

(Final Report)

TILAPIA POND FEEDING DEMONSTRATION TRIALS IN ABBASSA AND KAFR EL-SHEIKH, EGYPT

Total replacement of fishmeal with locally produced fish meal and soybean meal in diets for Nile tilapia (*Oreochromis niloticus* L.) in pre-fertilized ponds.

I. DESCRIPTION OF FEEDING DEMONSTRATION

Objective:

The objective of this feeding trial is to demonstrate the growth and economic performance of mixed sex and monosex Nile tilapia from fingerling to market stages using the ASA-IM feed-based pond production model and a soymeal-based, all-plant protein feed. And also to replace locally produced fish meal by imported soybean meal in diets for Nile tilapia in pre-fertilized ponds. The trial was conducted under two different farming conditions in two geographical locations in Egypt.

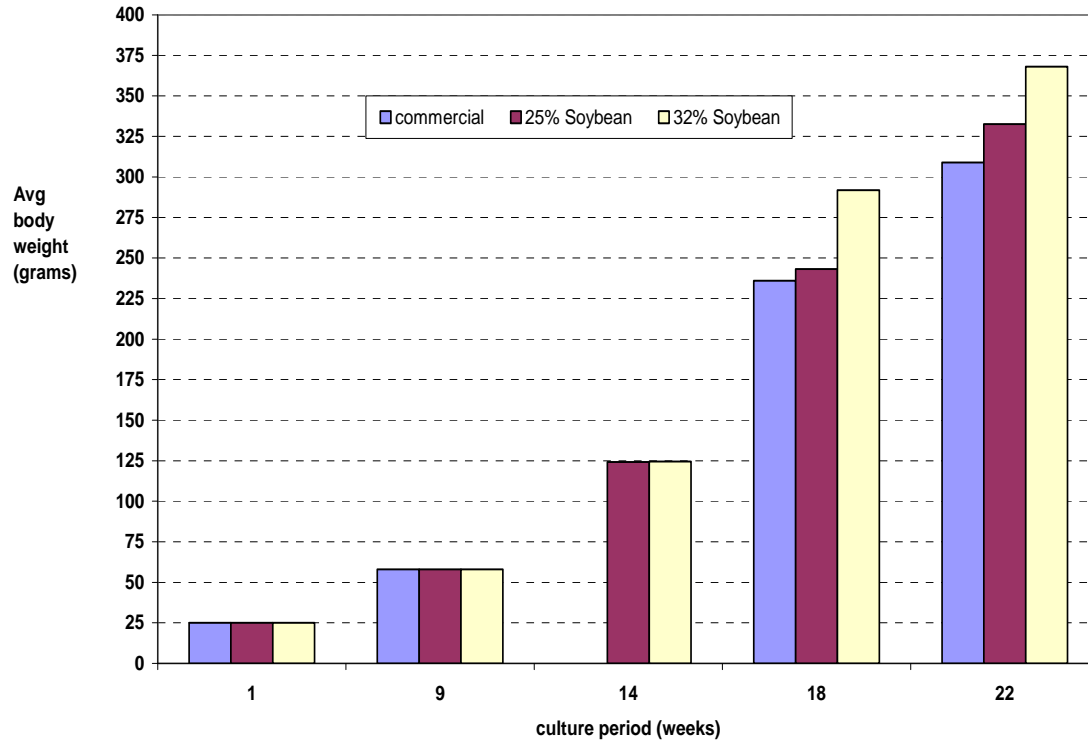
- 1) **The first location** was at the heart of the largest tilapia producing area in Egypt called Kafr El-Sheikh which alone produces about 50% of the total aquaculture Tilapia production (around 120,000 metric tones). The trial was implemented on a farm owned and managed by the most prominent and innovative fish farmer in Egypt, Dr. Ismail Radwan who is also the chairman of Kafr El-Sheikh Fish Farmers Association and is a graduate of Auburn University, USA
 - In this farm monosex all-male Nile tilapia fingerlings Averaging 25 g initial body weight were stocked into nine earthen ponds (0.15 ha each) at the rate of 40,000 fish per hectare (4 fish/m²) on April 1st 2006. Water depth for all ponds was around 1.5 m. The nine demonstration ponds were treated identically in all aspects to minimize variability and provide the farmer with an accurate assessment of average farm production that can be anticipated with the demonstrated technology and feed.
 - Three different diets were used in this trial as follows:

- a) 25% C.P. Commercial diet with fish meal as one of its ingredients.
- b) 25% C.P. diet with all-plant protein source (soybean)
- c) 32% C.P. diet with all-plant protein source (soybean)

Feeds were prepared in an extruded, floating pellet form.

- Each of the three diets was randomly assigned to a group of three ponds. On June 6, 2006, experimental feeding started. Fish were fed to satiation twice daily using the ASA-IM 90% satiation feeding technique (ref. section II.4). It is important to mention that average fish body weight was 58 grams at the time of starting the experimental feeding.
- Sampling of the fish population in each demonstration pond was carried out monthly on approximately the same date each month to monitor fish growth and adjust amounts of feed to be fed. All sample data were recorded in the feeding trial record book.
- The following figure illustrates the average body weight of Nile tilapia obtained during the different samples conducted during the culture period prior to final harvest

Figure 1: Growth of all male tilapia fed on different dities
 (initial weight 25 g stocked on April 1st at rate of 2 fish\msq)
 Feeding started on June 6, 2006 *



This demonstration was concluded during the first week of November and the following table and figures show the total fish production, feed conversion ratios and economic performance of the different treatments.

Table 1:

Comparison of culture performance of All-male Nile Tilapia *Oreochromis niloticus* fingerlings in earthen ponds for 26 week growing period and fed three different types of practical feeds containing different levels and sources of dietary protein for 18 weeks.

Treatment	Total tilapia production (Kg/Ha)	Total Fish production (Kg/Ha)	FCR	Gross Return \$ US/Ha	Total Cost \$ US/Ha	Net Return \$ US/Ha
25% Fishmeal	8610	8677	2.426	11387	6716	4670
25% Soybean	12441	12441	1.611	14100	7178	6921
32% Soybean	12733	13033	1.61	14002	8175	5827

S.Dev.	571	620	0.1561	374	0	374
S.Dev.	826	826	0.1038	560	0	560
S.Dev.	1895	2320	0.236	1863	0	1863

The obtained results demonstrate clearly the significant increase in total tilapia production from the ponds that were fed the soybean based diets in comparison to those fed the commercial feed containing fishmeal as the sole animal protein source. Feed conversion ratios from the trial were very encouraging and demonstrated very strongly the significant improvement of the FCR values for the soybean based diets over that for the commercial fishmeal based diet. Feed conversion ratio for the 25% CP and 32% CP soy feed was 1.61 and the FCR for the 25% CP commercial feed was 2.426 (Table 1). Economic parameters from the trial also demonstrated the significant increase in the net profits generated in the case of using soybean-based feeds despite the higher prices of the soy feeds compared to the commercial feed used in the experiment (The higher price of the soy-based diet was due to higher vitamin and mineral supplementation than in the commercial feed and also the inclusion of Stay C vitamin). The higher net returns

resulted from the higher total production rates and the highly improved FCR values for the soy feeds.

Fig 2: Average production of super grade Tilapia* , total Tilapia production and total fish production (Kg/ Hectare) from earthen ponds stocked with all-male tilapia fingerlings and fed three different test diets for a 18-week feeding period.

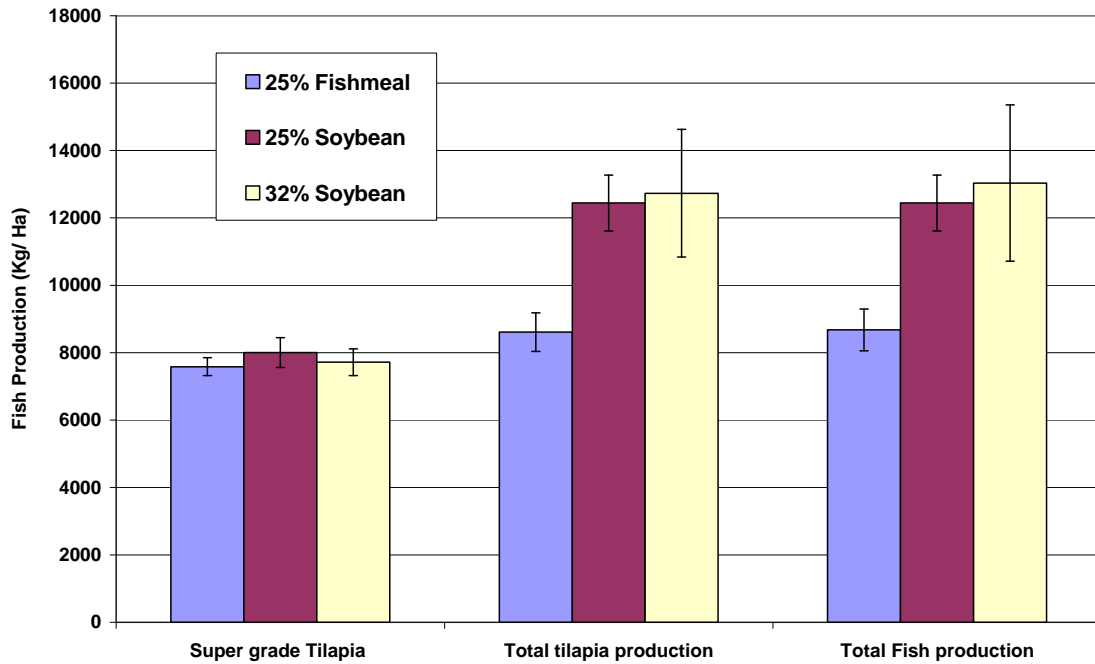


Figure 3: Average values of Feed Conversion Ratio (FCR) for the three different feeds used in the demonstration farm in Kafr El Sheikh, Egypt.

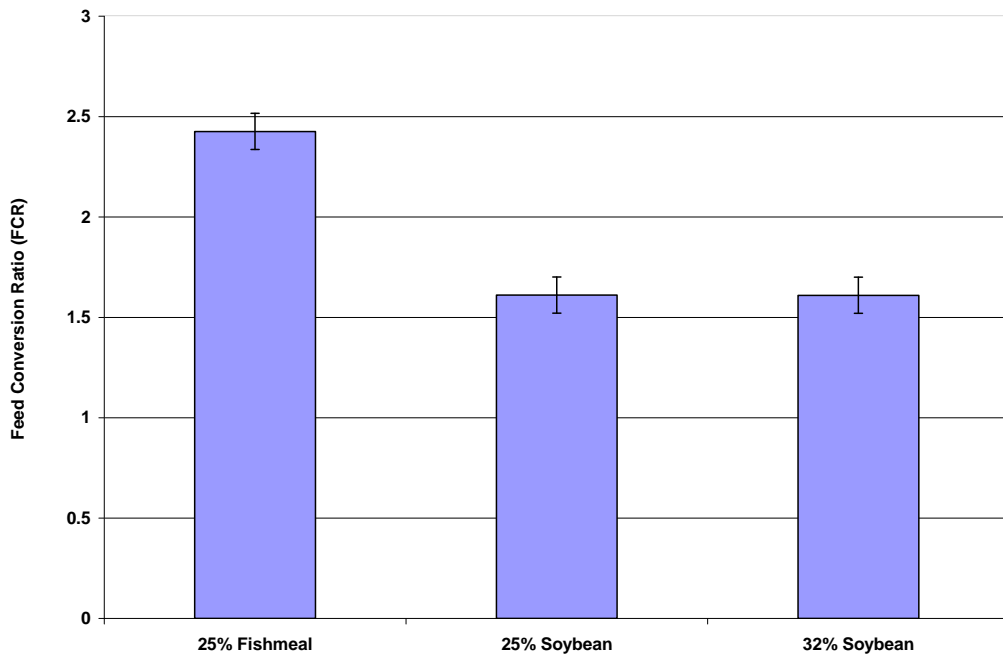
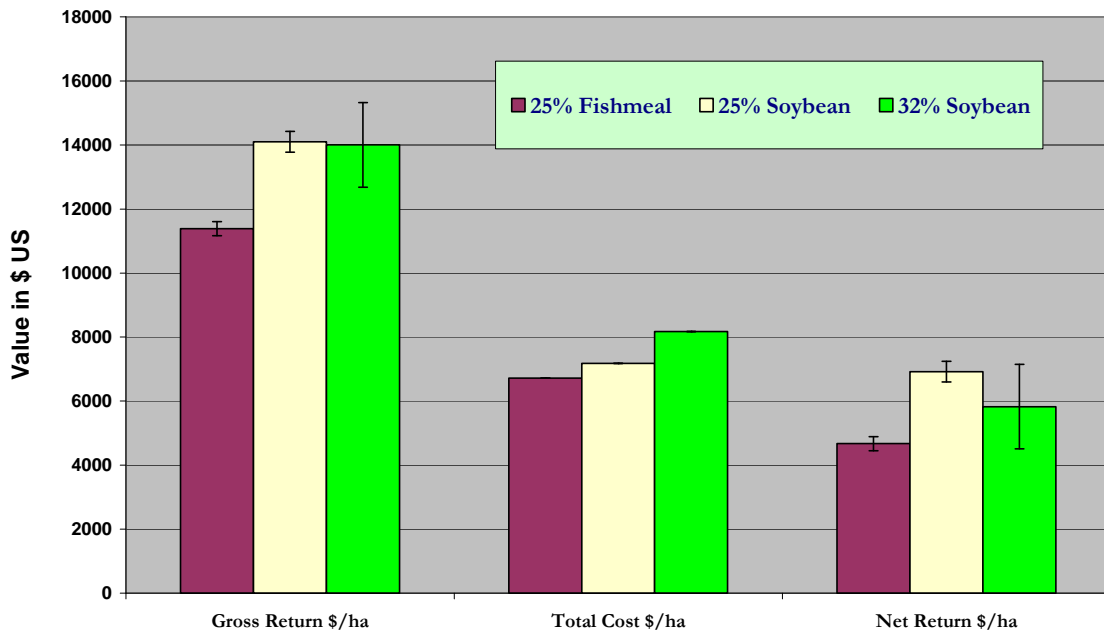


Figure 4:
Economic parameters for the fish production using three different floating feeds containing different crude protein levels and sources.



2) **The second location** was at the WorldFish Center experimental station at Abbassa, Egypt.

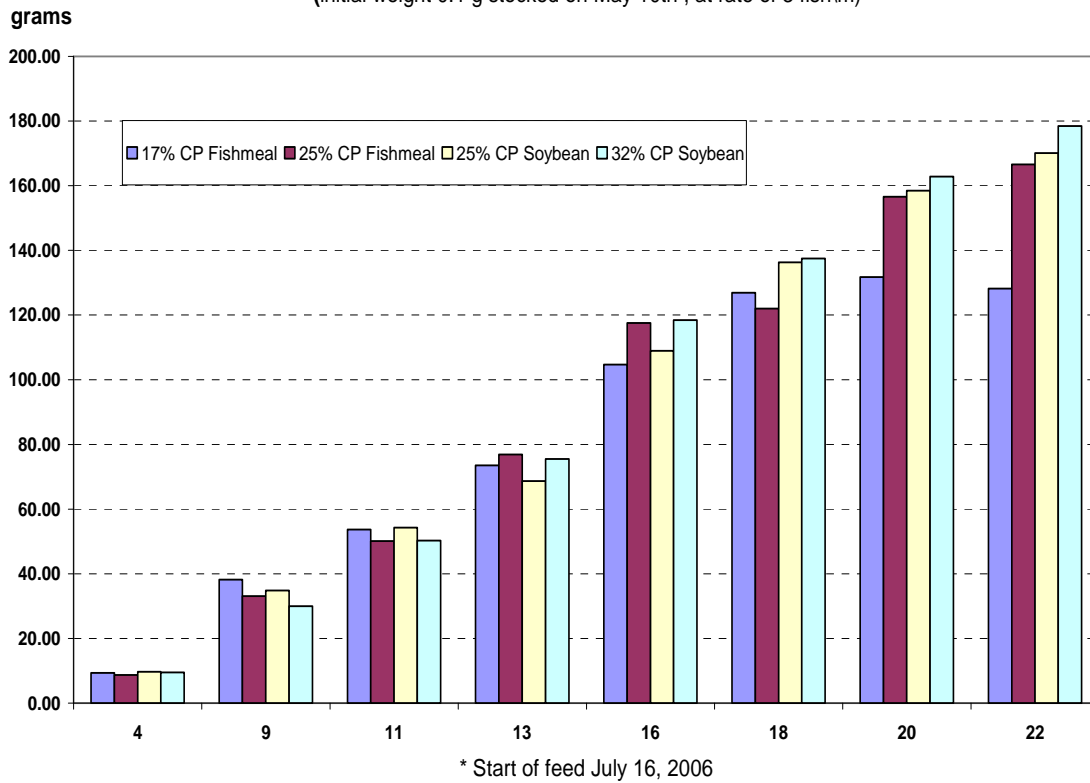
- In this trial mixed sex Nile tilapia fry Averaging 0.1g initial body weight were stocked into twelve earthen ponds (0.2 ha each) at the rate of 30,000 fish per hectare on May 10th 2006. Water depth for all ponds was around 1 m. The twelve demonstration ponds were treated identically in all aspects to minimize variability and provide an accurate assessment of average farm production that can be anticipated with the demonstrated technology and feed under these farming conditions.
- four different diets were used in this trial as follows:
 - a) 17% C.P. commercial diet with fish meal as one of its ingredients.
 - b) 25% C.P. commercial diet with fish meal as one of its ingredients.
 - c) 25% C.P. diet with all-plant protein source (soybean)
 - d) 32% C.P. diet with all-plant protein source (soybean)

Feed was prepared in an extruded, floating pellet form.

- Each of the four diets was randomly assigned to a group of three ponds.
- On July 16, 2006, experimental feeding started. Fish were fed to satiation twice daily using the ASA-IM 90% satiation feeding technique (ref. section II.4).
- Sampling of the fish population in each demonstration pond was carried out at monthly intervals on the approximately the same date each month to monitor fish growth and adjust amounts of feed to be fed. All sample data were recorded in the feeding trial record book.
- The following figure illustrates the average body weight of Nile tilapia obtained during the different samples conducted during the culture period prior to final harvest.

Figure 5:

Growth of mixed sex tilapia fed on different diets
(initial weight 0.1 g stocked on May 10th , at rate of 3 fish/m²) *



- This trial concluded by the end of November where final harvest of the fish and data collection took place from 12 to 26 November 2006 and the following table and figures show the total fish production, feed conversion ratios and economic performance of the different treatments.

Table 2:

Comparison of culture performance of Nile Tilapia *Oreochromis niloticus* fry in earthen ponds for 25 week growing period and fed four different types of practical feeds containing different levels and sources of dietary protein for 16 weeks.

Treatment (Feed type)	Total tilapia production (Kg/Ha)	Total Fish production (Kg/Ha)	FCR	Gross Return \$ US/Ha	Total Cost \$ US/Ha	Net Return \$ US/Ha
17% Fishmeal	3089	3792	1.5	3583	2746	836
25% Fishmeal	3760	4367	1.3	4512	2910	1601
25% Soybean	3984	4646	1.3	4796	2953	1843
32% Soybean	3747	4513	1.2	4639	3200	1439

S.Dev.	146	67		182	40	221
S.Dev.	263	173		166	53	160
S.Dev.	51	45		119	98	208
S.Dev.	147	201		272	70	251

Figure 6:

Total Tilapia production and total fish production (Kg/ Hectare) from earthen ponds stocked with all-male tilapia fingerlings and fed three different test diets for a 18-week feeding period.

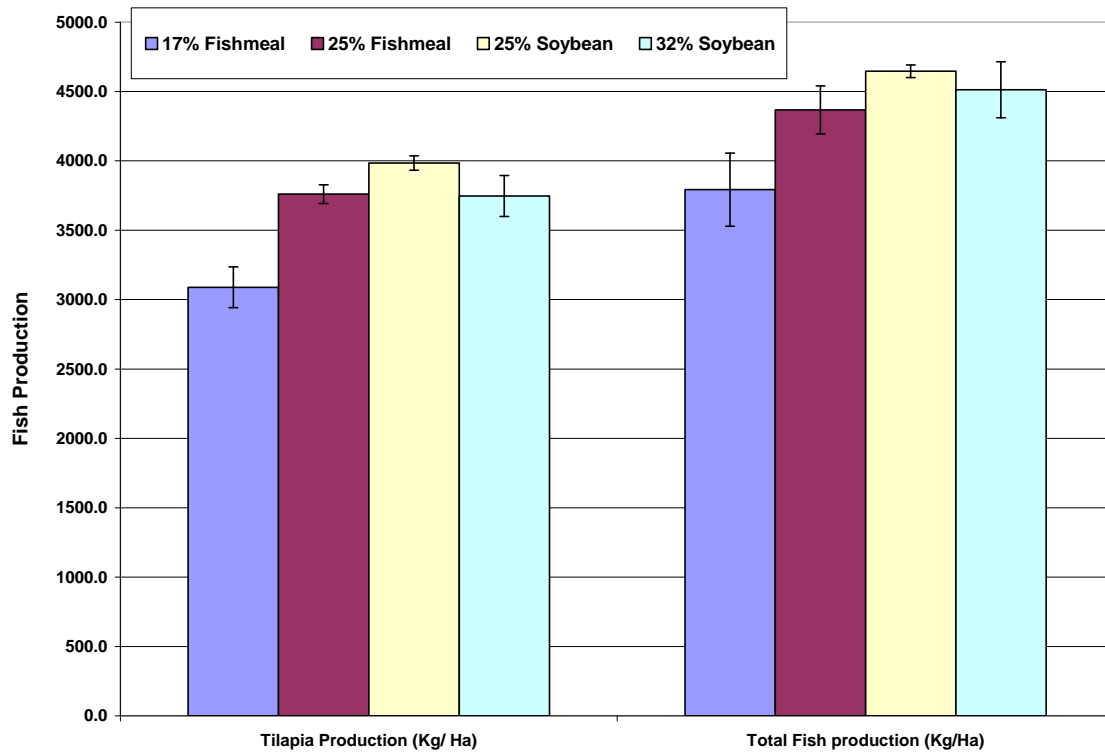


Figure 7: Average values of Feed Conversion Ratio (FCR) for the three different feeds used in the demonstration farm in Abbassa, Egypt.

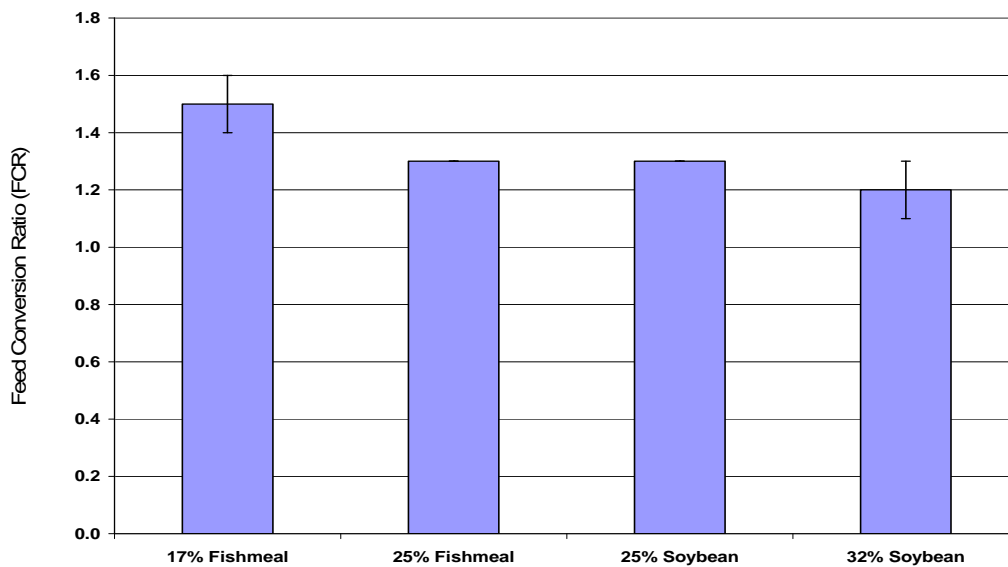
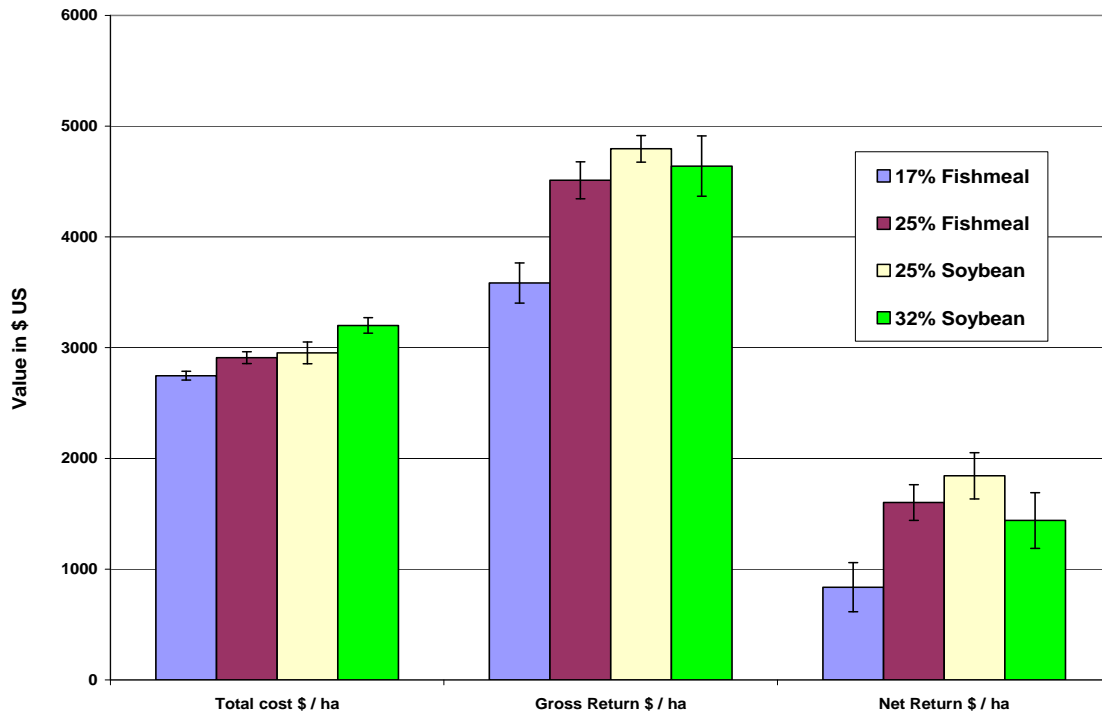


Figure 8: Economic parameters for the fish production using three different floating feeds containing different crude protein levels and sources.



Conclusion:

The results obtained from the two trials together provide a good set of information for two different farming systems that are both commonly practiced in the Egyptian aquaculture sector. Results demonstrated clearly and reassured the advantage of using soybean-based feeds in tilapia farming in Egypt whether it is in terms of total pond productivity or its profit generation rates which both came significantly higher than conventional fishmeal containing commercial feeds. This of course supported by the sustainability of supplies of soybean meal and its comparative advantage over the shaky and uncertain sustainability of fishmeal supplies, provides strong basis justifying for favoring the use of these soybean-based feeds in tilapia farming in Egypt and for the Egyptian aquaculture in general.

But in order to further build upon these achievements and improve the conditions even further, there are a couple of concerns that need to be addressed and these are:

- 1- The higher cost of soybean-based feeds as compared to fishmeal-containing feeds having the same level of crude protein as a result of feed additives specifically added for the formulae of the soybean feeds.
- 2- The observed increase in amounts of reproduction recovered from the ponds fed with the soybean-based feeds than those fed the commercial feed. Moreover, higher reproduction rates were observed in ponds fed the higher protein soybean-based feed than those fed the lower protein soybean-based feeds. It is worth noting that the hormonal treatment to produce mono sex Tilapia for the kafr El Sheikh trial did not produce a satisfactory percentage of males, and in the abbassa trial, no hormonal treatment was applied.

It is worthwhile to look at these issues and any successful efforts for mitigating these concerns will definitely be a plus to an already proven successful and profitable practice.