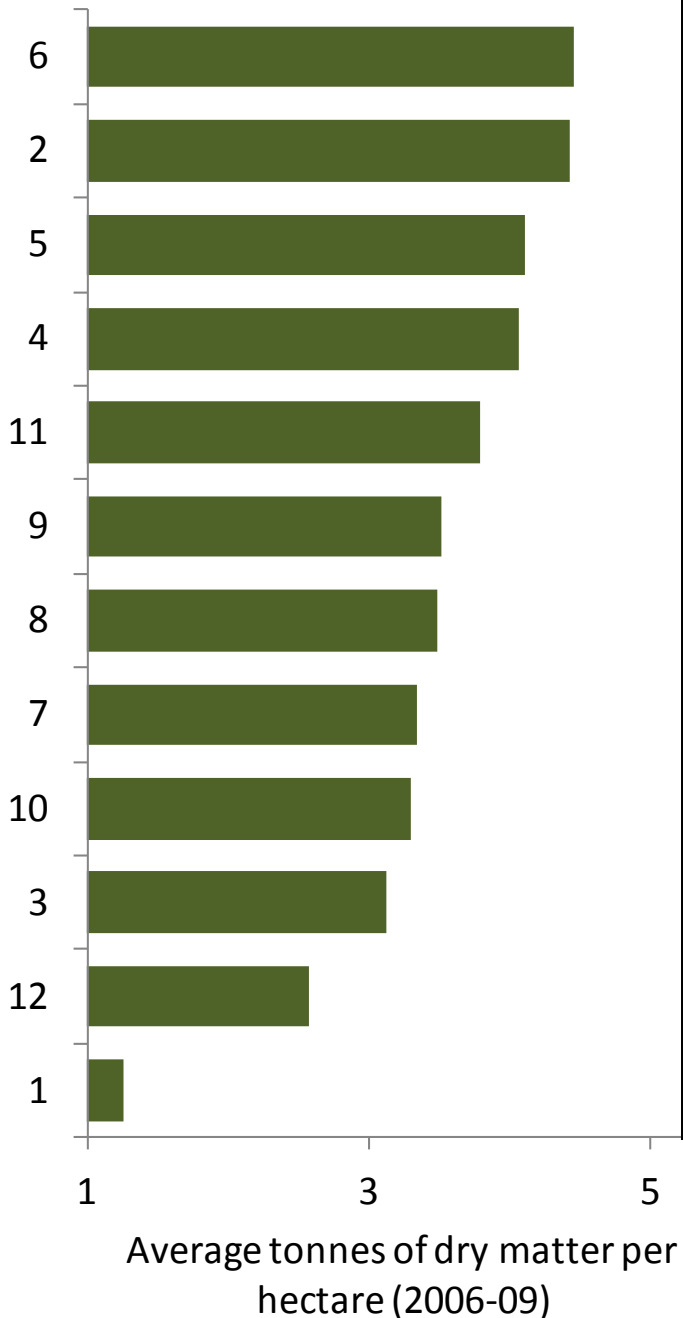
Location	Winter pruning	No of seasons trunk girdling	Nitrogen (kg/ha)	Hives / ha
Te Puke No 3 Rd	LV	None	110	8
Tauranga Omokoroa	Mix	3	120	7.5 (S, 1 year)
Te Puke Te Matai Rd	LV	1	120	8 (S, 2 years)
Te Puke Rangiuru Rd	LV	3	120	8 (S, once)
Tauranga Omanawa	Mix	4	100	7.5 (S, at least once)
Te Puke No 3 Rd	LV	2	200	9
Te Puke Pongakawa	LV -> CR	1	120	7 (S, 2 years)
Katikati Ongare Pt	Mix	1	160	8 (S, 2 years)
Katikati Sh2, Nth	Mix	2	125	8 (S, 3 years)
Tauranga Belk Rd	LV	1	230	11
Motueka	CR	3	110	8 (S, 1 year)
Kerikeri	CR	None	10	12

Green Organic

Location	Altitude	Canopy area	Year of purchase	Year of organic registration	Type of operation
Tauranga Belk Rd	130	10.0	1989	1997	Owner-operator
Katikati Shwy 2, Nth	10	2.7	1999	1997	Managed
Tauranga Omanawa	120	1.9	1996	1997	Owner-operator
Tauranga Omokoroa	20	1.8	1980	1996	Managed (son)
Te Puke Pongakawa	20	3.6	2008/9	1999	Owner-operator
Te Puke Te Matai Rd	175	4.6	1991	1992	Owner-operator
Te Puke No 3 Rd	185	2.9	1993	1997	Owner-operator
Te Puke No 3 Rd	110	4.1	1985	1991	Owner-operator
Te Puke Rangiuru	40	4.4	2000	1994	Owner-operator
Katikati Ongare Pt	20	4.8	???	1996	Owner-operator
Motueka	5	3.0	1997	1997	Managed (packhouse)
Kerikeri	80	2.0	1976	1985	Manage (son-in-law)

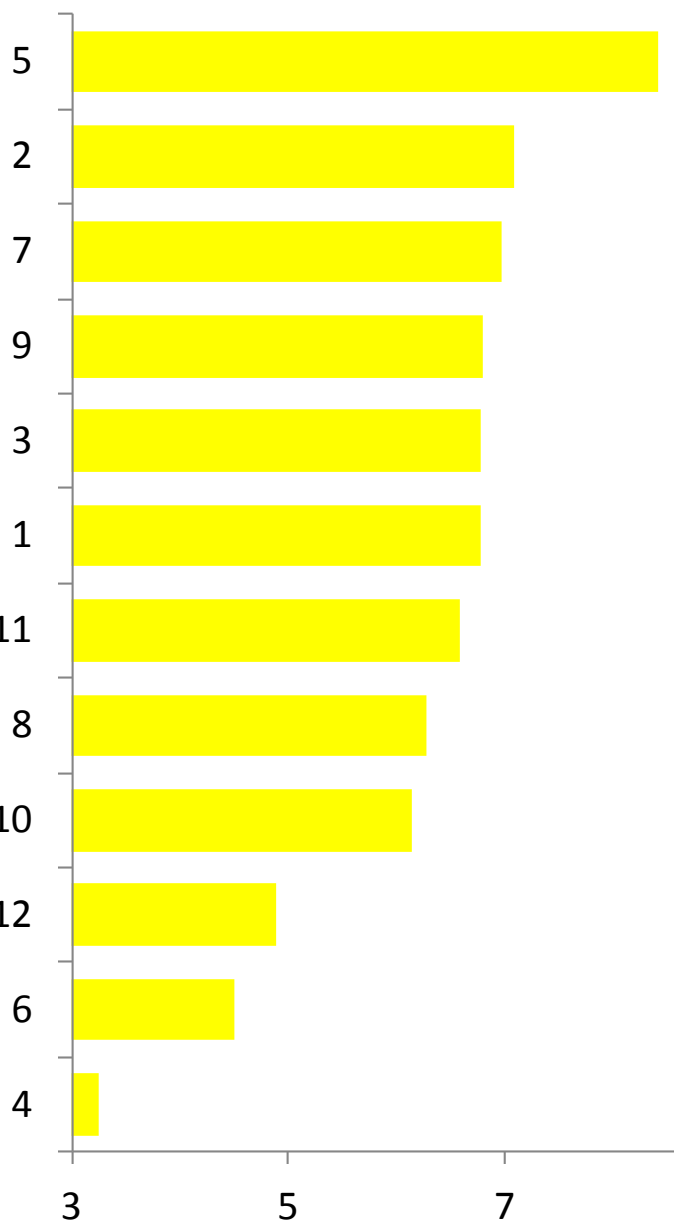


Green Organic



Location	Winter pruning	No of seasons trunk girdling	Nitrogen (kg/ha)	Hives / ha
Tauranga Belk Rd	CR	4	40	9
Katikati Shwy 2, Nth	CR	4	50	10 (S, 3 years))
Tauranga Omanawa	CR	3	40	8.5 (S, 2 years)
Tauranga Omokoroa	Mix	4	60	7.5 (S, 3 years)
Te Puke Pongakawa	CR	3	70	7 (S, 2 years)
Te Puke Te Matai Rd	CR	2	50	6
Te Puke No 3 Rd	LV	4	40	6.5 (S, 3 years)
Te Puke No 3 Rd	LV	None	13	6
Te Puke Rangiuru	Mix	2	30	9
Katikati Ongare Pt	CR	¾	60	6 (S, 2-3 years)
Motueka	CR	2	100	8
Kerikeri	CR	None	15	0 (S, at least 2 years)

Gold

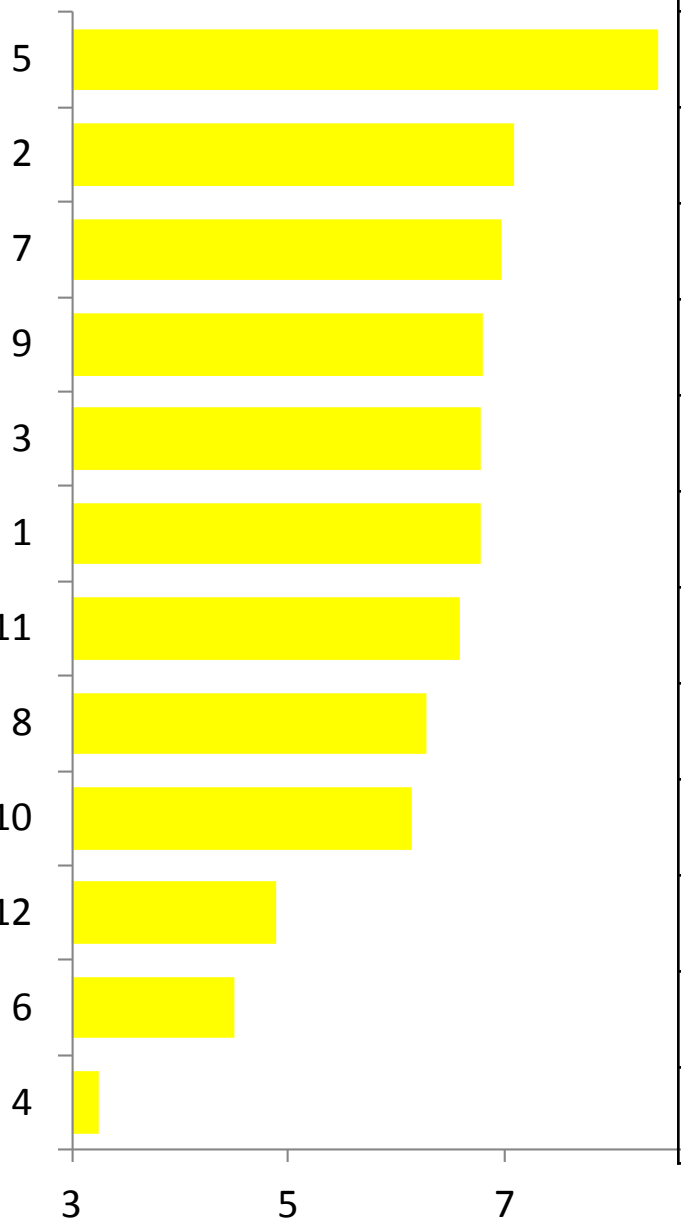


Location	Altitude	Canopy area	Year of purchase	Year Hort16A first planted	Type of operation
Tauranga Omanawa	160	4.5	2002	1998 g	Managed
Katikati Sh2, Nth	20	1.8	1997	2000 g	Managed
Te Puke No 4 Rd	110	2.5	1996	1998 s (NEW)	Owner-operator
Te Puke Te Matai Rd	215	4.2	Early 1980's	1998 g	Managed
Katikati Ongare Pt	20	6.5	2000	1997 sg (NEW)	Owner-operator
Kerikeri	90	1.0	1986	1998 g	Owner-operator
Te Puke Pongakawa	40	2.0	Changed recently	1998 g	Managed
Te Puke No 3 Rd	160	1.2	Changed recently	1997 s (NEW)	Owner-operator
Te Puke Rangiuru	210	1.9	Early 1980's	1999 sg (NEW)	Family farm operation
Motueka	5	1.0	2003	1997 g	Leased
Tauranga Belk Rd	130	0.6	1985	2000 g	Managed
Tauranga Omokoroa	20	0.9	1970	2000 g	Managed

g = grafted; s = seedlings

Average tonnes of dry matter per hectare (2006-09)

Gold



Location	Winter pruning	No of seasons trunk girdling	Nitrogen (kg/ha)	Hives / ha
Tauranga Omanawa	LV	4	130	10
Katikati Sh2, Nth	CR	4	170	9
Te Puke No 4 Rd	CR -> LV	4	130	10
Te Puke Te Matai Rd	LV -> CR	4	110	10.5
Katikati Ongare Pt	CR	4	60	5.5
Kerikeri	CR	1	90	7.5
Te Puke Pongakawa	LV	4	160	9.7
Te Puke No 3 Rd	CR	4	> 100	8
Te Puke Rangiuru	LV	2	140	10 (S, 2 years)
Motueka	LV -> CR	4	100	8.0 (S, 3 years)
Tauranga Belk Rd	LV	3	150	8
Tauranga Omokoroa	CR	1	40	9

Average tonnes of dry matter per hectare (2006-09)



Summary

- There are clear production differences between production systems.
- There may be some consistent orchard/management factors amongst the highest producing orchards (maybe some other commonalities i.e. social, financial?).
- ARGOS's goal is to better understand these differences, their drivers and their effects using the management, social, ecological and financial data we have collected.