



Operations Management of a Centralized Zebrafish Facility

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Business Plans and Cost Recovery

- Cost Recovery Model Chosen Will Dictate How and Where and When you make Expenditures
 - Billing Cycle for Users
 - can your books be in the Black? Legally
 - can your growth be modeled?
 - Dedicated Staff vs. User Contributed labor?

Major Costs

- Labor
- Maintenance of Equipment
 - (minimizes downtime)
 - PM costs
 - replacement costs
 - \$ provision for emergency repairs
- Consumables

Cost Recovery

- Per Diems/Usage Costs
- Department/Institute Budget
- Subsidies?
 - for capital equip and maintenance
 - can significantly reduce per deim cost
 - improves faculty/staff/student recruitment
- Grants Specific to lab animals
 - e.g. GLAS (AALAS)

Facility Management

- Maintenance of Equipment
 - you should strive to become an expert about all of your equipment
 - ask for technical training for your operators from manufacturers
 - this permits you to save time and money on upkeep and repairs
 - minimizes downtime
 - allows you to better understand when you are wasting your time
 - allows you to scrutinize the content of a PM agreement to get the best value

Per Diems comparisons

| Institution | cost per tank (3.5L) per day (adult) | cost per tank (3.5L) per day (nursery) | cost per facility user per month |
|---|---|---|---|
| Duke University SOM | \$0.0800 | n/a | \$130 |
| WASHU MCDS | \$0.1430 | \$0.27 | 12.87 |
| Boston Children's Hospital (Aquatics Resource Program) | \$0.2100 | n/a | n/a |
| Rush University Medical Center | \$0.5100 | n/a | n/a |
| Univ. Queensland (AUS) | \$0.6786 | n/a | n/a |

Facility Management

- question why you are doing why you are doing. Are you simply repeating an old SOP with no improvement or evolution?
- challenge the old staffing and care paradigm
 - hire fish people!
 - look for people with previous fish-handling skills
 - use dedicated staff if possible, not students and researchers

Facility Management

- applicability of the "economy of scale" is case specific
- if you can buy/store in bulk- do it!
 - NaCl, NaHCO₃, artemia cysts, algae paste, prepared diets
- look at shipping and MSDS for clues as to the actual distributor or manufacturer- you could save a bundle
- cost share? buying consortium?

Facility Management

- collect labor data periodically to better understand where your efforts are going
 - time to feed
 - time to prep
 - time to wash
 - time to check fish
 - time to move fish
- Collection of labor data in some settings has the added benefit of improving performance (efficiency and consistency)

Facility Management

- generous oversight-
 - lots of checklists, but don't over-do it.
 - if you can't easily envision a way to mine the data and get a real benefit, it is not needed

Facility Management

- how much dry/artemia/etc. do you feed per fish per day?
- how do you decide how much to feed? how is it quantified?
- make easy to understand charts that permit staff to make decisions based on actual practices - insert artemia charts and rotifer charts

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provide easy
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| # of tanks (3.5L) to feed rotifers to | # of L needed for feedout (30mL/tank) | # rotifers (M) needed for feedout |
|---|--|---|
| 300 | 9 | 31.5 |
| 275 | 8.25 | 28.875 |
| 250 | 7.5 | 26.25 |
| 225 | 6.75 | 23.625 |
| 200 | 6 | 21 |
| 190 | 5.7 | 19.95 |
| 180 | 5.4 | 18.9 |
| 170 | 5.1 | 17.85 |
| 160 | 4.8 | 16.8 |
| 150 | 4.5 | 15.75 |
| 140 | 4.2 | 14.7 |
| 130 | 3.9 | 13.65 |
| 120 | 3.6 | 12.6 |
| 110 | 3.3 | 11.55 |
| 100 | 3 | 10.5 |
| 90 | 2.7 | 9.45 |
| 80 | 2.4 | 8.4 |
| 70 | 2.1 | 7.35 |
| 60 | 1.8 | 6.3 |
| 50 | 1.5 | 5.25 |
| 40 | 1.2 | 4.2 |
| 30 | 0.9 | 3.15 |
| 20 | 0.6 | 2.1 |
| 10 | 0.3 | 1.05 |

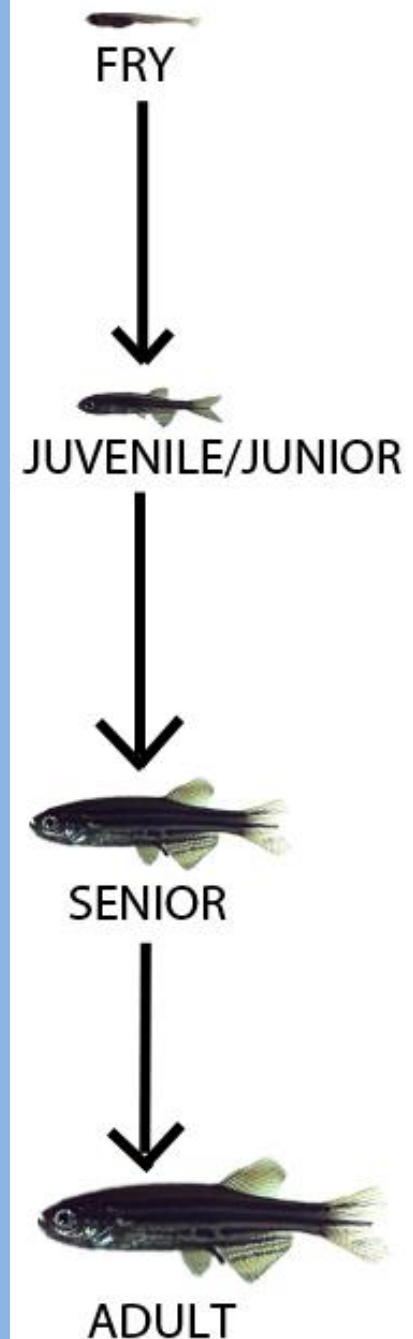
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| | # of L needed for feedout (30mL/tank) | | | | | | | | | | | |
|--|---|------|------|------|------|------|------|------|------|------|------|---|
| | 9 | | | | | | | | 180% | 158% | 140% | 1 |
| | 8.25 | | | | | | | 193% | 165% | 144% | 128% | 1 |
| | 7.5 | | | | | | | 175% | 150% | 131% | 117% | 1 |
| | 6.75 | | | | | | 189% | 158% | 135% | 118% | 105% | 9 |
| | 6 | | | | | | 168% | 140% | 120% | 105% | 93% | 8 |
| | 5.7 | | | | | 200% | 160% | 133% | 114% | 100% | 89% | 8 |
| | 5.4 | | | | | 189% | 151% | 126% | 108% | 95% | 84% | 7 |
| | 5.1 | | | | | 179% | 143% | 119% | 102% | 89% | 79% | 7 |
| | 4.8 | | | | | 168% | 134% | 112% | 96% | 84% | 75% | 6 |
| | 4.5 | | | | 197% | 158% | 126% | 105% | 90% | 79% | 70% | 6 |
| | 4.2 | | | | 184% | 147% | 118% | 98% | 84% | 74% | 65% | 5 |
| | 3.9 | | | | 171% | 137% | 109% | 91% | 78% | 68% | 61% | 5 |
| | 3.6 | | | | 158% | 126% | 101% | 84% | 72% | 63% | 56% | 5 |
| | 3.3 | | | 193% | 144% | 116% | 92% | 77% | 66% | 58% | 51% | 4 |
| | 3 | | | 175% | 131% | 105% | 84% | 70% | 60% | 53% | 47% | 4 |
| | 2.7 | | | 158% | 118% | 95% | 76% | 63% | 54% | 47% | 42% | 3 |
| | 2.4 | | | 140% | 105% | 84% | 67% | 56% | 48% | 42% | 37% | 3 |
| | 2.1 | | 184% | 123% | 92% | 74% | 59% | 49% | 42% | 37% | 33% | 2 |
| | 1.8 | | 158% | 105% | 79% | 63% | 50% | 42% | 36% | 32% | 28% | 2 |
| | 1.5 | | 131% | 88% | 66% | 53% | 42% | 35% | 30% | 26% | 23% | 2 |
| | 1.2 | | 105% | 70% | 53% | 42% | 34% | 28% | 24% | 21% | 19% | 1 |
| | 0.9 | 158% | 79% | 53% | 39% | 32% | 25% | 21% | 18% | 16% | 14% | 1 |
| | 0.6 | 105% | 53% | 35% | 26% | 21% | 17% | 14% | 12% | 11% | 9% | |
| | 0.3 | 105% | 53% | 26% | 18% | 13% | 11% | 8% | 7% | 6% | 5% | |

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| 1-L bottles needed | | | | | | | | | |
|----------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 18 | 908 | 1029 | 1087 | 1178 | 1275 | 1456 | 1543 | 1641 | 1734 |
| 18.5 | 933 | 1057 | 1117 | 1210 | 1311 | 1496 | 1586 | 1687 | 1782 |
| 19 | 958 | 1086 | 1147 | 1243 | 1346 | 1536 | 1629 | 1733 | 1830 |
| 19.5 | 983 | 1114 | 1177 | 1276 | 1381 | 1577 | 1671 | 1778 | 1878 |
| 20 | 1008 | 1143 | 1207 | 1309 | 1417 | 1617 | 1714 | 1824 | 1926 |
| 20.5 | 1034 | 1171 | 1237 | 1341 | 1452 | 1658 | 1757 | 1869 | 1974 |
| 21 | 1059 | 1200 | 1268 | 1374 | 1488 | 1698 | 1800 | 1915 | 2022 |
| 21.5 | 1084 | 1229 | 1298 | 1407 | 1523 | 1739 | 1843 | 1960 | 2071 |
| 22 | 1109 | 1257 | 1328 | 1439 | 1558 | 1779 | 1886 | 2006 | 2119 |
| 22.5 | 1134 | 1286 | 1358 | 1472 | 1594 | 1819 | 1929 | 2052 | 2167 |
| 23 | 1160 | 1314 | 1388 | 1505 | 1629 | 1860 | 1971 | 2097 | 2215 |
| 23.5 | 1185 | 1343 | 1419 | 1538 | 1665 | 1900 | 2014 | 2143 | 2263 |
| 24 | 1210 | 1371 | 1449 | 1570 | 1700 | 1941 | 2057 | 2188 | 2311 |
| 24.5 | 1235 | 1400 | 1479 | 1603 | 1736 | 1981 | 2100 | 2234 | 2360 |
| 25 | 1261 | 1429 | 1509 | 1636 | 1771 | 2022 | 2143 | 2280 | 2408 |
| 25.5 | 1286 | 1457 | 1539 | 1668 | 1806 | 2062 | 2186 | 2325 | 2456 |
| 26 | 1311 | 1486 | 1569 | 1701 | 1842 | 2102 | 2229 | 2371 | 2504 |
| 26.5 | 1336 | 1514 | 1600 | 1734 | 1877 | 2143 | 2271 | 2416 | 2552 |
| 27 | 1361 | 1543 | 1630 | 1767 | 1913 | 2183 | 2314 | 2462 | 2600 |
| 27.5 | 1387 | 1571 | 1660 | 1799 | 1948 | 2224 | 2357 | 2508 | 2648 |
| 28 | 1412 | 1600 | 1690 | 1832 | 1983 | 2264 | 2400 | 2553 | 2697 |
| 28.5 | 1437 | 1629 | 1720 | 1865 | 2019 | 2305 | 2443 | 2599 | 2745 |
| 29 | 1462 | 1657 | 1751 | 1897 | 2054 | 2345 | 2486 | 2644 | 2793 |
| 29.5 | 1487 | 1686 | 1781 | 1930 | 2090 | 2385 | 2529 | 2690 | 2841 |
| 30 | 1513 | 1714 | 1811 | 1963 | 2125 | 2426 | 2571 | 2736 | 2889 |
| 30.5 | 1538 | 1743 | 1841 | 1996 | 2161 | 2466 | 2614 | 2781 | 2937 |
| 31 | 1563 | 1771 | 1871 | 2028 | 2196 | 2507 | 2657 | 2827 | 2986 |
| 31.5 | 1588 | 1800 | 1901 | 2061 | 2231 | 2547 | 2700 | 2872 | 3034 |
| 32 | 1613 | 1829 | 1932 | 2094 | 2267 | 2588 | 2743 | 2918 | 3082 |
| decap density (g/mL) | 0.170 | 0.150 | 0.142 | 0.131 | 0.121 | 0.106 | 0.100 | 0.094 | 0.089 |

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Facility Management

- set out clearly defined, agreeable, reasonable, daily tasks for employees that never change
- play to the strengths of your staff, but foster an opportunity for them to improve upon
- their weaknesses
- no calculators!

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