Department of **Employment, Economic Development and Innovation**

Economic Impact of Tilapia In the Murray Darling Basin

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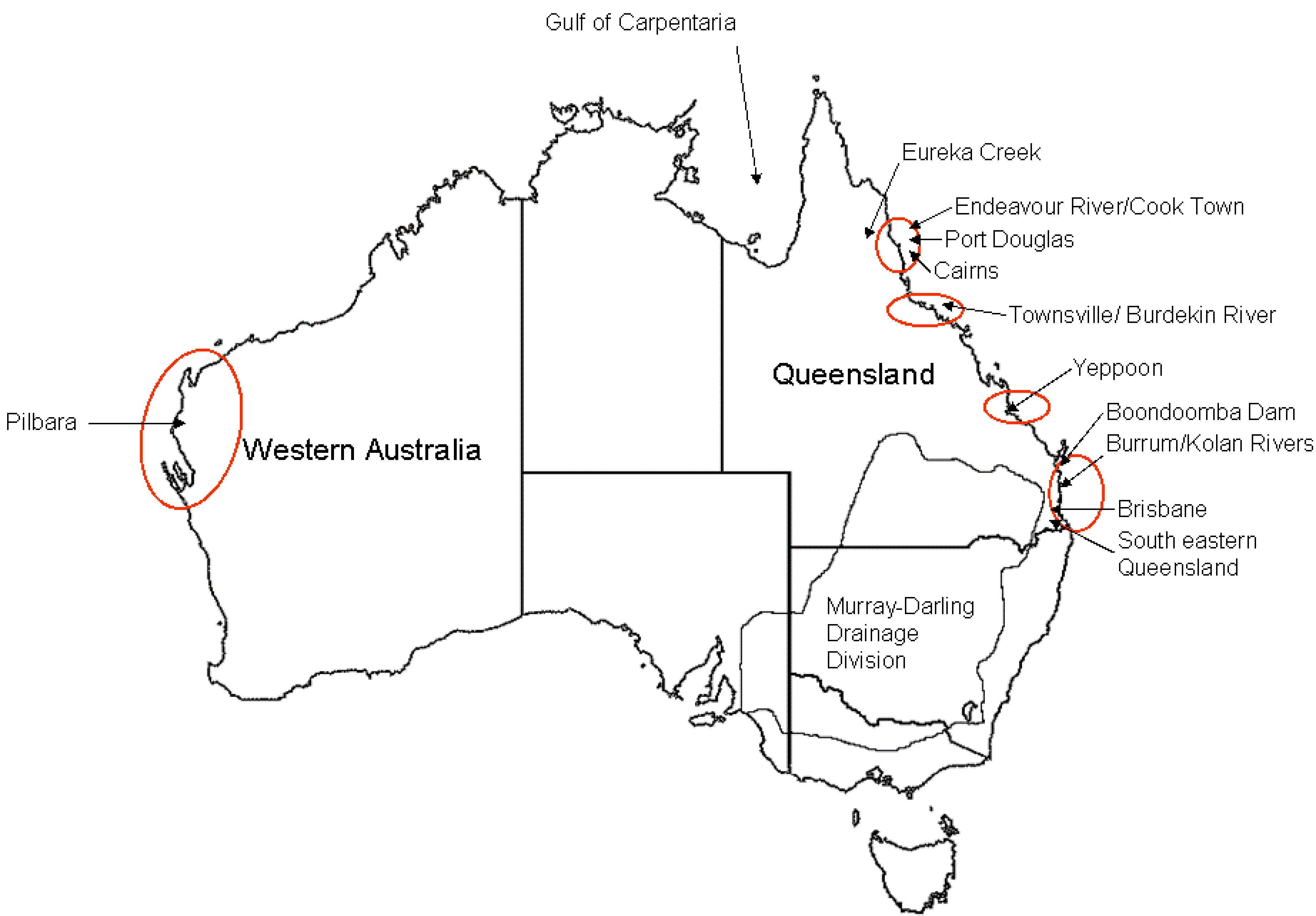
Toward Q2 Tomorrow's Queensland

Queensland Government

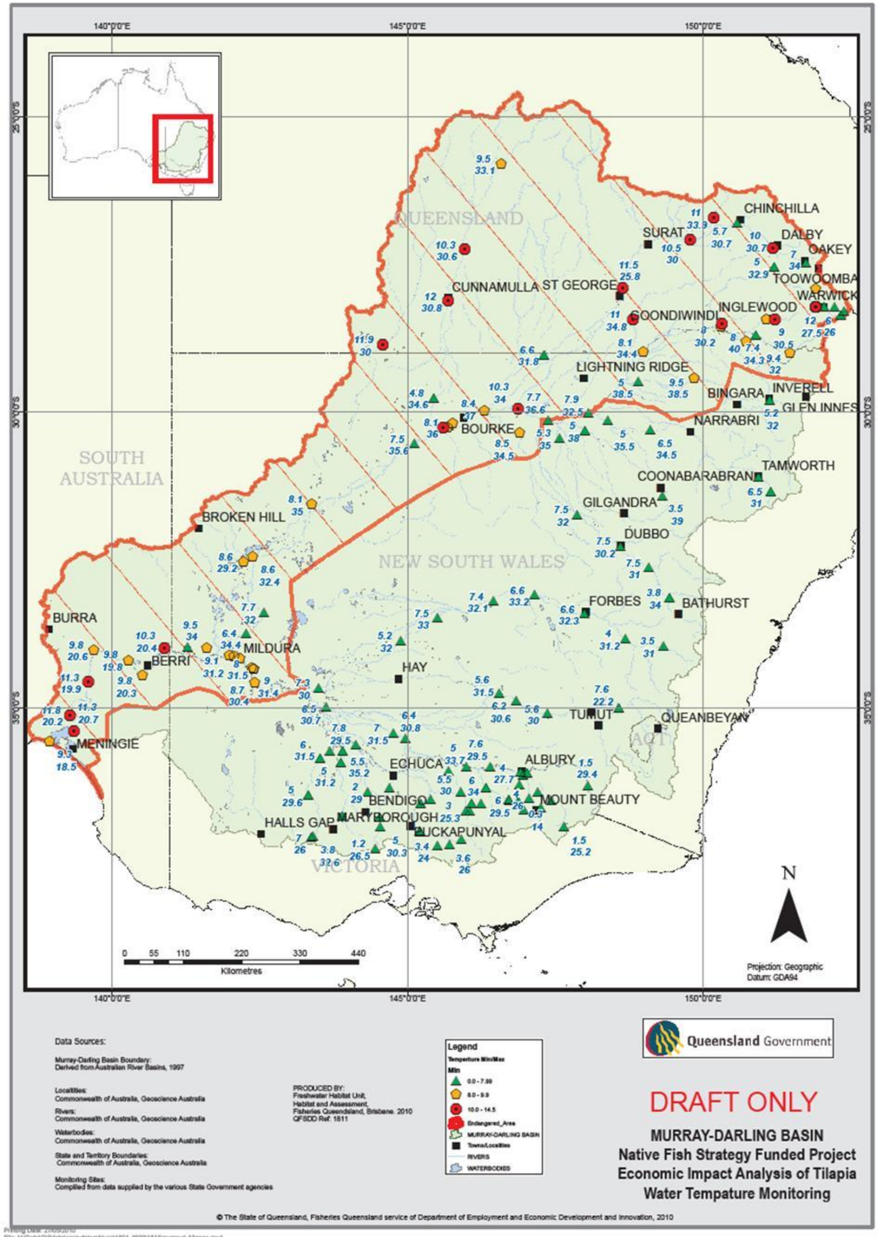


Modified from Russell et al., 2010

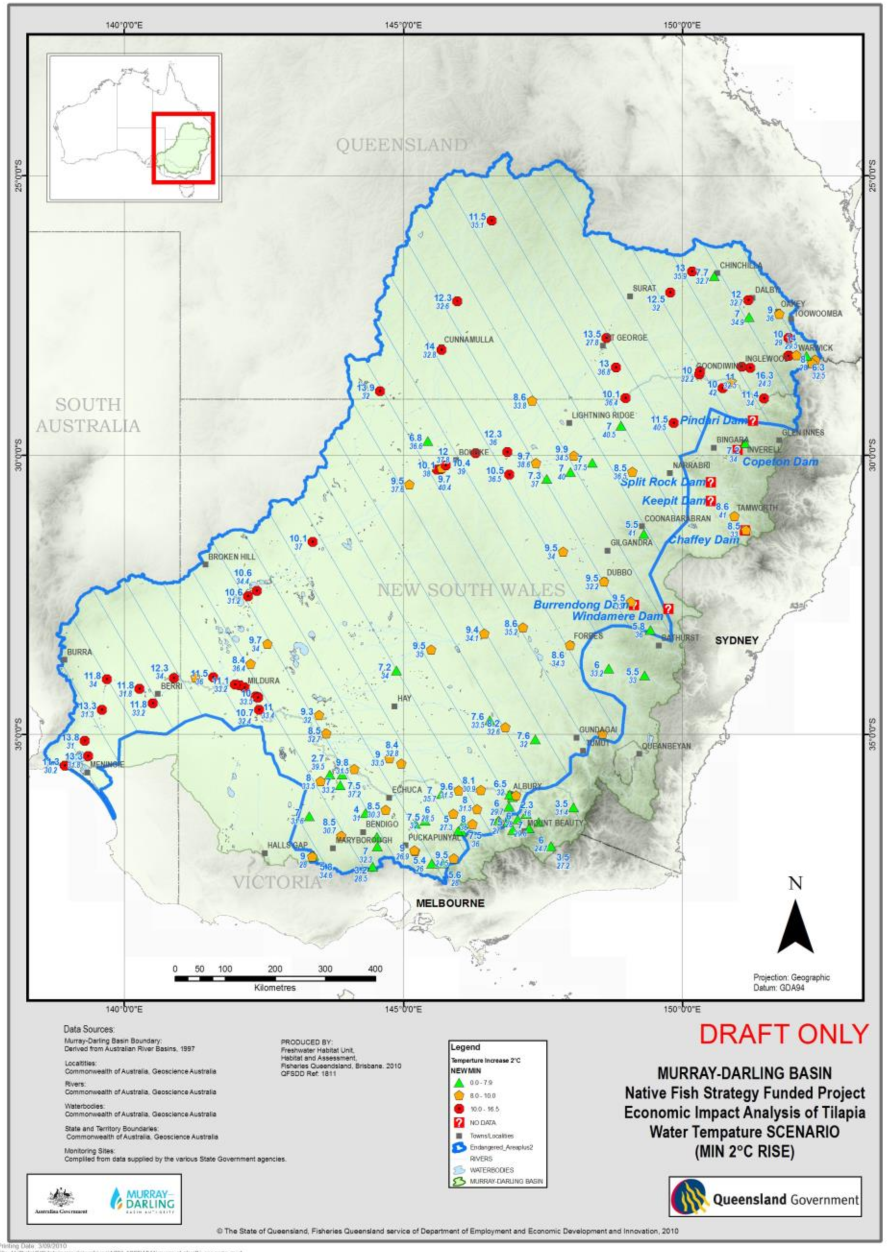
Economic Impact of tilapia

- Literature Review
- Economic impact analysis

Literature Review Findings



Literature Review Findings



Literature Review Findings

- Little information on impacts of tilapia in Australia but we know they can dominate ephemeral systems (Gascoyne River).

- Have a tendency to runt and mature early in ephemeral systems

- Tolerate wide range of salinities

- Are plastic in diet. Mainly detritivore and herbiviore, but can switch to piscivory and omnivory as resources demand. More piscivorous in low productive environments.

- Can damage macrophytes through direct grazing and grazing of periphyton

- Are known to predate rainbow fish, gudgeons, gobies, ambassids.

Literature Review Findings

- Known carrier of exotic and east coast catchment parasites and diseases.
- Nesting behaviour can disturb bottom substrates and interfere with native substrate spawners
- Aggressive guarding of nesting sites can exclude native fish (observations in Gascoyne R)
- Are mouth brooders, so survival of eggs and young is high.
- Have been linked to blue green algae blooms as they convert detritus back into available phosphorus.
- Winter fish kills of a proportion of population can also lead to declines in water quality and possible flow on effects to native fish.

Economic Impact Analysis

Economic Impact Analysis

Significant information gathering was carried out based on:

- The biology of tilapia

- Recreation and commercial fishing and their presumed or assumed interactions with tilapia in Australia outside the Murray Darling Basin, and with the other pest species such as carp and climbing perch

- Data on the Murray Darling Basin based on its characteristics such as geography, hydrology, ethnology and ecology

- Behaviour of tilapia in the Australian catchments

- Up to date costing associated with the eradication, control and preventative measures employed against tilapia.

Economic Impact Analysis

Options

- Eliminate tilapia whatever the cost (scorched earth policy)
- Ignore their introduction (serendipity policy)
- Manage the introduction (appeasement policy)

Possible scenarios

- Worst case scenario
- Best case scenario
- Most likely scenario – examined the three options

Economic costs - measures

- Used mean annual costs (current dollars)
- Assessment based on average of 20 years of tilapia in the system
- Three types of costs – measurable (water cleaning costs), think can be measured (expenditure for recreational fishing) and opinion of value (intrinsic properties)
- Only the additional costs due to tilapia are estimated

Estimated economic costs - Worst case scenario - one year

Activity	Expenditure type	Amount ($m)
Surveillance team	Not undertaken	0
Promotion programme	Not undertaken	0
Water provision	Additional	8.9
Recreational fishing	Not spent on that activity	13.5
Intrinsic property value	Subjective and unquantifiable	Unknown
TOTAL		**22.4**

Estimated economic costs – Best case scenario - one year

Activity	Expenditure type	Amount ($m)
Surveillance team	Annual cost	1.32
Promotion programme	Annul cost	0.40
Water provision	Single rotenone treatment	0.02
Recreational fishing	No change	0
Intrinsic property value	No effect	0
TOTAL		**1.74**

Economic Impact Analysis

Most likely scenario

- Unknown in river until reported from Warra
- River fresh dispersal – in summer
- Surveillance team discovers widespread and rare – 10 km upstream & 40 km downstream
- Three options available – eradicate, live with or try to manage

Economic Impact Analysis

Estimated economic costs – Most likely scenario – Scorched earth policy – one year

Activity	Expenditure type	Amount ($m)
Surveillance team	Annual cost	1.32
Promotion programme	Annul cost	0.40
Water provision	Single treatment	5.50
Recreational fishing	No long term effect	0
Intrinsic property value	No long term effect	0
TOTAL		**7.22**

Economic Impact Analysis

Scorched earth policy - outcomes

- Unlikely to be acceptable (rotenoning? 50 km of river)
- Unlikely to be successful as may miss potential source of infestation next flush

Serendipity policy - costs

- Three years option for “winter kill” of tilapia – 1,3,5 years
- Three rates of tilapia movement - 30,50 & 70 km each year on average
- Providing “usable water” costs about $330,000 each sector/year a fish kill
- Loss of recreational fishing expenditure in fish kill years

Economic Impact Analysis

Serendipity outcome - best result

Distance moved each year	Years between kills	Activity	Expenditure type	Amount ($m)
30	5	Surveillance team	Annual cost	1.32
		Promotion programme	Annual cost	0.4
		Water provision	Mean annual additional cost	0.42
		Recreational fishing	Not spent on recreational fishing	0.63
		Intrinsic property value	Long term effect unlikely	Nil
			Total	2.77

Economic Impact Analysis

Serendipity Option – worst outcome

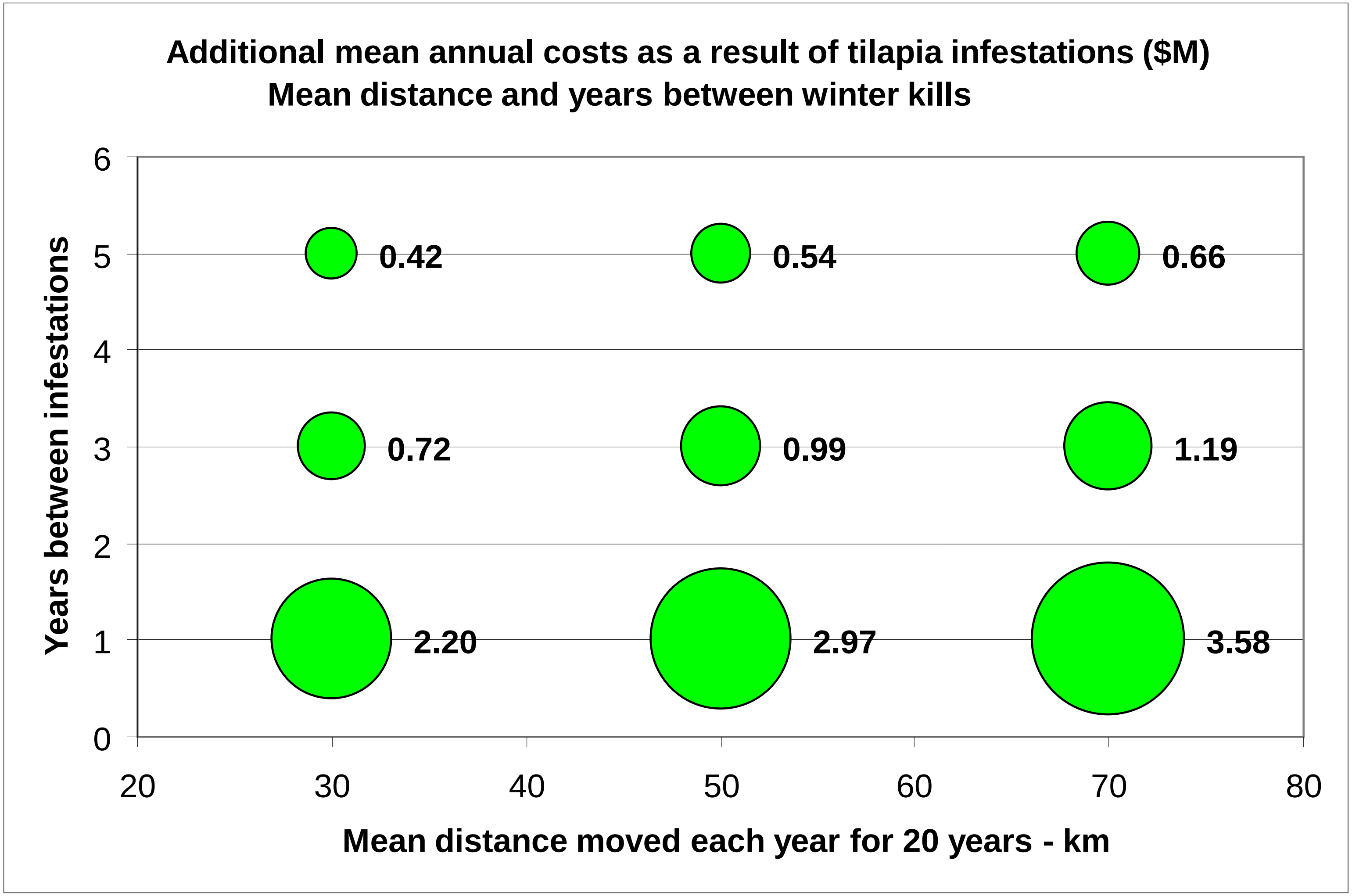
Distance moved each year	Years between infestations	Activity	Expenditure type	Amount ($m)
70	1	Surveillance team	Annual cost	1.32
		Promotion programme	Annual cost	0.4
		Water provision	Mean annual additional cost	3.58
		Recreational fishing	Not spent on recreational fishing	13.42
		Intrinsic property value	Subjective and unquantifiable	Unknown
		TOTAL (70,1)		18.72

Useful information

- Two way interaction between frequency of tilapia winter kill and rate of movement
- If move 30 km/year if the frequency of winter kill decreases by one year the cost savings will be about $450,000
- If move 70 km/year if the frequency of winter kill decreases by one year the cost savings will be about $730,000
- Although recreational values are estimated, there is a concern about its inclusion in the economic costs

Economic Impact Analysis

Effect of years between kills and movement of tilapia



Conclusions

- Preliminary analysis only
- Prefer quantification of rates of movement, frequency of winter kills related to tilapia density
- Indicative of scale of financial outlay