

Markeds- utvikling

RAPPORT-TITTEL

Utprøving av lakseensilasje-konsentrat i Kina

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SAMMENDRAG OG KONKLUSJONER

Med bakgrunn i avsetningsvanskeligheter for de sterkt økende volumene konsentrat av lakseensilasje i Norge og Europa, ble det i 2000 igangsatt et prosjekt for å undersøke markedsmulighetene i Kina. Kina er et stort marked for fiskeproteiner og importerer 0,5 mill. tonn pr. år til internasjonale priser. Prosjektet var et samarbeid mellom Hordafør som produsent av ensilasjekonsentrat, og Hydro Nutrition Formates, som leverandør av maursyre og med et godt utbygd nettverk inn mot forindustrien i Kina.

Rent praktisk er prosjektet blitt gjennomført ved at tonn H-pro (lakseensilasjekonsentrat) ble sendt til Norsk Hydro's kontor i Kina. Det er blitt gjennomført en rekke intervjuer og besøk for å finne frem til egnede fôrblendere, som både hadde interesse og mulighet for å gjennomføre praktiske forsøk. Totalt 11 fôrblendere ble tatt ut. Disse representerer ålefôrprodusenter, vanlig fiskefôrprodusenter, samt grise- og fjørfefôrprodusenter. Alle hadde tilhørende forsøksgårder. Disse firmaene mottok til sammen ca 20 tonn H-pro. To ansatte ved Norsk Hydros kontorer i Kina har hatt oppgaven med å intervjuere forhandlere, gjennomføre markedsundersøkelser, tollklarere, distribuere og følge opp prosjektet lokalt.

Prosjektet har avdekket et stort markedspotensiale for H-pro i Kina til grise- og fjørfefôr (40-120.000 tonn). Føringforsøk viste at H-pro ga en økt tilvekst på 1,5 - 4%, sammenlignet med kontrollfôr (peruansk importert laksemel). Imidlertid finnes det ikke umiddelbart grunnlag for å anvende H-pro som tilskudd i fiskefôr. Det er ingen fordeler av H-pro framfor pelletert fiskefôr, slik at viljen og evnen til å investere i doserings utstyr til flytende ingredienser ikke er tilstede. Pga. lav pH i H-pro dekomponerer deigfôret til ål og andre oppdrettsarter. Det kreves derfor ytterligere produktutvikling for å lykkes innen dette segmentet.

Prisen som H-pro kan oppnå på det kinesiske markedet er USD 0,24/kg, som er lik prisen på Peru Standard mel (sammenlignbart fôrstoff). Med en dollarkurs nær NOK 8 blir prisen i norske kroner 2 kr pr. kg H-pro. Dette er betydelig lavere enn prisen på 2,70-3,00 kr/kg, som var forutsatt ved prosjektstart. (Dokumentert bedre tilvekst med H-pro gir imidlertid mulighet for økt pris på sikt).

Med transportkostnader og lokale avgifter blir nettoprisen i dagens situasjon på 1 kr/kg for den norske produsenten, noe som i dag er betydelig lavere enn det som oppnås av priser i Norge og i landene rundt Norge. Med dagens forholdvis gode avsetningsmuligheter for H-pro i Europa, vil en foreløpig ikke arbeide for eksport til Kina, men avvente til situasjonen skulle tilsi noe annet.

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RUBIN PROSJEKT

UTPRØVING AV LAKSE ENSILASJE KONSENTRAT I KINA

HORDAFOR A.S
HYDRO NUTRITION

SLUTTRAPPORT

Juni 2002

SLUTTRAPPORT FOR UTPRØVING AV LAKSEENSILASJE KONSENTRAT I KINA

1.0 Bakgrunn for prosjektet

På grunn av store økninger i volumet av laksebiprodukter og det begrensede markedet for lakseensilasje i norsk kraftfôrindustri, arbeider lakseensilasjeindustrien for å skape nye eksportmarkeder for deres hovedprodukt H-pro.

Kina er et potensielt marked for lakseensilasjekonsentratet H-pro. Kina er et stort marked for fiskeproteiner, og importerer ca. 0.5 million tonn/år, til internasjonale priser. Norsk Hydro er etablert i Kina med salgskontorer og har et bra nettverk lokalt mot fiskeindustrien.

2.0 Prosjektet

Prosjektet, som har vært et samarbeids prosjekt mellom Hordafôr og Hydro Nutrition, har hatt som formål å eksportere Hordafôrs H-pro til Kina. Rent praktisk har prosjektet blitt gjennomført ved at ca 50 tonn H-pro fiskeensilasjekonsentrat ble sendt til Kina/Norsk Hydro. Det har vært gjennomført en rekke intervjuer og besøk for å finne frem til egnede fôrblendere som både hadde interesse og mulighet for å gjennomføre praktiske forsøk. En liste over alle kontakter er vedlagt, (Vedlegg 1). Totalt 11 fôrblendere ble tatt ut. Disse representerer ålefôrprodusenter, vanlig fiskefôrprodusenter, samt grisefôr- og fjørfefôrprodusenter. Alle hadde tilhørende forsøksgårder: Disse 11 firmaene mottok til sammen ca 20 tonn H-pro.

To ansatte ved Norsk Hydros kontorer i Kina har hatt oppgaven med å intervjuere forhandlere, gjennomføre markedsundersøkelser, tollklarere, distribuere og følge opp prosjektet lokalt.

Både forsendelse av H-pro, ikke minst tollklarering og videreforsendelse av H-pro i Kina, har gått meget tregere enn beregnet. Dette har tok totalt ca 6 måneder. Pga forsinkelser i mottak på de enkelte forsøksgårder så har produktet kommet i ufase når det gjelder uttesting, slik at prosjektet har tatt ett år mer enn beregnet, ca ett og et halvt år til sammen (halve 2000 og hele 2001).

Selv med alle forsinkelser så har prosjektet dekket de opprinnelige planer, H-pro har blitt testet i 11 fôrings forsøk mot 4 som planlagt og det er gjennomført en interessant markedsundersøkelse som ikke var planlagt.

Uttestingen av H-pro mot disse 11 fôrselskaper ble gjennomført i tidsrommet februar - juni 2001. Rapportering og oppfølging har blitt gjennomført i tidsrommet fra juni-oktober/november. Sluttrapport er vedlagt ("Final Report for Fish Protein Concentrate (H-Pro) Trial in China", Vedlegg 2).

I tillegg til vedlagte sluttrapport fra forsøkene, så er markeds analysen vedlagt ("Market Promotion of Fish Protein Concentrate in China, January 2001", Vedlegg 3)

3.0 Prissammenligning.

(Hentet fra markedsanalysen i vedlegg 3)

Tabell 1 Prissammenligning per proteinenhet.

Protein Raw Material	Produkt pris/kg	Protein*
	USD	USD
Soya cake (44% CP)	0,22	0,50
Local made Fish meal (58% CP)	0,43	0,74
Imported Peru FAQ red Fishmeal (61 % CP)	0,48	0,79
Imported US with fishmeal (65% CP)	0,98	1,50
* Pris (pr. unit protein pr kg, USD)		

Fôrings forsøkene viste at det er mest aktuelt å bruke H-pro i fôr til gris og fjørfe i det kinesiske markedet. Til denne type fôr blir laksemel fra Peru (Imported Peru FAQ red Fishmeal) benyttet i dag. Laksemelet er det produktet som H-pro må fortrenge for å komme inn på dette markedssegmentet. Som det fremgår av tabell 1 er prisen på laksemel per kilo protein USD 0,79. Det vil si at prisen på H-pro ikke kan være høyere enn USD 0,79 per kilo protein. **Dette gir et prispotensiale pr kg for "H-pro" levert Kina lik USD 0,24 (0.79USD x 30% protein i H-pro), eller ca. 2 NOK. Dette inkluderer toll/VAT og transport.**

4.0 Konklusjon

Prosjektet har avdekket et stort markedspotensiale for H-pro i Kina, særlig til grise- og fjørfefôr (40-120 00 tonn), men avdekket også at det ikke finnes umiddelbart grunnlag for å anvende H-pro som tilskudd i fiskefôr. Hovedårsaker for det sistnevnte er som følger:

1. Ingen umiddelbare fordeler av H-pro brukt mot pelletert fiskefôr, slik at viljen og evnen til å investere i doserings utstyr til flytende ingredienser ikke var tilstede.
2. Pga lav pH i H-pro dekomponerer deigfôret til ål og skilpadder. Det kreves derfor ytterligere produktutvikling for å lykkes innen dette segmentet.

Når det gjelder bruk av H-pro i fôr til gris og fjørfe viste fôringsforsøk at dette gav en økt vekst på 1.5-4%, sammenlignet med kontroll (Peruansk importert laksemel).

Prisen som H-pro kan oppnå på det kinesiske markedet er USD 0,24 / kg som er lik prisen på Peru Standard mel, som er det mest aktuelle melet å sammenligne H-pro med. Med en dollarkurs nær NOK 8 blir prisen i norske kroner 2 kr per kilo H-pro. Det ble dokumentert at H-pro gir 1,5 - 4 % bedre vekst hos gris og fjørfe og dermed kan prispotensialet på sikt økes ytterligere. Imidlertid er prisen på 2,70 – 3,00 NOK / kg H-pro, som var forutsatt ved prosjektstart vesentlig høyere enn hva vi har erfart er oppnåelig i Kina.

Forutsetninger og inntjeningspotensialet for salg av H-pro i Kina innen smågris- og fjørfefôr er

1. Importtoll og VAT på H-pro må reduseres ned til nivå for Peruansk importet fiskemel (3.0 %). Dette vil øke fortjenesten med knapt 23 %, men forutsetter en omklassifisering av H-pro fra "feed ingredient" til et fôrråstoff som fiskemel. Ifølge importøren er dette oppnåelig.
2. Transport og emballasjekostnadene ble vesentlig høyere enn først antatt og må reduseres. De faktiske transportkostnader og emballasjekostnader i forsøket var ca 1,80 NOK/kg. Skipning i bulk vil senke transportkostnadene ned mot ca NOK 1/kg. . Bulkskipninger vil også fjerne emballasjekostnader. **Dette gir et inntjeningspotensial på ca 1 NOK/kg H-pro, forutsatt omklassifisering av H-pro.**

Siden prosjektet ble initiert er det skjedd store forandringer i markedssituasjon. Blant annet har Kina som følge av BSE, innført importstans på alle typer fiskemel av europeisk opprinnelse, inklusiv H-pro. Dette forbudet forventes imidlertid å bli opphevet innen rimelig tid, men importreglene er uklare og endres ofte, samt at de blir håndhevet forskjellig fra region til region. Dette bidrar til at det å redusere motivasjonen til å gå inn på kinesiske markedet.

Avsetningsmulighetene for H-pro i landene rundt Norge har bedret seg betydelig de siste to årene. Prisen som kan oppnås i dagens marked (Europa) gir høyere marginer enn hva som er mulig å oppnå på det kinesiske markedet. Foruten de ovenfor nevnte forutsetningene som må på plass, så må inntjeningspotensialet (ca. 1 NOK/kg H-pro) forbedres med minimum 40 øre dersom det skal være aktuelt å igangsette salg av H-pro i det kinesiske markedet.

Oslo juni 2002

Bekkevold juni 2002

Nils Einar Aasen

Bartal Dulavik

Vedlegg:

1. Oversikt over intervjuede fôr selskaper og selskaper som har vært med i forsøkene
2. Rapporten "Final report for Fish Protein Coincentrate (H-PRO) Trial in China, Norsk Hydro Beijing Office October 2001"
3. Rapporten "Market Promotion of Fish Protein Concentrate in China, January 2001".

Company Name	Location	Main Products	Delivery Status	Interview by Tel.	Interview by personal	Contact Person	Telephone
Beijing Tianxiang feed company Ltd.	Beijing	Shrimp feed 2000MT/Y	No delivery	Yes	No		
Tianjin Huafu feed company Ltd	Tianjin	Shrimp feed 3000MT/Y	No delivery	Yes	No		
Fujian Dachangsheng feed company Ltd.	Fuzhou	Eel feed 8000MT/Y	No delivery	Yes	Yes		
Huada feed company Ltd.	Fuzhou	Eel feed 9000MT/Y	Delivered	Yes	Yes	Lin Hong	+ 865913682918
Fuzhou Mawei feed company Ltd.	Fuzhou	Shrimp feed 17000MT/Y Eel and Turtle 28000MT/Y	Delivered	Yes	Yes	Chen JinCui	+ 86 591 3687150
Fujian Sanhua feed company Ltd.	Fuzhou	Eel feed 3000MT/Y	Delivered	Yes	Yes	Huang Zhoubiao	+ 86 591 5388705
Xiamen Putou feed company Ltd.	Xiamen	Marine feed 7000MT/Y	Delivered	Yes	Yes	Lin Binghui	+86 592 7029999
Xiamen Yinxiang feed company Ltd.	Xiamen	Marine feed 4000MT/Y	No delivery	Yes	No		
Xiamen Fushou feed company Ltd.	Xiamen	Eel feed 5000MT/Y,Shrimp feed 3000MT/Y	No delivery	Yes	No		
Xiamen Tongwei feed company Ltd.	Xiamen	Eel feed 3000MT/Y,Shrimp feed 2000MT/Y	No delivery	Yes	No		
Shanghai Zhanwang feed company Ltd.	Shanghai	Shrimp feed 4000MT/Y	No delivery	Yes	No		
Shanghai Dajiang feed company Ltd.	Shanghai	Shrimp feed 15000MT/Y	No delivery	Yes	No		
Quanxing international feed group	Changshu	Shrimp feed 12000MT/Y	No delivery	Yes	No		
Sulanling feed company Ltd.	Lianyungang	Shrimp feed 8000MT/Y	Delivered	Yes	Yes	Jiang Changxun	+86 518 2341672
Nantong Chai Tai feed company Ltd.	Nantong	Shrimp feed 15000MT/Y	Delivered	Yes	Yes	Zhou Jun	+86 513 4588888
Jiangsu Huadong feed company Ltd.	Wujiang	Eel feed 8000MT/Y	No delivery	Yes	No		
Zhenjiaang Changjiang feed company Ltd.	Dantu	Eel feed 23000MT/Y,Shrimp 17000MT/Y	No delivery	Yes	No		
Provimin Ganyu feed company Ltd.	Ganyu	Piglet feed 8000MT/Y	No delivery	Yes	No		
Zhejiang Huangguan feed company Ltd.	Hangzhou	Eel feed 4000MT/Y	No delivery	Yes	No		
Zhejiang Xinxin feed company Ltd.	Jiaying	Eel feed 5000MT/Y	No delivery	Yes	No		
Zhejiang Jindadi feed company Ltd.	Zhuji	Eel feed 12000MT/Y	No delivery	Yes	No		
Zhejiang Yuzhao Tianbang feed company Ltd.	Yuzhao	Eel feed 4500MT/Y	No delivery	Yes	No		
Shenzhen Kangdaer feed company Ltd.	Shenzhen	Piglet feed 9000MT/Y,Chickling feed 8000MT/Y	Delivered	Yes	Yes	Yang Xiaolan	+86 755 5428579
Zhanjiang Yuehai feed company Ltd.	Zhanjiang	Shrimp feed 23000MT/Y	Delivered	Yes	Yes	Zheng Shixuan	+86 759 2302968
Gaoming Zhanda feed company Ltd.	Gaoming	Shrimp feed 4000MT/Y	No delivery	Yes	No		
Guangdong Hengchang feed company Ltd.	Zhanjiang	Shrimp feed 5000MT/Y	No delivery	Yes	No		
Gangda feed company Ltd.	Zhanjiang	Shrimp feed 3000MT/Y	No delivery	Yes	No		
Zhanjiang Nanzhu feed company Ltd.	Zhanjiang	Shrimp feed 3000MT/Y	No delivery	Yes	No		
Zhongshan Tongyi feed company Ltd.	Zhongshan	Piglet feed 5000MT/Y,Chickling feed 4000MT/Y	No delivery	Yes	No		
Zhanjiang Rida feed company Ltd.	Zhanjiang	Shrimp feed 3000MT/Y	No delivery	Yes	No		
Zuhai Dahai feed company Ltd.	Zuhai	Marine feed 2000MY/Y	No delivery	Yes	No		

Shenzhen Nongke fry farm company Ltd.	Shenzhen		Delivered	Yes	Yes	Zheng Maoyuan	+86 755 4300582
Guangdong Shunde Nanqiang feed company Ltd.	Shunde	Shrimp feed 4000MT/Y	No delivery	Yes	No		
Harbin Shuanglai feed company Ltd.	Hulan	Shrimp feed 3000MT/Y,freshwater fish feed 10000MT/Y	No delivery	Yes	No		
Liaohe yingpeng feed company Ltd.	Liaohe	Piglet feed 6000MT/Y,Chickling feed 5000MT/Y	No delivery	Yes	No		
Qingdao Haiyue feed company Ltd.	Qingdao	Shrimp feed 9000MT/Y	No delivery	Yes	No		
Hengxing Zhanjiang feed company Ltd.	Zhanjiang	Shrimp feed 5000MT/Y,Chickling 6000MT/Y,Piglet 8000MT/Y	Delivered	Yes	Yes	Ma Minghui	+86 759 2707792
Jiangxi Mingxing feed company Ltd.	Jiangxi	Shrimp feed 3000MT/Y,Chickling 13000MT/Y,Piglet 15000MT/Y	No delivery	Yes	No		
Sichuan Tongwei Feed group	Sichuan	Shrimp feed 2000MT/Y,Chickling 6000MT/Y,Piglet 8000MT/Y	No delivery	Yes	No		
Jinhaian feed company Ltd	Guangxi	Shrimp feed 4000MT/Y,Eel 8000MT/Y,Turtle 5000MT/Y	No delivery	Yes	No		
Fujian Fish disease research institute	Fuzhou	Research institute of Fujian province government	Delivered	Yes	Yes	Yu Fusong	+86 591 7817514

Final Report for Fish Protein Concentrate (FPC) Trial in China

By Norsk Hydro Beijing Representative Office

October 2001

On November 2000, approximately 19 tons of FPC were delivered to 11 interested potential customers for trial. The FPC was packed in 110 kg plastic drums and transported by road and railway, after picked up from Tianjin Sea Port, the importing destination, to customers. The list of companies received FPC are as follows:

1. Fuzhou Hua Da Feed Industrial Corporation	2000 kg
2. Fujian Mawei Aquatic Feed Corporation	2000 kg
3. Zhanjiang Yuehaiatic Feed Corporation	900 kg
4. Fujian Agricultural Technology Academy	1000 kg
5. Fujian Sanhua Co. Ltd.	1000 kg
6. Xiamen Putou Feed Corporation	2000 kg
7. Jiangsu Sulanlin Aquatic Feed Co. Ltd.	2200 kg
8. Nantong Zhengda Feed Corporation Aquatic Feed Branch	1000 kg
9. Shenzhen Agriculture Technology Center Fish Hatchery	1000 kg
10. Zhanjiang Hengxing Feed Co. Ltd.	3000 kg
11. Shenzhen Nongke fry farm company ltd	3000 kg
Total	19100 kg

Trials were carried out in these companies during February to June 2001 and the brief results are as following:

There are three proposed main application for FPC in China for these trails

- Protein Material for Paste Feed applied in eel and turtle feeding
- Protein Material for Semi-Wet Feed applied in marine fish feeding
- Protein Material for Compound Feed applied in piglet and poultry feeding

Eel and Turtle Paste Feed

Vast majority of eel and turtle feed in China now are paste feed, which mixed fish oil and water with powder feed when feeding the eel and turtle. The feed therefore are in paste format, like a dough mixed from flour with water. Because the paste feed need to immerse into water for feeding and the feed-eating process normally last for one hour or more, the stickiness and endurance of the feed in water becomes very important. In normal situation, α -starch in the powder feed formula are used as adhesive.

Eel feed trial were carried out in customers 1, 2, 3, 4, 5. Turtle feed trial were implemented in 1, 5, 7. The FPC were used to replace part of fish meal in the feed formula (up to 40% of the total feed).

According to the trail result, due to the lower PH value of FPC, the paste feed stickiness and endurance has been greatly destroyed. It's believed that the acidity of FPC hurt the structure of α -starch and therefore destroy stickiness and endurance. The paste feed were very easy to dissolved in water and could not last for more than 10 minutes. The

dissolved feed were very difficult to feed eel and turtle and also pollute the water. The wasted feed due to its dissolution also reduce the feed utility.

Most of above companies comments that the cost saving effectiveness of FPC is not so obvious as we claimed, and the utilization is too complex to be easily applied in practice. While the PFC-inside-Paste-Feed is also not suitable for eel and turtle feeding. The conclusion is very less interest for this application.

Marine Fish Semi-Wet Feed

Farmed marine fish compose of many various species: giant yellow croaker, sea bream, grouper, red fish etc. Due to their relatively lower market price, fish farmers could not afford high quality, high price extruded pellet feed. Farmers are mostly small scale individual family business. They now mainly tear the fresh or defrozen pelagic fish asunder and use the fish mince to feed live fish. The feed convert ratio (FCR) is therefore as high as 10: 1 and the utility rate is also very low.

This trail suppose to use FPC to replace the fish mince and mix FPC with pellet marine fish feed. Trails were implemented in 3, 5, 6, 8, 9, 10. These feed companies distribute the FPC to individual marine fish farmers together with their pellet feed. FPC were mixed at farms with pellet feed and made into semi-wet feed.

There is not obvious improvement for the growth rate and cost saving. Most of the trailed farmer claimed that it's inconvenient to use FPC and the semi-wet feed, because of its liquid format. It needs specialized facilities to mix FPC and pellet feed on site, but most of these small fish farmers could not afford the facilities. In practice, still most of fish farmers use the fish mince for daily feeding. It's very difficult to convince them to accept the new concept within short time and change their traditional feed method. The conclusion is: without an advanced distribution system and service system, it's very difficult to make marine fish farmers to accept FPC in short term. In the meanwhile, feed mills are also reluctant to promote FPC because of the current small market demand, unless Norwegian FPC suppliers are highly commitment to the market development.

Piglet and poultry Compound Feed

The trials were carried out at 8, 9, 10 and 11. FPC were added 3% to 5% in the feed formula and the compound feed were used to feed the piglet and poultry. According to the comparison result of the trails, FPC could improve the growth rate of piglet and poultry by 1.5% to 4% within 40 days, compare with group feed standard feed. But due to the very low market price of pork and chicken, egg, farmers could not afford the FPC-inside feed. The per protein price of FPC is about 20% higher than the per protein price of local made fish meal and imported Peru fish meal.

Therefore, these feed mills all will not able to use FPC in their feed formula, unless the price has a great decrease.

Barriers of FPC sales in China

- High Transportation and Packing Cost

It cost 120 USD per ton for transportation from Denmark to China main port. The domestic transportation cost various from 10 to 50 USD, depends on distance. Added with the drum packing cost, the total cost could be as high as 160 to 200 USD per ton.

- Import Duty and VAT

Chinese customs authority ranked FPC into feed additive (2309.9010) and impose a 5% import duty and a 17% VAT (totally 22.85%). While importing fish meal in China enjoys a 3% import duty and none VAT special treatment. If the current duty level remains unchanged, it will be very difficult for FPC to compete with fish meal.

- Importing ban on European animal feed and animal feed raw material

From 1st February, China banned all above commodities importing from Europe, because of the mad-cow disease (BSE) and mad-sheep disease. Animal feed has become an very sensitive item throughout the world, especially in Europe. FPC, like all other European made animal feed and feed raw material, is banned from then on. When the Chinese government could release the banning still unclear till now. Many of the farms who using the importing European feed has shifted to use feed and fish meal from South America and North America.

Comments and Suggestion from potential customers

Powder format solid FPC will be much more interested and accepted by the market. The liquid format is one of the main disadvantage of its application and promotion.

Some other application of FPC, like attractiveness might be a value added approach. If FPC could be used as attractant for eel or other species, the selling price could be much higher than simply used as protein raw material. But develop FPC attractant need many laboratory and filed trials.

Conclusion

Currently, FPC can not well accepted by China market, due to different reasons, include price, product characters & utilization, distribution & package, import duty, importing-banning policy etc. It's not economic to into China market now. Future opportunity depends on the macro circumstance and new application development or innovation.

Market Promotion of Fish Protein Concentrate in China

Beijing, January 2001

*Introduction

This project was requested by Hydro Nutrition, started on February 2000 and finished on 15 December 2000. The aim is to find out the potential market for FPC and to carry out primary trials. The project last longer than originally planned mainly due to the delay of transportation and distribution of FPC to customers.

During this period, the key activities are:

1. Conducted market study and defined key customers
2. Visited or called about 40 key customers
3. Prepared FPC Product Brochure (12 pages) in Chinese and distributed to customers
4. Displayed FPC posters in VIV 2000 Feed Exhibition in Beijing
5. Made advertisement on China Fishery, October, 2000
6. Made technical presentation in two seminars
7. Sent 19t FPC to 12 key customers
8. Prepared Trial Protocol for trials

*Market Potential for FPC in China

China is the world leading animal husbandry and aquaculture/fish farming producer. Both pork and fish farming production are number one in the world (Table1). Consequently, China is the world second large animal feed producer with total production of about 70MT, just behind US (Table 2)

Table 1. Output of Pork and Fish Framing in 1999 (MT)

Pork	40
Fish Farming	24
Total	64

Table 2. Output of Fish Feed in China in 1999 (MT)

Compound feed	57	83 %
Concentrated Feed	10	15 %
Pre-mix	1.6	2 %
Total	68.6	100%

The growth of Fish Farming and Fish Feed is very fast over the last 10 years (Table 3, Table 4). This tendency will continue when the economic reform is moving ahead. It would provide a large potential fish feed market.

Table 3. The Annual Growth of Fish Farming in China

1996	1997	1998	1999
10.61%	8.3%	7.1%	8.9%

Table 4. The Annual Growth of Animal Feed in China

	1996	1997	1998	1999
Compound feed	18%	6.5%	1.8%	3%
Concentrated Feed	17.4%	40.2%	21%	11.3%
Pre-mix	11.7%	41.8%	9.6%	13.6%

The consumption of Animal Protein Feed is mainly for pig, poultry and fish/shrimp. Among them pig is decreasing and fish/ shrimp is increasing (Table 5)

Table 5. Consumption Structure of Animal Protein Feed

	1990	1998	1999
Pig	56%	42%	39%
Poultry	40%	47%	47%
Fish/Shrimp	4%	7%	10%
Others		4%	4%

To provide protein for fish feed, several different types of protein raw material are available in the Chinese market which are:

- Soybean cake
- Local made fishmeal
- Peru FAQ imported red fishmeal
- Imported white fishmeal

In principle, FPC could substitute all protein raw material listed above. In terms of cost it is only possible to compete with imported white fish meal (Table 6).

Table 6 Price Comparison of Unit Protein

Protein Raw Material	Price (per unit protein per kg, USD)
Soybean cake (44%CP)	0.50
Local made fishmeal (58%CP)	0.74
imported Peru FAQ red fishmeal (61%CP)	0.79
Imported US white fishmeal (65%CP)	1.50
FPC (30%CP)	1.23

White fishmeal is widely used in the following sectors (Table 7). Theoretically total consumption could be 1.5 mt based on nutrition needs. As a substitute, FPC is able partly to replace white fishmeal. The optimal percentage shown in table 7 is based on our estimation which needs further test. So total consumption of FPC could be 1mt which is a large potential market. But up to now, it is still rather small mainly due to its high cost. At this moment, the imported white fishmeal is about 120,000t per year out of total imported fishmeal of 1mt. Therefore realistically we think the current market of FPC is around 40,000t which is to take 30% of white fishmeal market. Gradually it could be increased if we do good promotion and provide good service.

Table 7 Consumption of White Fishmeal Market in 2000

Sector	Annual Feed		White Fishmeal		FPC	
	(T)	%	(T)	%	(T)	%
Marine Fish	368,015	18	66,243	10	36,800	
Shrimp	180,000	30	54,000	10	18,000	
Eel	450,000	40	180,000	10-30	90,000	
Turtle	840,000	40	336,000	10	84,000	
Piglet	1,346,000	3	403,800	3	403,800	
Chickling	1,532,000	3	459,600	3	459,600	
Total	4,716,015		1,499,643		1,092,200	

* Key Applications and Key Customers

1. Key Application

FPC has many good properties, such as

- High digestibility
- Attractiveness
- Balanced Amino Acid portfolio
- Increased stickiness of compound feed and paste feed
- Reduced pollution in feed production
- Composed of so called "unknown growth factor"

During our visit to potential customers, three properties are identified that are high proportion of protein, digestibility and attractiveness. Its application in different sectors are varied (Table 8).

Table 8 FPC's Application in Farming Sectors

Sector %	Optimal FPC	Feed Taste	Feed Digestibility
Marin fish	10	+++	+++
Shrimp	10	+++	+++
Eel	10-30	+++	++
Trurtle	10	++	+++
Chickling	5	+	++
Piglet	5	+	++

Notes: +++, ++, + improvement degree

2. Key Customers

Fish farming is widely spread in China in terms of both geographic areas and scales.

Most of fish farming is located in coastal areas, but gradually moved to inland provinces as well. In terms of scale, a small sized feed mill produces 1 ton fish feed per hour and served to 3 fish farms in average; the large feed mills produces more than 5 tons fish feed per day and serve to large fish farms (Table 9 and 10).

Table 9 Small Fish Feed Farm

Province	Eel	Shrimp	Turtle	Seawater Fish	Total
LiaoNing		20		10	30
Shandong		10	5	10	25
Hebei		20		5	25
Jiangsu	20	20	20	10	70
Zhejiang	15	20	10	10	55

Fujian	50	20	10	20	100
Guangdong	30	50	15	10	105
Guangxi	5	5	5	5	20
Hainan		20	5	10	35
Hubei	5		30		35
Sichuan			10		10
Sum	125	185	110	90	510

Table 10 Large Fish Feed Farm

Province	Eel	Shrimp	Turtle	Seawater Fish	Total
Liaoning		2		1	3
Shandong		1	1	1	3
Hebei		1			1
Tianjin		1			1
Jiangsu	2	3	3	1	9
Zhejiang	2	2	1	1	6
Fujian	5	2	1	2	10
Guangdong	3	5	1	1	10
Guangxi	1	1		1	3
Hainan		1	1	1	3
Hubei	1		3		4
Sichuan			2		2
Sum	14	19	13	9	55

We think 55 large fish feed producers are our key customers. The detailed information is shown in Appendix 1. Among them we chose 12 companies to deliver our products.

Pricing, Import Duty and Logistic Cost

As mentioned before, FPC is only competitive with white fishmeal in terms of price and import duty. The import duty for FPC is 5% which is rather low and could be reduced to 3% once able to register as normal fishmeal, now as liquid specility, but not expect to be reduced further more even after China gets into WTO in the near future. The local VAT for fish meal is 13% which is lower than normal commodities, 17%. But recently the Chinese government announced new regulation to ban import fish meal from all EU countries which would impact on FPC from Denmark.

Table 11 Import Duty, VAT and Pricing

Fish Feed	Import Duty	VAT	Price	Unit Price
%	%	US\$/t	US\$ per unit protein per Kg	
Red Fishmeal	3	13	470 CIF	0.79

(61%CP) White Fishmeal	3	13	950 CIF	1.50
(65% CP) FPC	5	13	310 CIF	1.23
(30% CP)				

FPC could be directly sold to the large sized customers by container without charge of stocking and local transportation. If it is to sell to small individual feed mills and fish farmers, a local distributor is needed. The additional 20% to 30% cost would be added.

Figure 1 FPC Distribution Channel

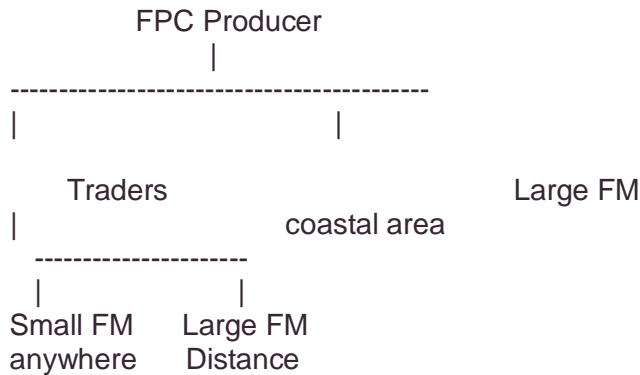


Table 12 Logistic Cost for Distributors and Transportation

	Direct Sell	Distributor to Coastal Inland	
1	1.2	1.3	

***Trial Program and Protocol**

The 19t sample of FPC has been sent to 12 companies. Some companies have started to try, most of them want to wait until February when fish season starts.

We have designed six types of trial programs in terms of trial species and selected 12 companies for test (Table 13). The purpose is to compare with other fishmeal and to measure three key indicators which are feed convert rate (FCR), growth rate and attractiveness. One example is shown in Appendix 2 and others are in Chinese.

Table 13 Structure of Trial Program and Protocol

Trial Species	No of company specie	Trial methods cage group
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pool
pen

Shrimp	4	500	8	4
Marine fish	3	100	6	2
Eel	2	100	6	2
Turtle	1	30	1/4	2
Piglet	1	10	10	2
Chickling	1	50	10	2

***Appendix 1. Key Customer Information**

***Appeddix 2. Formular of Sample Trial for Shimp**

Material	Price(RMB/MT)	Formula A	Formula B	Formula C	Formula D
Fish meal(Peru)	4.500	28	32.72	34.63	36.64
Fish meal(White)	7.500	30	20	15	10
Soybean meal	2.200	13	14	15	16
Dry FPC*	6.000	0	4.78	7.17	9.56
Wheat meal(CFD)	1.100	17	17	17	17
a-starch	6.000	3	3	3	3
Shell meal	1.500	3	3	3	3
Fish oil	5.000	3	2.5	2.2	1.8
Wheat bran (CFD)	1.000	2	2	2	2
Vitamin mix	50.000	1	1	1	1
Formula cost	4878.00	4624.20	4473.93	4369.40	
Nutrition Level					
Nutrition Standard**	Formula A	Formula B	Formula C	Formula D	
Dry matter %	86.0-100.0	89.5	89.3	89.2	89.1
Crude protein %	42.0-45.0	45.2	45.2	45.2	45.2
Crude fat %	5.5-7.5	7.5	7.6	7.6	7.5
Ca%	2.00-2.80	2.31	2.21	2.14	2.08
Available P %	1.00-1.20	1.74	1.68	1.64	1.60
Lys %	2.385-3.704	3.418	3.376	3.343	3.316
Met %	1.060-1.240	1.091	1.083	1.075	1.068
Met+Cys%	1.550-2.000	1.566	1.567	1.564	1.564
Arg %	2.610-4.000	2.679	2.821	2.819	2.820
Isoleu %	1.575-2.061	1.907	1.898	1.890	1.884
Leu %	2.430-3.344	3.346	3.501	3.488	3.481
Thr %	1.620-1.953	1.977	1.969	1.962	1.957
Trp%	0.320-0.720	0.567	0.541	0.527	0.515
Val %	1.800-2.340	2.236	2.226	2.217	2.210
His %	0.770-1.319	1.184	1.228	1.219	1.212
Phe%	1.470-2.304	1.856	1.956	1.951	1.949
Phe+Tyr %	2.840-3.200	3.262	3.417	3.400	3.388

*Dry FPC contains 90% dry matter.

**Summary from Addison Lawrence (1996); Akiyama etc. (1989); Li Aijie (1988); Rong Chengkuan (1998); Fujian Aquaculture Beau (FDB/SC 2099-90); NRC ect.
If the project keep going on, we can discuss the detailed planning protocol.