Water and nutrient budgets of traditional pangasius *(Pangasianodon hypophthalmus)* production ponds in Mekong Delta, Vietnam

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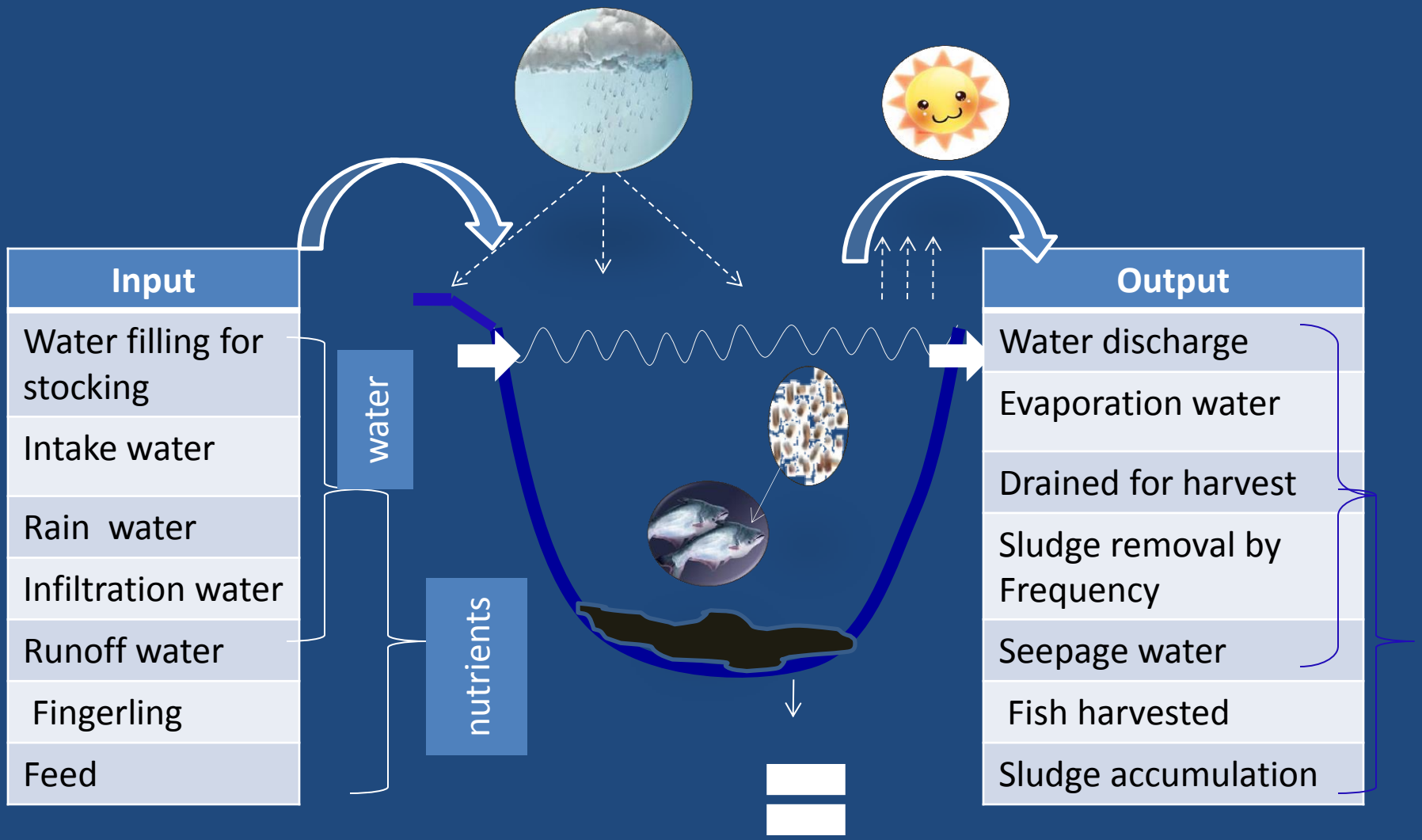
Introduction

- More than 95% striped catfish production from earth pond
- Annually 1.3 million MT
- 5500 ha , 54000 farms & 220,000 people (indirectly & directly) for working.
- High water exchange daily
- No aeration

Aims of research

- To understand water and nutrients balance detail
  - *To consider improving sustainability*
  - *to develop sustainable technologies for pangasius*

How do we make water and nutrients balance?

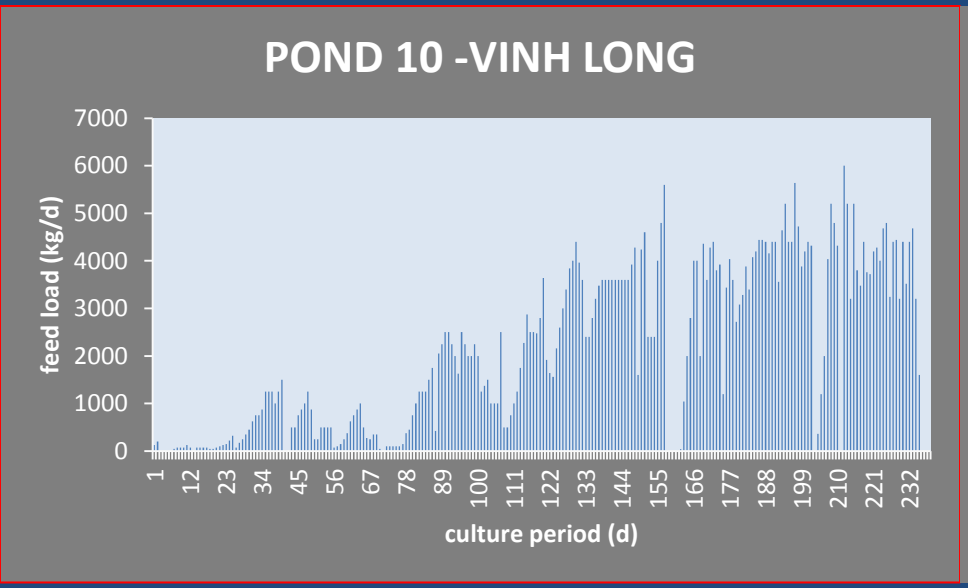


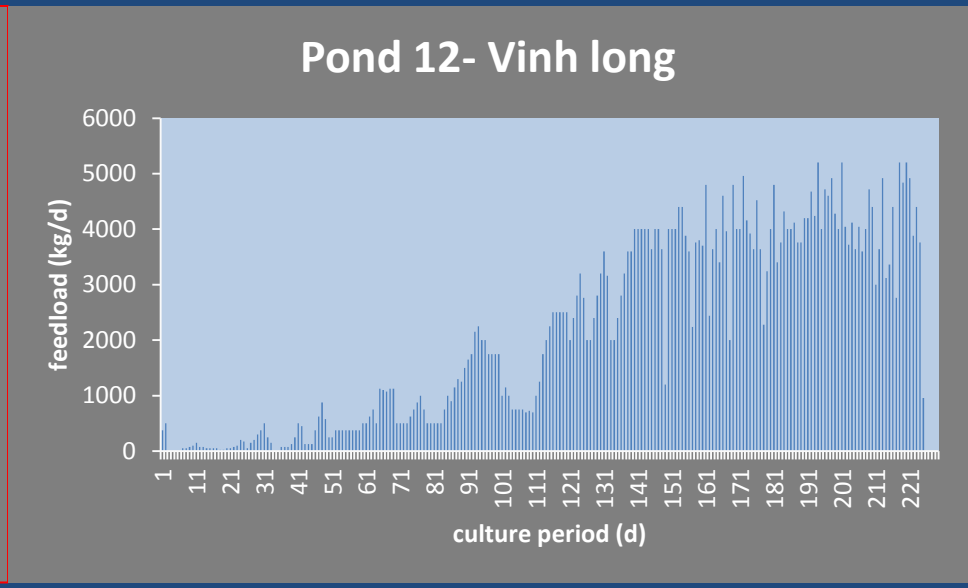
Water and nutrients (N,P and C)

Pond information

Parameter	Vinh Long- dowstream Mekong river	
Pond number	10	12
Pond area (m^2)	11,721	10,504
Water depth (min-max)	2.23-4.25	1.97-4.1
Number for stocking (#)	730,000	470,000
Initial BW stocking ($g.ind^{-1}$)	45.5	46.5
Initial biomass (kg/pond)	33,178	21,840
Initial density (kg/m^2)	2.83	1,85
Harvest		
Final density ($kg.m^{-2}$)	32.7	27.4
Final biomass (kg/pond)	383,316	322,364
Mean final BW ($g.ind^{-1}$)	781	801
Total feed (kg/pond)	496,970	475,780
FCR (kg feed/kg fish)	1,41	1,58
SGR ($\%.fish^{-1} . d^{-1}$)	1.2	1.25
Survival rate (%)	67.2	85.6
Culture period ($d.crop^{-1}$)	238	228

Feedload in ponds





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Sampling program

- For water balance: daily measurement of input and output cover full production cycle

- For nitrogen, phosphorus and carbon budgets: biweekly measurement TN, TP and TC of input and output following full production cycle

Analysis & Calculation

Input	Method
Water filling for stocking	Water depth * surface area
Intake water	Water depth * (after – before) * pond surface area
Rain water	Raining Gouge
Infiltration water	Different water level in PVC pipe
Runoff water	Water catchment frame of $1m^2$ * runoff area
Fingerling	Biomass * % nutrients in whole fish
Feed	Quantity * % nutrients

Output	Method
Water discharge	Water depth * (after – before) * pond surface area
Evaporation water	Evaporation chamber
Drained for harvest	Water depth * (before – after discharge) * pond surface area
Sludge removal by Frequency	Sampling calculate water and analysis nutrients
Seepage water	Different water level in PVC pipe and analysis nutrients
Fish harvested	Sampling analysis of nutrients * biomass harvest
Sludge accumulation	Sludge analysis for nutrients and sludge quantity in pond

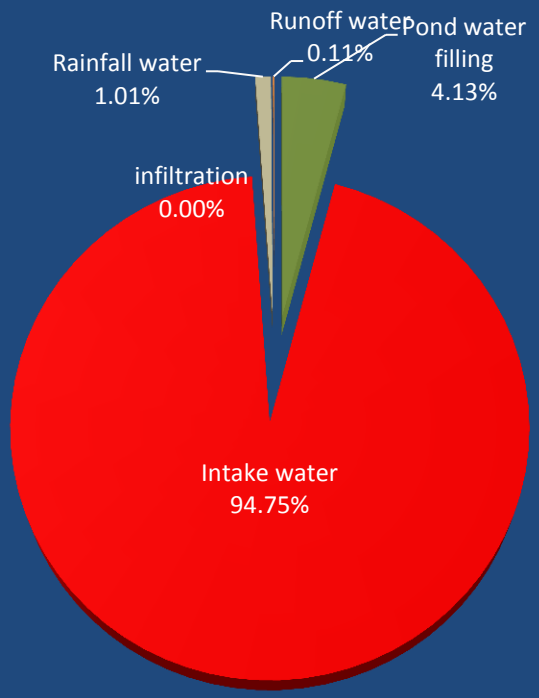
Result

1.Water budget

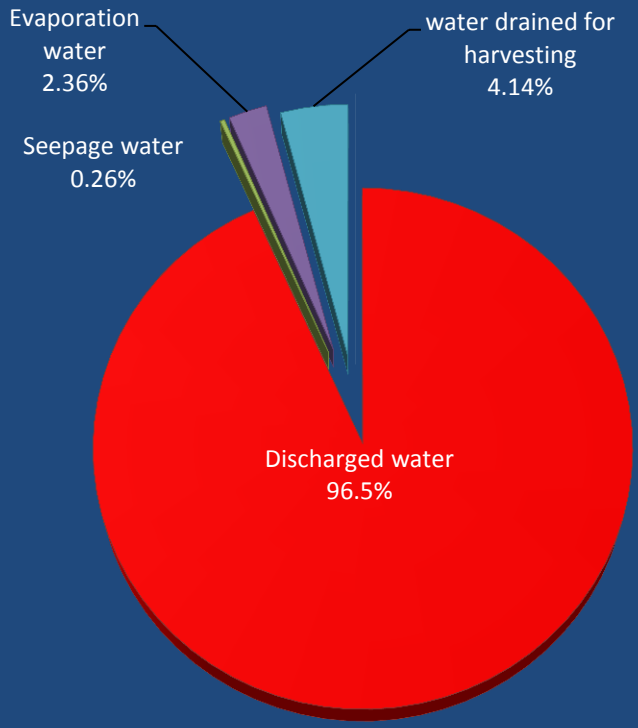
Input	m^3
Pond water filling for stocking	33,900 ± 2,078
Intake water	777,530 ± 31,523
Rainfall water	8,274± 3102
Runoff water	815 ± 470
Infiltration water	0
Total	820,737 ± 37,352
Output	
Discharged water	792,030 ± 32,475
Seepage	2,250 ± 383
Evaporation	20,037 ± 204
Water drained for harvest	35,137 ± 2,899
Total	881,504± 106,437
Water consumption per kg of fish produced(m^{-3}.kg)	**2.18**
Water consumption per kg of feed (m^{-3}.kg)	**1.87**

Result

How is water used in traditional striped pangasius pond ?



Water input

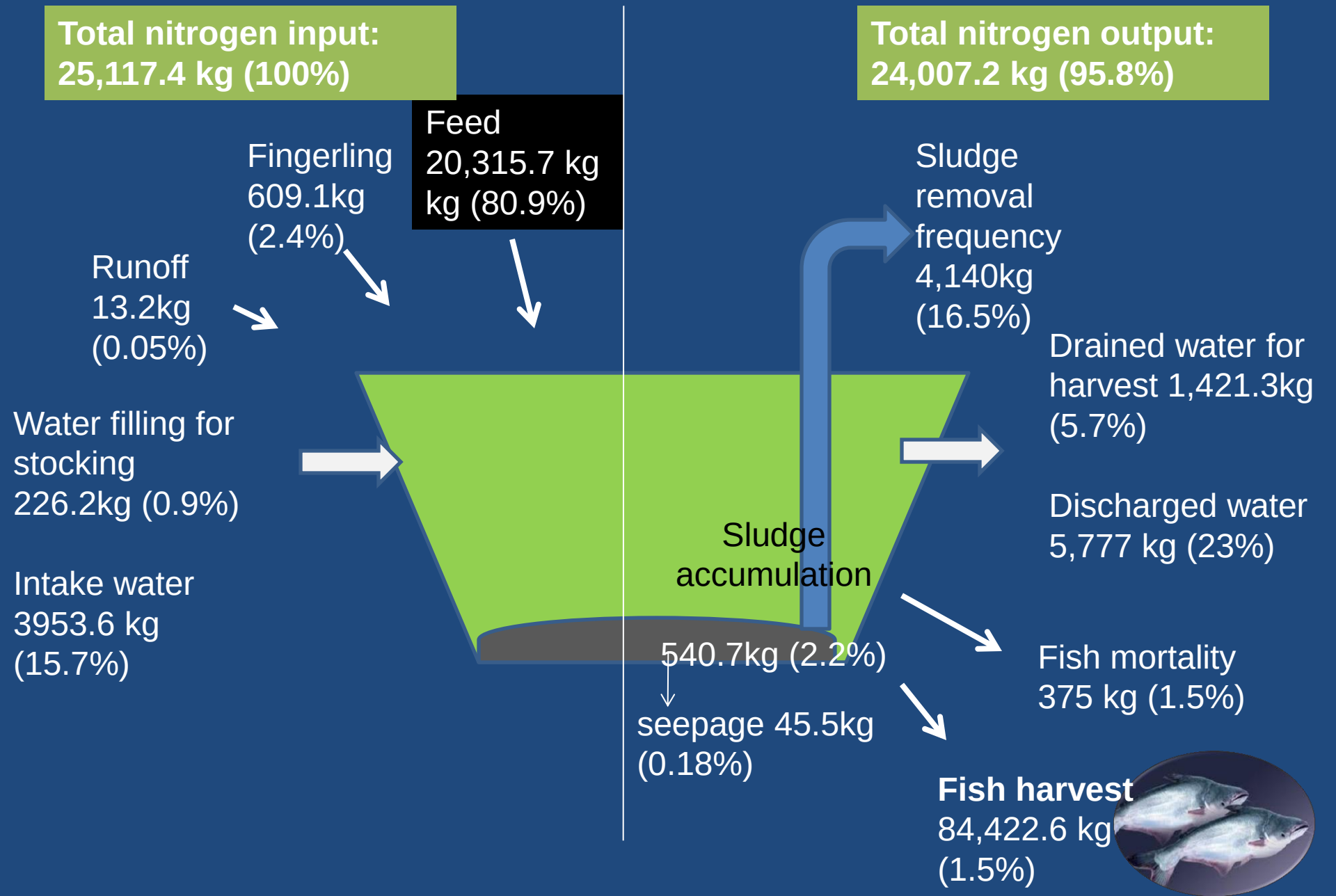


Water ouput

How is nitrogen balance in pond?

Total nitrogen input: 25,117.4 kg (100%)

Total nitrogen output: 24,007.2 kg (95.8%)



How is phosphorus balance in pond?

Total phosphorus input: 8,089.5 kg (100%)

Total phosphorus output: 7,376.9 kg (91%)

Feed: 6,510.3 kg kg (80.5%)

Fingerling : 83.6kg (1%)

Runoff : 2.3kg (0.03%)

Water filling for stocking: 145.1kg (1.8%)
Intake water : 1,348.4 kg (16.6%)

Sludge removal frequency 1,511.2kg (18.7%)

Drained water for harvest: 1,113.5kg (13.7%)
Discharged water : 2,832.2 kg (35%)

Fish mortality: 42.5 kg (0.5%)

Sludge accumulation 1,107.2kg (13.8%)

seepage: 9.8kg (0.12%)

Fish harvest: 758 kg (9.4%)

How is total carbon balance in pond?

Total carbon input: 189559.2 kg (100%)

Total carbon output: 94,669.8 kg (50.5%)

49.5%?

Feed: 174867.3 kg kg (92.2%)

Fingerling : 83.6kg (1%)

Runoff : 52kg (0.3%)

Water filling for stocking: 869.8kg (0.5%)
Intake water : 10341.8 kg (5.5%)

Sludge removal frequency 1,511.2kg (18.7%)

Drained water for harvest: 1572.4kg (0.8%)
Discharged water : 20,290 kg (10.7%)

Fish mortality: 2,087 kg (0.5%)

Sludge accumulation 3901.3 kg (2%)

seepage: 216.5kg (0.11%)

Fish harvest: 58,268 kg (30.7%)

Thank you very much

Question ?