Instructions for identifying least expensive fertilizers, estimating fertilizer input amounts and costs, and other useful information

Introduction:

The fertilizer input calculations are designed to very simply determine:

1. The least expensive fertilizer sources of N and P for stimulating algal growth.
2. An estimation of the amount and cost (both weekly and annually) of N and P fertilizers required for each pond.
3. An estimation of gross and net profitability using different fertilizer combinations.

Method:

1. Go to the Fertilizer Input Calculations (file: *Workshop.FertCalc.xls*.)
   Fill in only those worksheet cells which have this color: [ ]

2. Fill in blanks in Table 1.
   - pond size (approximate surface area)
   - N fertilization rate:
     Maximum N fertilization rate is about 30 kg N/ha/week. This amount is appropriate for ponds with low inorganic turbidity. If there is inorganic turbidity, then the maximum N input rates may be reduced accordingly.
   - P fertilization rate:
     This value estimates average P input rate for a particular pond (actual pond-specific P input rates are determined using algal bioassays). Use a rate estimation of about 6-10 kg P/ha/week for new earthen ponds, and a rate of about 3-5 kg P/ha/week for older, more experienced ponds.
   - Time pond fertilized:
     Insert the number of weeks per year the pond will be fertilzed. This will allow a calculation to estimate annual fertilizer costs as indicated in Table 5.
   - Fish selling price:
     Give farm-gate selling price of the cultured fish.
   - Unit of money:
     Give name of national monetary currency.

2. Review Table 2.
   Table 2 estimates both annual and per pond fish yields based on data from Table 1. An empirical relationship between N inputs and fish (tilapia) yield is assumed for these calculations. This relationship assumes an annualized average of approximately 250 kg/ha/year of net fish (tilapia) yield for every 1 kg N/ha/week average fertilization rate when sufficient P, C, and light are made available.

3. Fill in blanks in Table 3.
   For all available fertilizers, give the cost and package size. If a listed fertilizer is not available, leave corresponding cells blank. Use N-P-K (other) for N-P-K fertilizers not listed. Actual N and P values for the N-P-K (other) fertilizer are inserted in Table 4.

Note that in Table 3 last two columns calculate the actual cost of available N and P for each fertilizer. Comparing these values will indicate which fertilizer is the least expensive source for N and P for natural food production.

4. Fill in blanks in Table 4.

   Use this table only if there is a N-P-K (other) fertilizer available and/or bagged manure is available. For the N-P-K (other) fertilizer, input the values for N and P. For the manure, input percent N and P content of the manure. As a basis for calculations, it is assumed that only 50% of total manure N and P is available for algal uptake.

5. Review Table 5.

   Table 5 lists all the fertilzers included in Table 3. Experience in Asia has shown that urea is consistently the least expensive source of N. Table 5 lists seven fertilizer combinations with urea the primary source of N, and other fertilizers as the primary source of P. When N is part of the P fertilizer (e.g., with N-P-K fertilizers and manures), then the N contribution from the N-P-K fertilizer/manure is included in the calculation - which reduces the amount of urea required.

   The left side of Table 5 calculates the weekly amount and cost of each fertilizer required based on the information supplied in Tables 1 and 2. The right side of Table 5 calculates annual gross profit, fertilzer costs, net profit, and percent return on fertilizer investments (note: net profit is for N & P fertilizer costs only, and does not include other production costs (e.g., fingerlings)). Comparing different fertilizer combinations will indicate which combination provides N and P the most economically.

Example:

Input the following information collected in Bangladesh during 2002:

Table 1:

pond size:	400 m2
N fertilization rate:	30 kg N/ha/week
P fertilization rate:	5 kg P/ha/week
time fertilized:	50 weeks
tilapia selling price:	75 taka per kg fish (farm-gate)
unit of money:	taka (note: 57 taka = 1 USD)

Table 3:

urea:	1 kg costs 6 taka
DAP:	1 kg costs 11 taka
TSP:	1 kg costs 14 taka
bagged chicken manure:	1 kg costs 1 taka

Table 4:

percent N in chicken manure:	2
percent P in chicken manure:	2

Results:

- urea is the least expensive source of N (Table 3)
  - urea: 13 taka per kg N
  - DAP: 61 taka per kg N

- manure: 100 taka per kg N
- DAP is the least expensive source of P (Table 3)
  - DAP: 54 taka per kg P
  - TSP: 158 taka per kg P
  - manure: 100 taka per kg P

Therefore, urea + DAP combination provides the greatest net profit of all possible combinations (Table 5)

- weekly costs:
  - 13 taka per week for urea
  - 11 taka per week for DAP
- annual fertilization costs:
  - 1,206 taka per pond
  - 21,294 taka net profit, or 1,765% return on fertilizer costs

The spreadsheet also allows for easy examination of the effects on costs and profitability using different input values. For example, If the pond is more turbid and N and P inputs are reduced to 15 kg N/ha/week and 3 kg P/ha/week, then fertilizer costs are reduced to 6 taka/week for urea and 6 taka/week for DAP. Although yields are also halved because of reduced fertilizer inputs net profitability is still over 1,600%. As another example, DAP is still the less expensive source of P even with a 50% reduction in the cost of TSP.

Questions or Problems?

The Fertilizer Input Calculations are designed to be a useful tool for identifying least expensive sources of N and P for pond fertilization. Also provided are rough estimations of net yields and profitability. These are only estimations based on Nile tilapia research, and should not be considered as guarantees. For example, variabilities in inorganic turbidity will affect a pond's response to nutrient input, natural food production and fish yields. Nevertheless, comparing relative results from different fertilizer combinations is useful for seeing how different fertilizers, pond sizes, selling price, etc. can affect fertilizer costs and profitability. This analysis is both site and pond specific.

This is the first, and likely only version of this spreadsheet to be made by me. The calculations are quite logical and not complex. Nevertheless, if there are any questions or problems, please email them to me at the following email address:

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Good luck, and good farming!

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Fertilizer Input Calculations: **Fill in only those cells with this color:** [ ]

Table 1.

Pond size:		m^2
N Fertilization Rate:		kg N /ha/week
P Fertilization Rate:		kg P/ha/week
Time Pond Fertilized:		weeks per year
Fish selling price:		per kg fresh weight
Unit of money:		

Table 2.

Estimated Tilapia (fish) yi	0	kg/ha/year
Estimated Tilapia (fish) yi	0	kg/pond/year

Table 3.

Fertilizer	size (kg)	cost	cost/kg N	cost/kg P
urea			#DIV/0!	
N-P-K (16-20-x)			#DIV/0!	#DIV/0!
N-P-K (15-15-x)			#DIV/0!	#DIV/0!
N-P-K (other)			#DIV/0!	#DIV/0!
DAP			#DIV/0!	#DIV/0!
TSP				#DIV/0!
MSP				#DIV/0!
Manure (bagged)			#DIV/0!	#DIV/0!

Table 4.

N-P-K (other): N =		P =	
Manure: % N =		% P =	

Table 5.

Fertilizer	Nutrient	Fertilizers per Pond kg/week	cost/week
urea	N	#DIV/0!	#DIV/0!
N-P-K (16-20-x)	N + P	0.0	#DIV/0!
urea	N	#DIV/0!	#DIV/0!
N-P-K (15-15-x)	N + P	0.0	#DIV/0!

Annual Fertilizer Costs/Profits per Pond			
Gross profit:	0		0
Fertilizer costs:	#DIV/0!		0
Net profit:	#DIV/0!		0
Per cent return:	#DIV/0!	%	
Gross profit:	0		0
Fertilizer costs:	#DIV/0!		0
Net profit:	#DIV/0!		0

					Per cent return:	#DIV/0!	%
urea	N	#DIV/0!	#DIV/0!		Gross profit:	0	0
N-P-K (other)	N + P	#DIV/0!	#DIV/0!		Fertilizer costs:	#DIV/0!	0
					Net profit:	#DIV/0!	0
					Per cent return:	#DIV/0!	%
urea	N	#DIV/0!	#DIV/0!		Gross profit:	0	0
DAP	N + P	0.0	#DIV/0!		Fertilizer costs:	#DIV/0!	0
					Net profit:	#DIV/0!	0
					Per cent return:	#DIV/0!	%
urea	N	#DIV/0!	#DIV/0!		Gross profit:	0	0
TSP	P	0.0	#DIV/0!		Fertilizer costs:	#DIV/0!	0
					Net profit:	#DIV/0!	0
					Per cent return:	#DIV/0!	%
urea	N	#DIV/0!	#DIV/0!		Gross profit:	0	0
MSP	P	0.0	#DIV/0!		Fertilizer costs:	#DIV/0!	0
					Net profit:	#DIV/0!	0
					Per cent return:	#DIV/0!	%
urea	N	#DIV/0!	#DIV/0!		Gross profit:	0	0
Manure	N + P	#DIV/0!	#DIV/0!		Fertilizer costs:	#DIV/0!	0
					Net profit:	#DIV/0!	0
					Per cent return:	#DIV/0!	%

Fertilization Reference Information

The information below is for reference, and is used in the Fertilizer Input Calculati
(there is nothing to add or input on this speadsheet)

Fertilizer	% N	% P2O5	% P	g N/kg fert.	g P/kg fert.
urea	46	0	0	460	0
N-P-K (16-20-x)	16	20	9	160	89
N-P-K (15-15-x)	15	15	7	150	67
N-P-K (other)	0	0	0	0	0
DAP	18	46	20	180	204
TSP	0	20	9	0	89
MSP	0	7	3	0	31
Manure (bagged)	0	0	0	0	0

note: assumes 50% availability of N and P from manures
DAP = diammonium phosphate
TSP = triple super phosphate
MSP = mono super phosphate

Fertilizer	size (kg)	cost	cost/kg fert.	cost/kg N	cost/kg P
urea	0	0	#DIV/0!	#DIV/0!	
N-P-K (16-20-x)	0	0	#DIV/0!	#DIV/0!	#DIV/0!
N-P-K (15-15-x)	0	0	#DIV/0!	#DIV/0!	#DIV/0!
N-P-K (other)	0	0	#DIV/0!	#DIV/0!	#DIV/0!
DAP	0	0	#DIV/0!	#DIV/0!	#DIV/0!
TSP	0	0	#DIV/0!		#DIV/0!
MSP	0	0	#DIV/0!		#DIV/0!
Manure (bagged)	0	0	#DIV/0!	#DIV/0!	#DIV/0!