real IPM

Can biological control really work?

Louise Labuschagne The Real IPM Company (Kenya) Ltd

Integrated Pest Management

IPM in GLOBAL GAP and Fair Trade – non prescriptive

'where technically feasible'

'Establish balance between environmental protection and business results'

'ICM minimises the use of fertilisers and pesticides – partially and gradually replaces them with organic fertilisers and biological disease control'

Few commercial examples – cost effective bio control in IPM

Protected salads, soft fruit ….

Remaining 'essential use' - pesticides

Soil sterliants, foliar diseases, nematicides etc

Commercial IPM

Most growers use Good Agricultural Practice (GAP)

implementation - wide range of achievement

'Real' IPM is more than GAP

Cost-effective replacement of chemicals with biological controls (with support from GAP)

Barriers to 'Real' IPM

High cost of biological control agents

Lack of experience – unable to measure risk

Lack of experienced technical support

Commercial dilemma retailers

EUREP /GLOBAL GAP developed by retailers – reduce risk

Pesticide issues remain strong consumer issue

Limiting pesticide use – may affect yield and quality

BCAs major tool in protected salads – cost effective

Fewer examples BCAs on outdoor crops

IPM – the next 12 months

IPM – immediate and intense commercial focus all crops

UK Retailers – demanding 50% reduction in pesticides in flower crops within 2 years

UK Retailers – positioning suppliers for 'branded' low pesticide inputs

Marks and Spencer's Policy – clear guidance

- Amber and Red Lists – prohibited pesticides
- Encourage increased use of BCAs
- Pesticide Reduction Net**work**

IPM – an issue growers can no longer avoid – not PR anymore

The Real IPM Company (Kenya) Ltd

Training, Consultancy, mass production and supply BCAs

Based in Thika, Kenya – on Equator AYR growing conditions

Dr Henry Wainwright and Louise Labuschagne – sole proprietors

Phytoseiulus (predator of spider mite)

Trichoderma (beneficial fungus – soil and foliar diseases)
AND root knot nematode

Metarhizium (broad spectrum, if combined with insecticides – thrips, ,mealybug, caterpillars, weevils, fruit fly, leafminer, stinkbug etc.)

Amblyseius cucumeris – predator for thrips and broad mites

Bacillus subtilis – powdery mildew, rust (Botrytis)

Outreach

Employ 120 staff – 12 agronomists, international consultancy and training.

Kenya, Ethiopia, Tanzania, Uganda, Rwanda, Zambia, Zimbabwe, South Africa, Mozambique, Madagascar, Ghana

Ecuador, Brazil, India and Malaysia

United Kingdom and Lebanon

Registrations

Kenya, Ethiopia, Uganda, Ghana, South Africa

Exports

EU, Canada (and above)

The Real IPM - Training

BASIS and FACTS

IPM Field Skills

Safe use of Pesticides

EUREP / GLOBAL GAP

Health and Safety

Post Harvest Management

Training of Trainers

Training in Real IPM Product use – integral to Product

CASE STUDY

Reduction of pesticides in roses

Ornamentals perceived as 'impossible' – pesticide free

50 – 60% of all chemical applications to roses for..

spider mite

Real IPM and World Flowers – active replacement policy

Oserian Development Company – 200 ha roses & carnations

WILL eliminate all pesticide use for mites

Real IPM customer base Kenya – 650 ha (25%)

Reduced costs/yr, increased yield and quality

Spider mite damage

speckled feeding damage on leaves and sepals of flowers

mites create webs and in high pest populations this can be serious

leaf drop will occur if not controlled

Advantages of Phytoseiulus

life cycle twice fast as rsm

feeds on eggs, nymphs and adults

actively moves to underside leaf

can be applied by picking ladies

no PPE required

no re-entry interval

BASIS Project results

Chemical Plot

		Week 1	2	3	4	5	6	7	Diff wk1-7
Stems		200	270	172	86	59	189	107	1083
Length	cm	69.2	68.9	72.2	70.3	70.7	62	63.8	-7.8%
Weight	g	30.8	30.9	28.2	28.2	27.7	26.9	27.4	-11.0%
Bud Ht	mm	37.2	36.9	40.3	36.6	36.5	35.6	33.5	-9.9%

Ref: Sean Finlayson – Rose Production Manager

BASIS Project results

		1	2	3	4	5	6	7	
Stems		157	65	180	132	114	173	188	1009
Av. Length	cm	67.8	67.7	67.9	67.5	73	67.9	69	1.8%
Av. Weight	g	29.6	29.5	28.9	28.3	29.7	30.2	32.6	10.1%
Av.Bud Ht	mm	36.5	35.8	38	37.5	36.6	38.2	37.6	3.0%

Bridge the cost GAP

Real IPM (Kenya) Ltd and Kenyan Rose growers

Use of Phytoseiulus to replace acaricides

TRAINING – Real IPM strategy - SCOUTING

Innundative release eliminate mites in 6 – 8 weeks
1 – 2 million Phytoseiulus /ha in one application

Half the cost of acaricides

Subsequent maintenance programme very low cost

50 – 70% reduction in overall pesticide use

Meets audit /customer requirements < pesticide

20% increase in yield

10 cm increase stem length

FUTURE: no market for acaricides in flower crops

CASE STUDY

Whitefly and Leafminer in melons

M&S put AgriFamosa and Real IPM together

Leafminer – extensive damage – not controlled by pesticides

Reduced yield and quality (<sugar levels)

Field Consultancy – development of IPM strategy

- Implemented compatible spray programme
- Developed quantitative scouting
- Re-cycled and re-distributed local parasitoid wasp

Technology Transfer – mass rear Diglyphus and Encarsia

CASE STUDY

Whitefly and Leafminer in melons

Field Nursery crops – Real IPM Strategy

Millions of pest can breed in crops by end of harvest

No sprays permitted during harvest

Millions move to adjacent small crops when crop uprooted

CONVERT 'problem' to an Advantage

Breed Diglyphus and Encarsia in the crop during harvest period

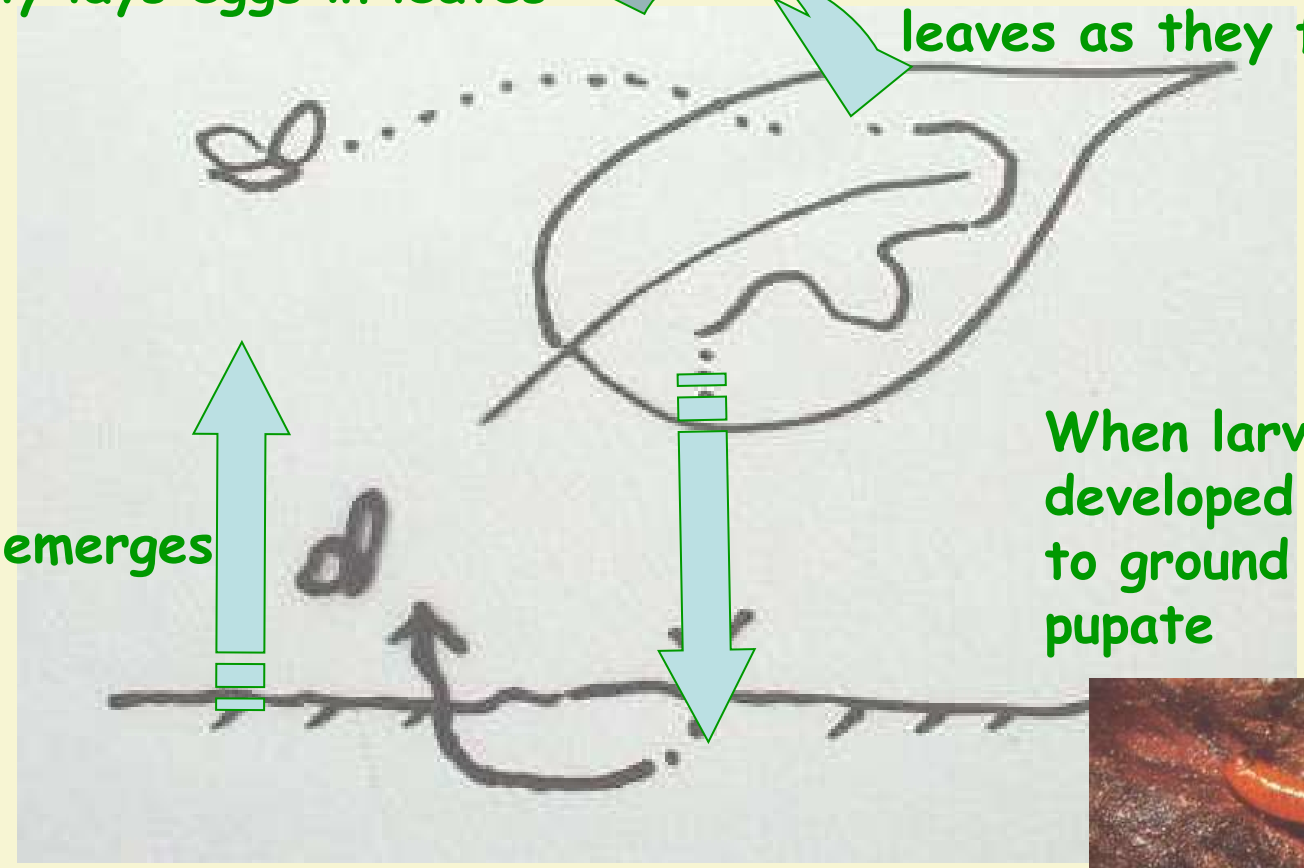
Crop without melons = host plant for parasitoids

Harvest parasitoids – or allow to migrate to new crops

Life cycle - leafminer

Adult fly lays eggs in leaves

Eggs hatch into larvae which tunnel 'mines' in leaves as they feed



Adult fly emerges from soil

When larvae fully developed it drops to ground to pupate

Biological control of leafminer

Diglyphus isaea

Indigenous parasitic wasp

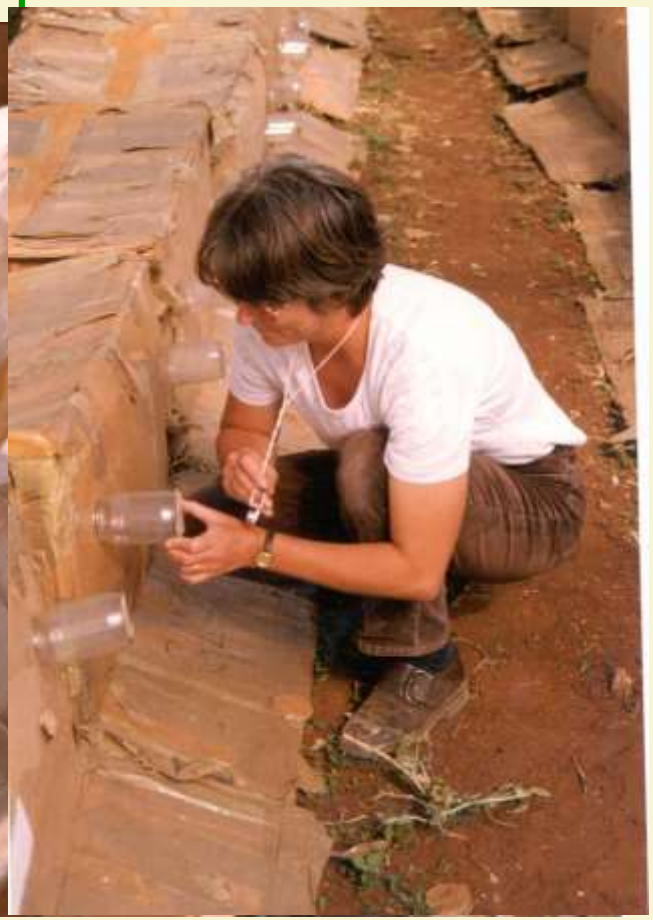
Mass reared internationally

Lays eggs in leaf miner 'mines' (on top of leafminer larvae)

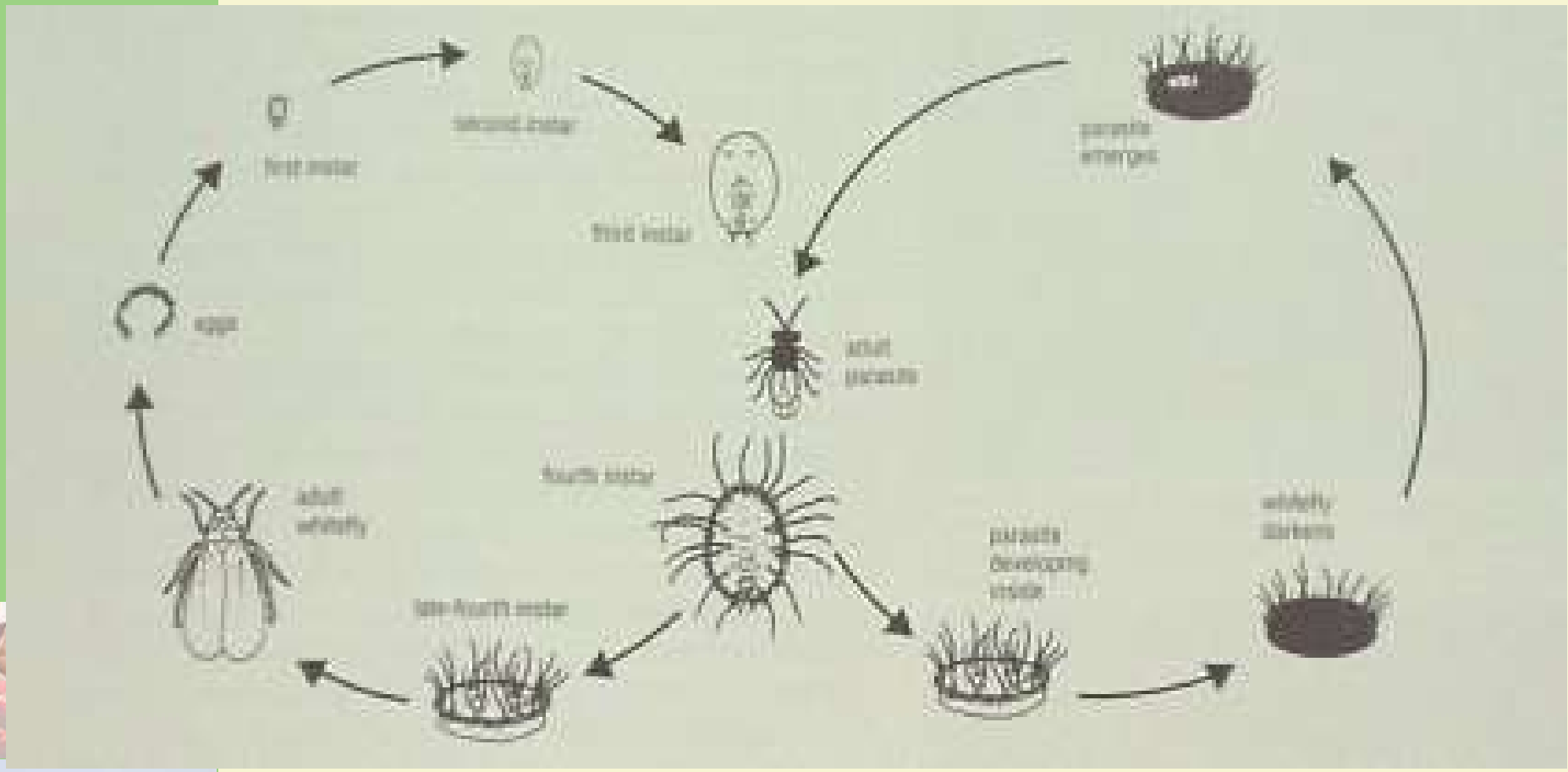
More effective than pesticides.

Diglyphus isaea

Why is anyone in the world using pesticides for leafminer?



Life cycle – whitefly and Encarsia



White fly

Encarsia

Encarsia adult and scales

CASE STUDY

Whitefly and Leafminer in melons

Whitefly cannot fly when cold (at night)

If crop removed when cold – NO MIGRATION

Starch sprays prevent scales (larvae) from hatching

Can be integrated with Encarsia parasitic wasp

METARHIZIUM for whitefly adults, eggs and larvae

Bridge the cost GAP

Real IPM (Kenya) Ltd and Agri Famosa (Brazil)

Environmental Awards from Customers in UK

Control of leafminer in outdoor melons (90 ha/wk)

- Removed sticky traps – catch parasites too
- Use only compatible pesticides
- Recycle parasites from parasitised leaves
- Re-apply to younger crops
- Set up small scale mass rearing on-farm
- Use older crops as 'Nursery' for rearing parasite

FUTURE: no market for pesticides for leafminer

CASE STUDY

Panama Wilt control in bananas

Fusarium oxysporum var cubense – Panama Wilt

Devastated banana production 1950s

World wide switch to Cavendish type - resistant

BUT – not as 'nice' as Gros Michel type (very susceptible to wilt)

R&D on bio-control stopped – when Cavendish used

BUT - Race 4 Panama wilt – resistance breaking down

Kenyan growers – in Meru – replanting Gros Michel
IN infected ground – with Trichoderma

PREDICT: Kenyan banana industry lead move back to Gros Michel

Future work - Trichoderma

Phytophthora – MD2 pineapples

Botrytis in soft fruit

Replace soil sterliants – methyl bromide etc

Replace nematicides in flower and vegetable crops (rkn)

- Rhizoctonia
- Fusarium
- Phytophthora

Bridge the GAP science & farming

Millions of dollars, euros, pounds spent on research …..

For common good of small scale farmers

BUT…How many biological control PRODUCTs?

How many scientific publications? Who benefits?

Why are researchers not linked to commercial companies as a pre-requisite for funding?

Why are Product Development pathways not an integral part of all Concept Notes to Donors?

Why is disproportionate funding aimed at research and insufficient to commercial companies to promote uptake?

Biological Control

Large international bio control mass producers

BUT…expensive
BUT…primarily greenhouse crops
BUT…full impact on pesticide use not achieved

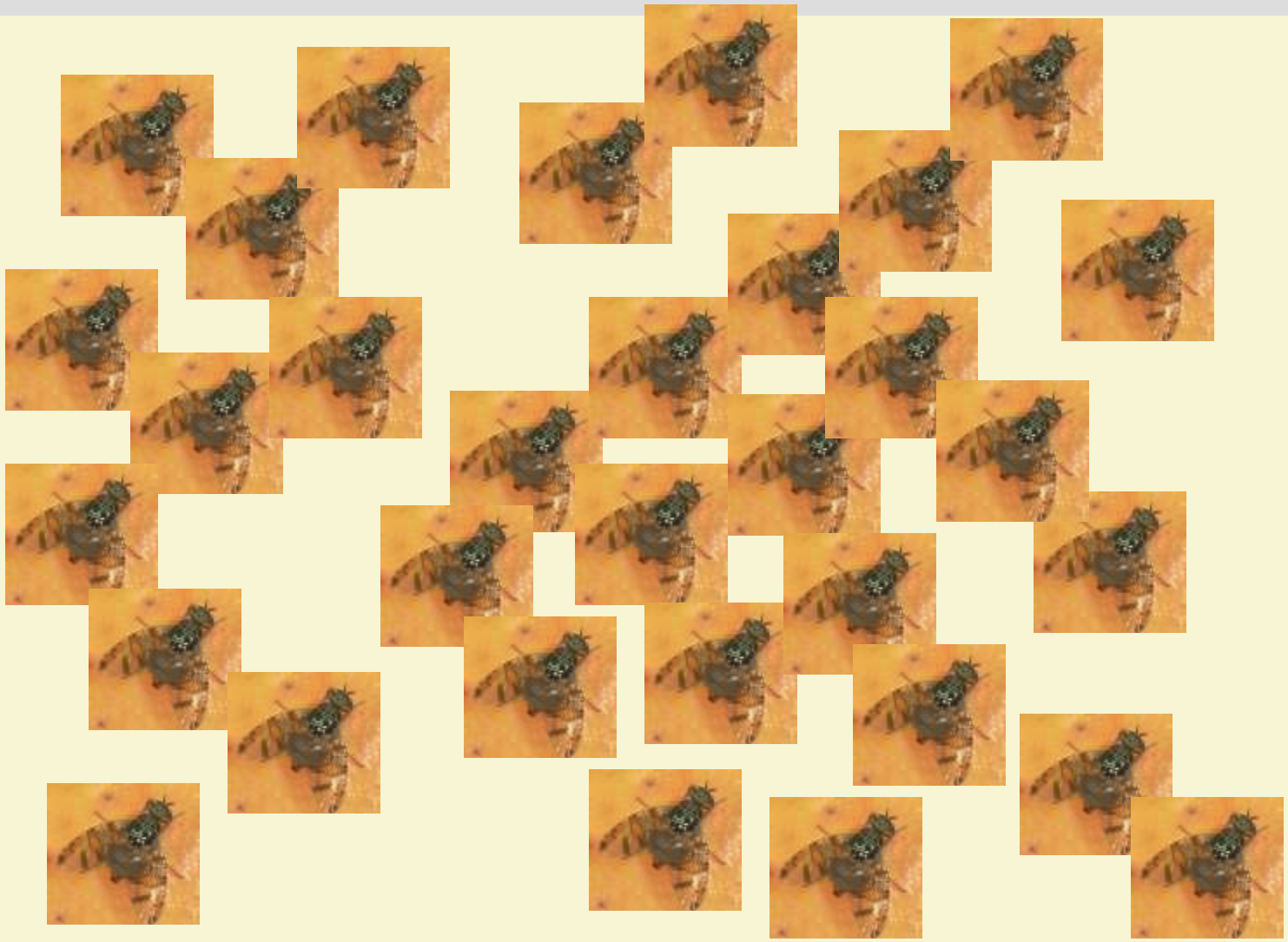
Smaller biocontrol producers on Equator potentially more impact

Lower production costs – labour, heat, light

KENYA: application rates roses 2 million predatory mites/ha – EU prices £8,000

KENYA: application rates legumes 12,000 Diglyphus/ha – EU prices £1,200

What's the problem?



One thing leads to another

400 eggs per female

Egg to egg 20 days

Male sterile technique

Species specific?

Expensive ?– so a regional programme – what is TOTAL cost of production and distribution / ha – who pays?

Still need to integrate with compatible pesticides. Sterile Males can be killed by pesticides

Individual growers less able to control/ rely on technology

Only controls fruit fly – not 'broad spectrum'

Parasitoids

Attack fruit fly larvae and pupae

realIPM

parasitoids

Need ENOUGH of them to PREVENT damage

Useful AFTER fruit fly have laid eggs in fruit

Main benefit is to REDUCE BUILD UP next generation

2 – 12,000 fruit fly per tree? Need a lot of parasitoids

Local control in mango trees important for chillies

Mass –produced parasitoids?

May be very specific to certain species of fruit fly

Numbers needed per hectare depends on fruit fly levels

Correct ordering relies on individual growers – WHICH species of fruit fly and HOW MANY = rate/ha of parasitoids

Shelf life? - cost of distribution

Parasitoids are expensive to mass rear

Who will pay?

Baits and pheromones

Are parasitoids ALSO attracted to same signal?

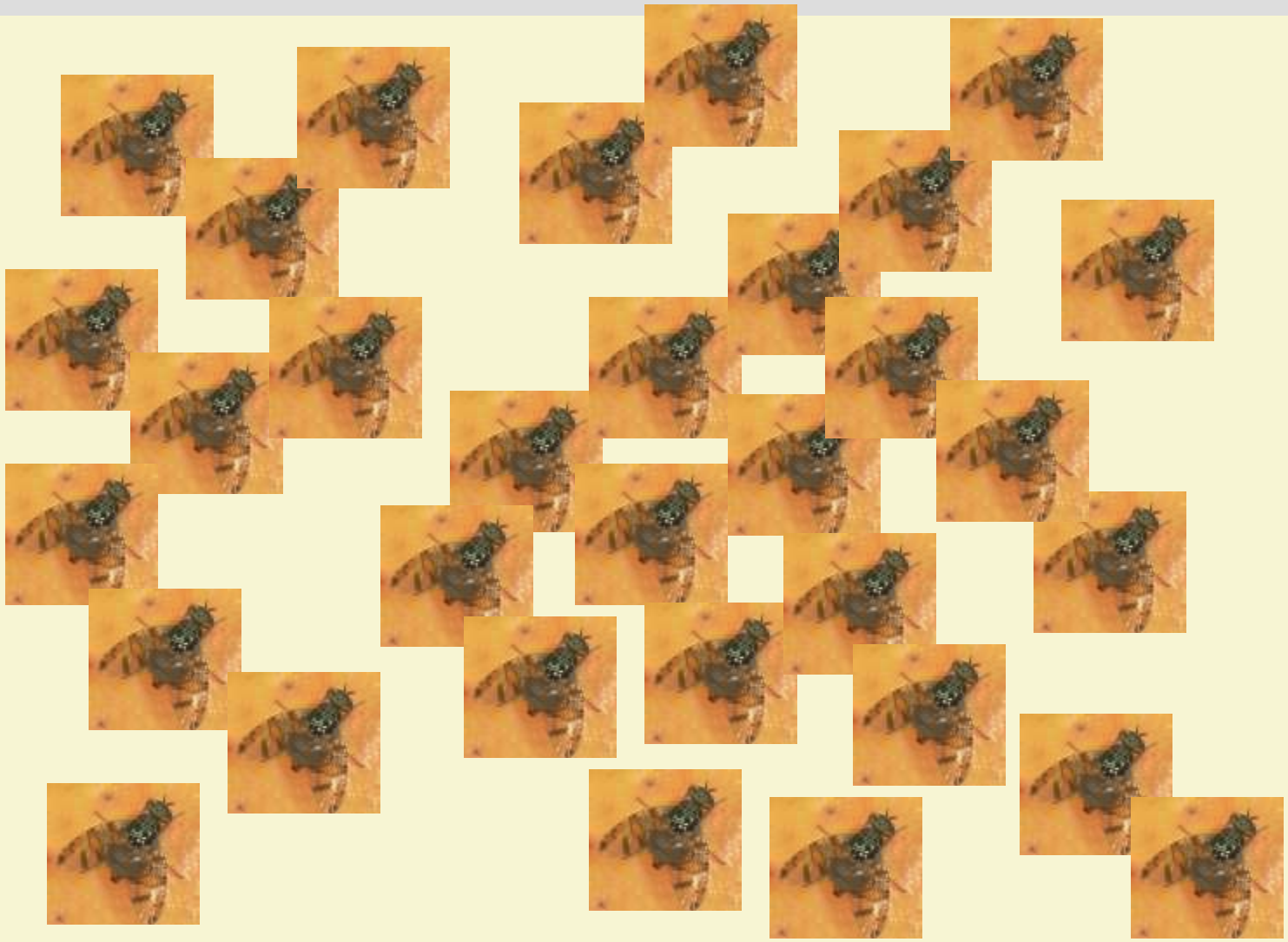
IF so – they will also be killed by
lure and kill methods

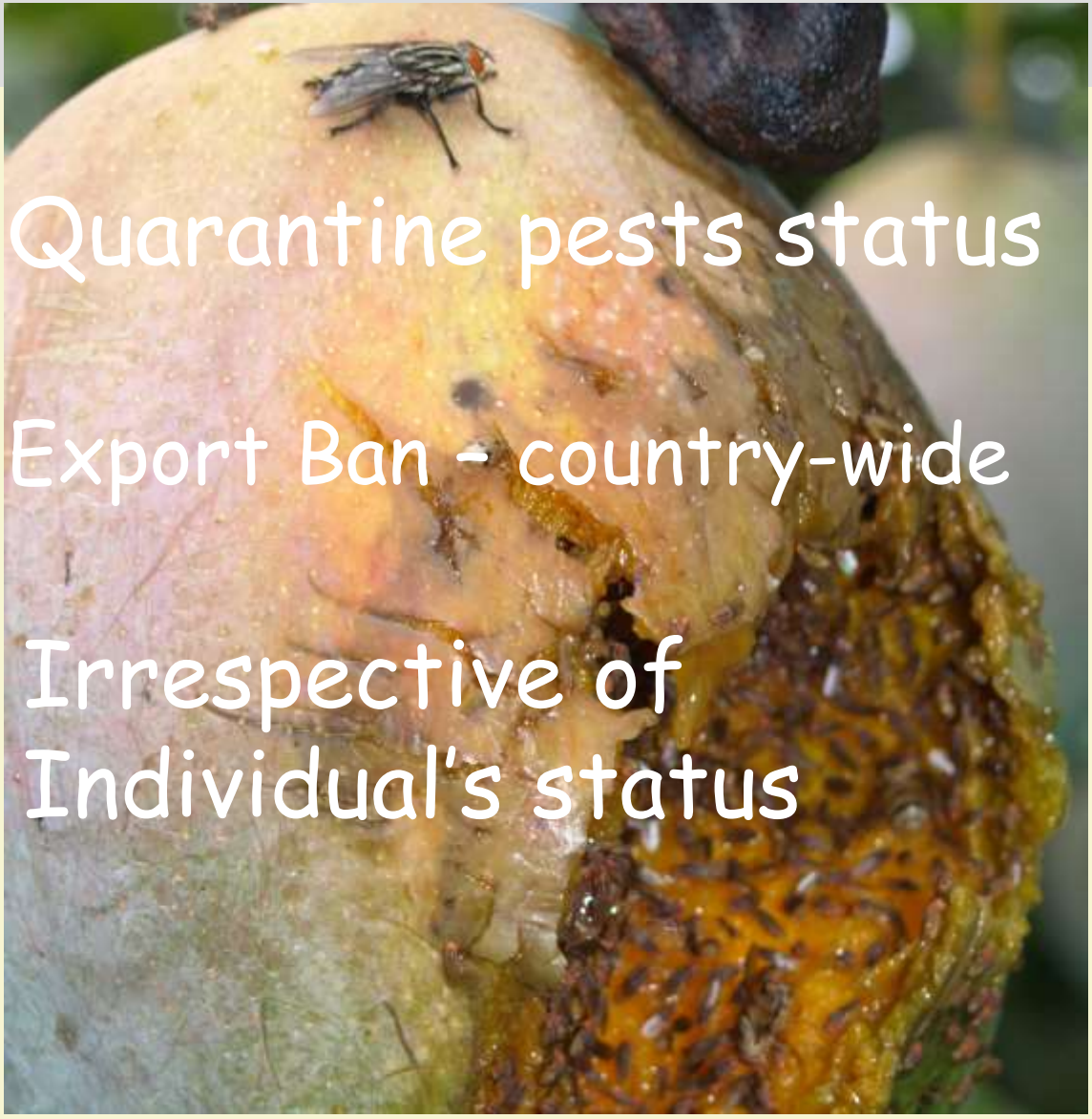
IF NOT – could be used for AUTO DISSEMMINATION
of bio-pectides

Insecticides		IRAC	WHO class	Encarsia		Aphidius	
Trade name	active ingredient			% death	persist (wks)	% death	persist (wks)
Talstar	*bifenthrin*	3A	II	>75%	8-12 wks	>75%	8-12 wks
Decis	*deltamethrin*	3A	II	>75%	8-12 wks	>75%	8-12 wks
Icon	*lambda cyhalothrin*	3A	II	>75%	8-12 wks	>75%	8-12 wks
Ambush	*permethrin*	3A	II				
Flower DS Pyrenone	*pyrethrins + PBO*	3A	II	>75%	2 wks	>75%	1 wk
Confidor	*imidachloprid* **(drip line ONLY)**	4A	II	>75%	2 wks	<25%	zero
Confidor	*imidacloprid* **(spray harmful)**	4A	II	>75%	2 wks	>75%	zero
Tracer	*spinosad*	5	U	>75%	2 wk	>75%	2 wks
Avid, Dynamec	*abamectin*	6	?	>75%	3 wks	>75%	1 wk
Pedestal	*novaluron*	15	?	?	?	?	?
Neemroc Azatin	*azadirachtin*	un	?	50-75%	?	<25%	zero
Actara	*thiamethoxam (drench)*	4A	?	50-75%	?	25-50%	?
Golan Mospilan	*acetamiprid drench*	4A	II	25-50%	?	<25%	?
Golan Mospilan	*acetamiprid spray*	4A	II	>75%	>2wks	50-75%	>2wks

Fungicides		FRAC	Risk resistance	Encarsia		Aphidius	
Trade name	active ingredient			% death	persist (wks)	% death	persist (wks)
Alto	*chlorothalonil +*	M5	low	<25%	zero	<25%	zero
	+cyproconazole	G1	med	50-75%	zero	25-50%	no data
Folicur, Orius, Raxil	*tebuconazole*	G1	med	<25%	zero	25-50%	no data
Ortiva	*azoxystrobin*	C3	high	*25-50%*	zero	<25%	zero
Sulphur	*Sulphur* ***(smoke/burning)***	M2	low	50-75%	0.5 wk	>75%	no data
Thiovit Jet	*Sulphur* ***(spray)***	M2	low	>75%	zero	25-50%	zero
Sulphur	*Sulphur* ***(dust)***	M2	low	50-75%	no data	no data	no data
Ortiva	*azoxystrobin*	C3	high	*25-50%*	zero	<25%	zero
Ridomil Gold	*mancozeb+*	M3	low	<25%	zero	<25%	zero
	+ metalaxyl	A1	high	25-50%	zero	no data	no data
Folio Gold	*metalaxyl +*	A1	high	25-50%	zero	no data	no data
	+ chlorothalonil	M5	low	<25%	zero	<25%	zero
Tecto	*thiabendazole*	B1	low	25-50%	no data	no data	no data
Real subtilis	*Bacillus subtilis*	M	low	<25%	zero	<25%	zero
Real Tricho	*Trichoderma*	M	low	<25%	zero	<25%	zero

Balance of nature ?





Quarantine pests status

Export Ban - country-wide

Irrespective of
Individual's status

Metarhizium anisopliae

Entomo-pathogenic fungus ICIPE 69

Researched for many years by ICIPE

Proposed as a bio-pesticide for thrips – but Real IPM also 'made it work' on mealy bug, whitefly and caterpillars (tank mix with insecticides)

Potential for stinkbug, weevils, beetles, fruit fly, leaf miner – placement of bio-pesticide, time of day and tank mix with pesticide

Environmentally safer

other isolate – LUBILOSA Africa-wide locust control

Applied over regions by AIR – area-wide control programmes

Although 'broad spectrum' – NOT persistent– killed by UV light / dehydration in 24 hrs

Real Metarhizium

Mass produced by Real IPM in Kenya

Global exclusive license from ICIPE - royalties

Less expensive than most insecticides

Intensive programme to RESTORE BALANCE

Parasitoids + low level Metarhizium programme +/- MSIT and baits

ICIPE field work fruit fly

Kills fruit fly pupae (more than one species) in SOIL

Does NOT KILL parasitoids inside fruit fly pupae !

Therefore MORE compatible than pesticides in IPM

Other work in Spain – Metarhizium used for ADULT fruit fly

IPM in mangoes

Metarhizium ALSO controls – thrips, mealybugs and probably seed weevil - enhance cost effectiveness

DESIGN programme with a backbone of Metarhizium in combination with carefully chosen pesticides

Timing and placement of pesticides + bio-pesticides – application technology improved (ULV?)

? Potential for pest-suppressive soils under mango and avocado trees? Perennial crops

What's the plan?

How urgent is need?

More of the same research?

Take an educated gamble?

Place some bets on Metarhizium?

Real IPM seriously interested in including fruit fly in business plan – MANY CROPS affected

RESEARCH INTO USE

What now?

Support for Real IPM

EU Pesticide Initiative Programme

DFID Crop Protection Programme

USAID – Kenyan Horticultural Development Programme

USAID – Agribusiness Trade Expansion Activity (Ethiopia)

Stockpiles Programme – WWF, UNDP, WHO

Kenyan Flower Industry

Kenyan Vegetable Industry

African Agricultural Capital

Make IPM Really Work

www.realipm.com