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Private Sector Competitiveness
Enhancement Program



AQUACULTURE ACTION PLAN

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Aquaculture Action Plan
USAID Private Sector Competitiveness Enhancement Program (PSCEP)
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Table of Contents

	Page
Section I	
EXECUTIVE SUMMARY	
A. Sector Overview	2
B. Action Plan	3
C. Expected Results	3
Section II	
SECTOR AND VALUE CHAIN ASSESSMENT	
A. Introduction	5
B. Background	5
C. Aquaculture Sector Assessment	8
Technology and Water	10
Genetic Quality	12
Feed	13
Marketing	14
Financing	14
D. Value Chain Description and Mapping	15
E. Strengths, Weaknesses, Opportunities and Threats	17
ACTION PLAN	
A. Introduction	20
B. Specific Actions	21
Demonstrate Early, Achievable Results	21
Firm Level Assistance	22
Regionally and Nationally Focused Sector Level Assistance	24
Access to Investment and Finance	25
Development of Associative Relationships	25
Table of Activity Timelines and Manpower Requirements	27
C. Expected Impact	28
D. References	30
E. Gantt Chart	31

SECTION I

EXECUTIVE SUMMARY

A. Sector Overview

As a result of the collapse of many Soviet-era facilities, the annual domestic supply of food from aquatic species in Azerbaijan has decreased 95% from approximately 60,000 Metric Tons (MT) in 1988 to just 3,000 MT in 2007. During the same period, aquaculture production in Azerbaijan also decreased 93% from 1,656 MT to just 116 MT per annum. In contrast, imports of aquatic species in Azerbaijan increased from 2,205 MT in 1994 to 8,051 MT in 2006 and a peak of 10,110 MT in 2005, an increase of 459%. Discussions with retailers, restaurants, and the management of the Caspian Seafood Products strongly indicate that the demand for seafood will continue to increase significantly in future years. The current price for aquaculture products in the Azeri market ranges from 8 AZN/Kg (\$10.00 USD) for carp is estimated to comprise 85% of the market and up to 50AZN/ Kg with a median closer to 30 AZN/Kg for trout (15% of market) and it is estimated that the total value of current production is 1.4 million AZN. Although the sector is relatively small today, it has significant potential, especially in certain regions such as Sheki-Zagatala, Ganja, Lankaran and among the areas where PSCEP is working. Just reaching 50% of its former high or 828 MT will result in estimated farm gate annual sales of 9.4 million AZN.

During Soviet Times, aquaculture facilities were prevalent throughout Azerbaijan. Most were fresh water facilities using pond culture to rear a variety of carp and concrete raceways in the mountain areas to rear rainbow trout where there is an abundance of clear, colder water. The majority of these facilities are in disrepair and operating much below capacity.

Azerbaijan fish farmers face five major constraints to expansion and increased production:

- a lack of knowledge of modern fish rearing technology;
- the genetic stock, particularly trout, is weak and needs improvement;
- there is no domestic source of fish feed of acceptable quality;
- marketing efforts are fragmented and will not meet significantly increased production; and,
- most fish farms are undercapitalized and affordable financing is not available

A more complete analysis of the value chain, as well as a discussion of the specific strengths, weaknesses, opportunities, and threat characteristics of the sector may be found in the body of this plan.

B. Action Plan

PSCEP's overall strategy consists of a four pronged approach to enhance the sector competitiveness: (1) firm level assistance, especially of key "anchor" enterprises as well as smaller, selected demonstration farms, focused on addressing key constraints to increasing sales, increasing investment, creating jobs, and enhancing productivity; (2) Regionally and nationally focused sector level assistance, especially select multi stakeholder training opportunities that address sector-wide issues and constraints; (3) Access to investment and finance, including sustainable commercial bank lending and equity investments; (4) Development of associative relationships. The following six pillars constitute strategy that PSCEP will apply in the Aquaculture Sector.

1. **Demonstrate early, achievable results:** Fortunately, many of the improvements needed in the aquaculture can be undertaken with relatively small investments and implemented over the short run. PSCEP will initially focus on a few select farms where visible results can be achieved and to catalyze similar improvements on other farms.
2. **Technology:** PSCEP will provide direct assistance and training to PSCEP participating fish farmers and fish farm associations in modern aquaculture technology including assistance in the design of new facilities and establishing at least two demonstration farms.
3. **Improve Genetic Stock:** For trout, PSCEP will initially assist selected participating fish farmers to import eyed eggs of genetically superior varieties from sustainable U.S. sources and for carp and related species, PSCEP will provide assistance and training to establish regional hatcheries.
4. **Feed:** PSCEP will provide technical assistance to fish farmers, feed mills, and input providers to develop feed formulations that maximize the use of locally available inputs and that provide economical, quality feeds.
5. **Marketing:** PSCEP will focus on providing direct assistance to associative groups of fish farmers, but will also provide individual farmers with assistance in marketing their current and future production.
6. **Capitalization:** PSCEP will provide assistance to fish farmers in the preparation of sound operations plans, with supporting documentation, and guidance on how to present proposals to lenders in order to receive loans. This effort will also include assisting lenders to learn how to fund fish farms and encouraging fish farmers to develop associative funding entities.

C. Expected Results

Expected results from PSCEP's efforts through this Action Plan include:

- Over 30 enterprises directly assisted reversing a declining industry trend line to increase sales of participating fish farms by over 200% within the project time period with some firms experiencing increased sales in excess of 500%. The Davachi Broilers Carp Farm planned to be constructed with PSCEP assistance in the second year of this project will increase carp production by 1200MT all of which is expected to be sold in the Russian market. This will be matched by commensurate increases in employment and investment.
- A sustainable program for technology transfer and development will be established at the Azerbaijan Agrarian University in Ganja.
- Establishment of associative relationships at the national and regional levels.
- A sustainable source of trout fingerlings will be established providing fingerlings in excess of one million fish per year.
- Three regional jointly owned carp hatcheries will be developed in Azerbaijan providing a continuing reliable source of carp fingerlings to support existing farms and increased production.
- Reliable and affordable feed formulations based upon predominantly domestic Azerbaijan inputs will be developed and disseminated in the public domain.
- Markets will be developed for domestically produced aquaculture products in Azerbaijan and abroad.
- Members of the Sector will make investments exceeding 5 million AZN and sources of funding to provide effective financing for the Aquaculture Sector will be established.
- The aforementioned activities, including Davachi Broilers forecast sales will expand the market in Azerbaijan to over \$9.5 million USD; an increase exceeding 558%. PSCEP will have a dramatic impact in the resurgence of the aquaculture market.
- Beyond these more quantifiable indicators, the Aquaculture Sector by September 2011 will be more mature, structured and cohesive, with technology and methodology closer to meeting world standards. In the course of the next six months (December 2009), PSCEP will work to establish benchmarks for each of these indicators.

SECTION II

SECTOR AND VALUE CHAIN ASSESSMENT

A. Introduction

The USAID Private Sector Competitiveness Enhancement Program (PSCEP) is a \$6.6 million, three-year program designed to promote the competitiveness of select sectors of the non-oil economy of Azerbaijan in order to create jobs, increase exports, and generate investments. PSCEP is managed by Chemonics International Inc. PSCEP will work in six non-oil sectors and at least ten sub-sectors with the objective of diversifying Azerbaijan's economy. The project aims to enhance the competitiveness not just of individual enterprises, but the entire value chain and sector. A key element in PSCEP's strategy is the development of sector/value chain "Action Plans" to serve as the strategic and operational mapping of activities to support each value chain. PSCEP has ambitious employment, sales, and investment targets (30% above the industry trend line for the first two, approximately \$50 million in new investments for its first year). Each Action Plan and value chain activity must be focused on contributing to these goals.

B. Background

Aquaculture, or "fish farming," the art and science of rearing aquatic organisms, has been practiced for millennia. It appears to have been first practiced by the Chinese approximately 4000 years ago. In 460 B.C., Fan Li produced the first known written description of aquaculture and its benefits. Aquaculture in Azerbaijan, particularly the impoundment or holding of sturgeon most likely dates back to at least the eighteenth century while the more formal rearing of carp and trout appear to have been introduced in the twentieth century with significant commercial production of trout not being initiated until post 1960's. Prior to this, the government made some effort to augment natural populations of fish from the Caspian Sea and the water systems feeding it by the use of fish hatcheries. This effort continues with one government trout hatchery operating in the Goy-Gol region and a large sturgeon restoration hatchery located in the Neftchala. Most aquaculture in Azerbaijan is in private hands, with small, low technology pond production prevalent.

The world's leaders in aquaculture include China, Japan, the United States, Israel and Norway. For the most part, aquaculture is practiced for profit and this is true for Azerbaijan where even small scale fish farmers who sell their fish in the local markets expect to receive a maximum return on their investment.

The five most critical factors that determine the success or failure of aquaculture ventures in include:

- water quality
- technology

- genetic quality of the fish
- feed
- marketing
- access to capital

Water quality: Water quality including, purity, temperature, and availability plays a significant role in the rearing of any species. However, the requirements vary with some fish such as carp and clarius (African walking catfish) being able to live in waters with low circulation and oxygen content, to trout and other salmonids that require cool, clear water with relatively high levels of oxygen saturation (dissolved oxygen).

Technology: The most typical means of fish farming is to use ponds, cages, or tanks. Ponds are predominantly earthen but may be lined with natural or synthetic materials to prevent loss of water. Cages range in size from small holding devices suspended in lakes or ponds, to large ocean fish pens some exceeding 30 meters (M) in diameter. Tanks are used in many sizes including raceways which may be exceed 50 M in length. Natural reproduction may be used for stocking the farms, but more commonly animals are sourced from private or public hatcheries.

Aquaculture systems are often classified as extensive, semi-intensive or intensive referring the degree of control that is exerted over the environment in which the fish are reared. At one end of the spectrum we have ocean farming where young fish are released to the ocean or even a lake or river, and the mature adults are harvested. At the other end of the spectrum are intensive recirculating systems capable of rearing high densities of fish using technologically advanced systems to control every aspect of the farming effort including reusing water augmented with supplemental oxygen, sophisticated water filtering systems, constant monitoring and high quality feeds. Semi-intensive systems fall in between commonly starting where a limited amount of control is exerted by the farmers, most commonly the addition of supplemental feed although supplemental oxygen and higher rates of water exchange may also be employed to farms with increasing control over these factors. In Azerbaijan, most carp farms are relatively extensive often involving simply placing young fish in earthen ponds with little or no supplemental feeding, while trout farms tend to be more intensive.

Genetic Quality: Like any livestock rearing effort, the genetic quality of the fish being raised is critical to the success of the venture. Fish must be healthy, suitable for culture in the environment they are to be reared in, capable of relatively rapid growth, and meet the demands of the targeted market. Fish breeding has progressed dramatically in the last 25 years and there are now several species and varieties available optimized for almost every growing condition and market.

Feed: Feed is the second most critical requirement of successful aquaculture. Some species such as carp can be reared with little if any supplemental feeding (but do much better if they

are fed appropriate diets) while trout, tuna, and many higher valued species require high quality feeds containing appropriate levels of protein, energy (fat or lipids), vitamins and minerals. Multiple species of car are often reared together in the same pond, each with different feed requirements and actually contributing to the natural food production for each other. For instance, grass carp literally eat the vegetation on the sides and bottom of the pond, while silver and bighead carp feed on plankton some of which resulting from decomposition of the feces from the grass carp, and common carp, being omnivorous, will eat many feeds including cereal grains and animal by-products.

However, trout feeds contain highly digestible proteins and lipids, most commonly containing terrestrial and aquatic animal products such as fish meal, as well as supplemental vitamins, amino acids and minerals. Current technology and research has led to the development of effective trout feed formulations that have increased components of plant material and reduced levels of fish meal. Fish oil and vegetable oils are often added to trout feed to increase the available energy and palatability of these feeds. Typically, fish feed mill combine a variety of input materials such as fish meal, fish oil, vegetable oils, by-product meals, press cake, and cereals with pre-mixed vitamin and mineral blends to produce extruded feeds. The extrusion process gelatinizes the cereals and binders forming pelletized feed sized for the stage of growth of the fish. Pelletized feeds remain do not tend to contaminate the water in which the fish are being reared and remain together long enough to be more fully utilized by the fish. Larval and starter feeds are specialized feeds used in the early stages of growth

The effectiveness of a feed is measured by a “Feed Conversion Ratio” (FCR) which presents the ration of feed required to produce a similar unit of fish. Thus if 2 kg of feed produces 1 kg of fish, the FCR is 2:1. Feed conversion ratios of trout fed good feed and reared under optimum commercial conditions often approach an FCR of 1.2:1.

Marketing: The key to running any enterprise is to have a market for your products that provides you with an acceptable return on your investment. Aquaculture is no different. Buyers of aquaculture products want consistent quality, quantity, and price. And they want deliveries of the fish when they need it. This latter criterion has been the key to success for salmon farmers in particular. Prior to the development of salmon net pen farming, fresh salmon were only available at certain times of the year and customers wanting salmon at other times were dependent upon canned, dried or, after the 1950’s, frozen product. As an example, the largest single wild harvest of salmon is the Bristol Bay run in Alaska which only lasts for approximately four weeks. Salmon farming changed this, now if a buyer in Los Angeles wants to order salmon for a weekend demand he can place his order on Monday, the fish are harvested on Tuesday, transported to Los Angeles on Wednesday and delivered to the customer on Thursday. The major marketing strength of fish farming, therefore, is the ability to deliver to the customer the fish he wants when he wants it and the customer has proven consistently to be willing to pay the higher prices this requires.

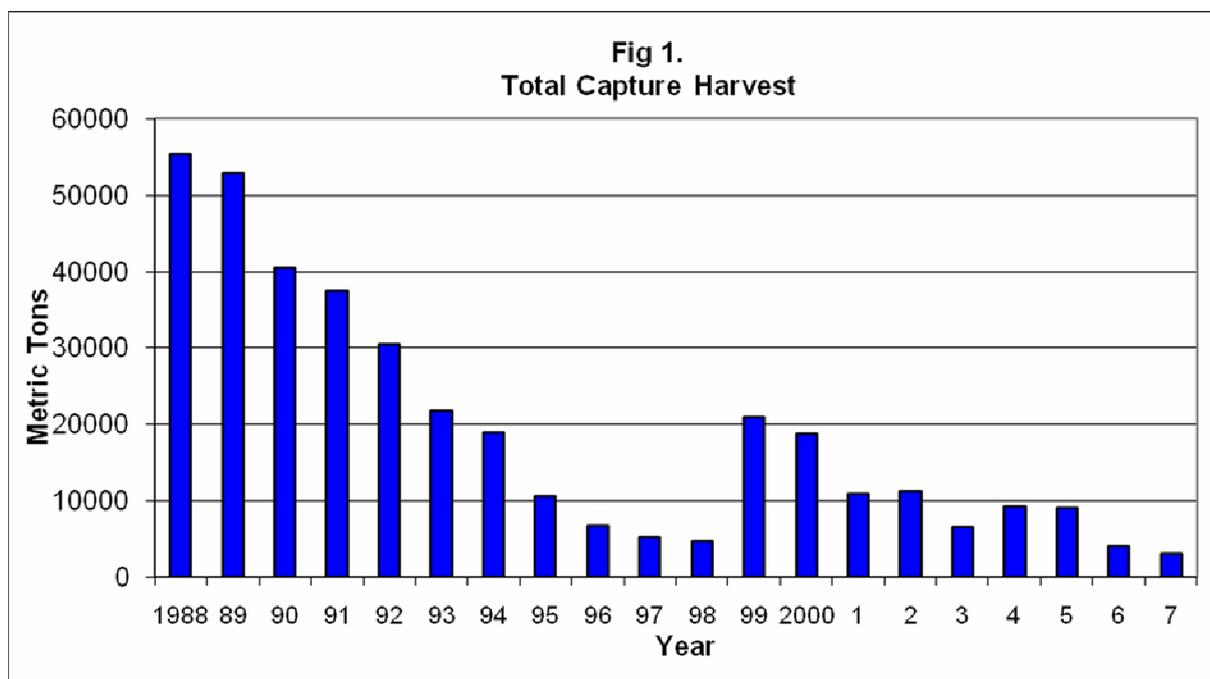
Financing: Undercapitalization and the lack of knowledgeable lenders willing to fund fish farms is almost a chronic condition. Most fish farms require considerable initial capital

inputs and continuing operating capital to cover the period between startup and harvest. Few lenders are cognizant of the particular needs and characteristics of the sector so few lenders are willing to bank the ventures. Aquaculture associations in many countries have made concerted efforts to educate their local lenders, and this had paid off well in many instances. Other associations have developed their own “farm lending institutions”, particularly with international donor aid in developing countries, and many of these efforts have paid off handsomely as well.

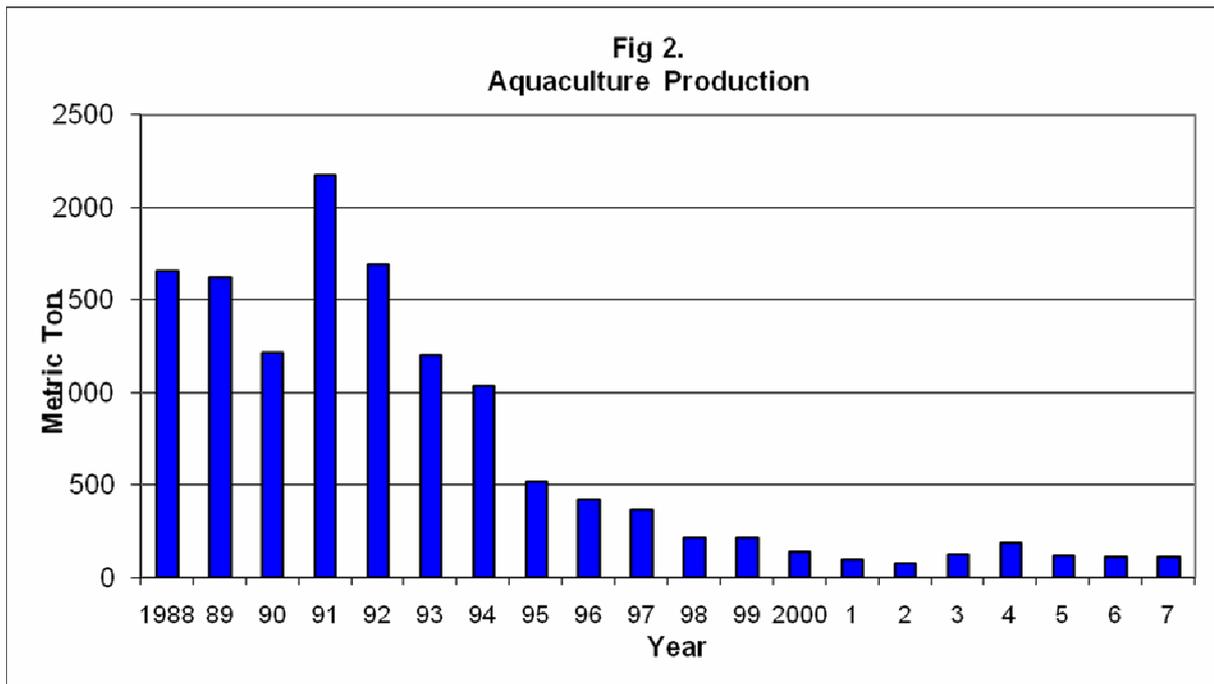
USAID has a long history of many successful interventions targeting aquaculture in developing economies around the world including the Philippines, Indonesia, Bangladesh, Eastern Europe, the Middle East, Africa and the Americas. Many of these efforts have been to provide subsistence farms for local farmers, but most have been designed to produce sustainable sources of incomes, jobs, and improved livelihoods in general. This effort in Azerbaijan has the potential to be one of the most successful to date and will contribute significantly to achieving the USAID PSCEP objectives.

C. Aquaculture Sector Assessment

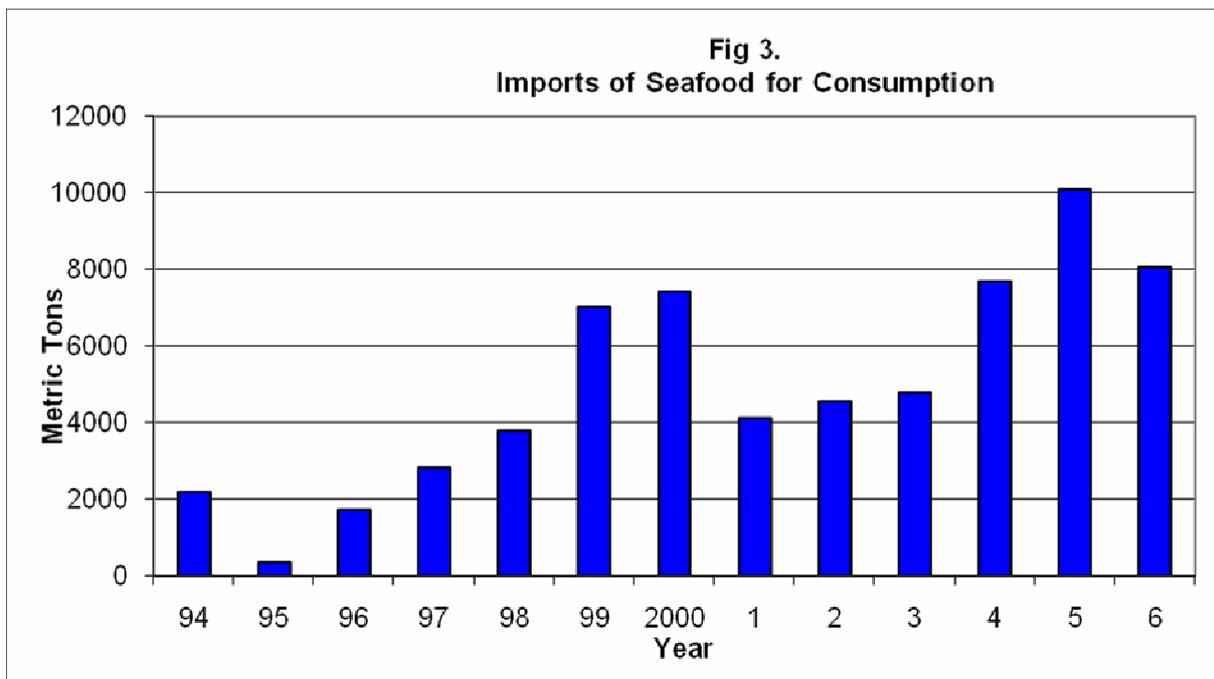
The domestic supply of food from aquatic species in Azerbaijan has decreased 95% from approximately 60,000 Metric Tons (MT) in 1988 to just 3,000 MT in 2007, the last year for which information is available. The values include the total of all aquatic species from commercial, industrial, recreational, subsistence and aquaculture sources. Figure 1 shows the capture harvest during that period.



During the same period, aquaculture production in Azerbaijan also decreased from 1,656 MT to just 116 MT per annum or approximately a 93% reduction as is shown in Figure 2 below.



In contrast, imports of aquatic species in Azerbaijan significantly increased from 2205 MT in 1994 to 8051 MT per annum by 2006 (the last year for which data is available) with a peak of 10,110 MT in 2005, an increase of 459% is portrayed in Figure 3. Discussions with retailers, restaurateurs, and the management of the Caspian Seafood Products strongly indicate that the demand for seafood has continued to increase since 2006 and will continue to increase significantly in future years.



The current price for aquaculture products in the Azeri market ranges from 8 AZN/Kg (\$10.00 USD) for carp is estimated to comprise 85% of the market and up to 50AZN/ Kg (\$82.50 USD) with a median closer to 30 AZN/Kg (\$37.50 USD) for trout (15% of market) and it is estimated that the total value of current production is 1.36 million AZN (\$1.7 million USD). Although the sector is relatively small today, it has significant potential, especially in certain regions such as Sheki-Zagatala, Ganja, and among the areas where PSCEP is working. Just reaching 50% of its former high or 828 MT will result in estimated farm gate annual sales of 9.4 million AZN (\$11.7 USD).

Technology and Water: During Soviet Times, aquaculture facilities were prevalent throughout Azerbaijan. Most were fresh water facilities using pond culture to rear a variety of carp including Common Carp (*Cyprinus carpio*), Grass Carp or Amure (*Ctenopharyngodon idella*), Bighead (*Hypophthalmichthys nobilis*), Silver (*Hypophthalmichthys molitrix*), and several other varieties. Carp tolerate relatively warm water and can survive waters with low dissolved oxygen levels; dissolved oxygen being a relative measurement of the oxygen saturation of water and thereby available to fish. As a result carp farms are found throughout Azerbaijan



Extensive Carp Farm near Astara



Newly constructed Carp Farm, Neftchala

with the highest concentrations being located in the southern regions Massali-Lankaran-Astara regions and along Caspian Sea coast in the Neftchala region. . Carp are also harvested from waterways and are sold by the fishermen at roadside stands.

Concrete, cold water raceways were also used along the mountain areas where there is an abundance of clear, colder water, to rear trout, predominantly Rainbow Trout (*Oncorhynchus mykiss*). Trout require colder water and much higher levels of dissolved oxygen than do carp. Unfortunately, most farms are currently in general disrepair or are operating at reduced capacity and many have been abandoned. There is no real current census of how many farms are in operation or are in a condition from which operations could be economically restored. The locations, capacities and other information of such facilities are also lacking.



Trout Raceways at the Qirxbulag Fish Farm, Sheki



Currently unusable Trout Raceways, Goy-Gol Region

There is a cluster of both trout and carp farms in the Sheki/Zagatala regions, additional trout farms near Ganja in the Goy-Gol region, and a well run trout farm with rainbow trout (reared from eyed eggs purchased from the Troutlodge Company of Sumner, Washington) located near the village of Zindanmaruq located just north of Guba.

The Qirxbulag Fish Farm near Sheki is a typical fish farm constructed during the Soviet era. Constructed in the early 1970's, it contains two concrete raceway sections, five carp ponds, a hatchery and a nursery. The farm has an excellent water supply originating from a series of mountain springs located about the facility. Like many such facilities though, it is in a state of disrepair and operates at less than 10% of its design capacity. This problem is exacerbated by a lack of good fish stock, very poor feed, insufficient capital, and a general lack of technical knowledge on how to efficiently and effectively rear fish, particularly trout.

The Apek LLC farm near Goy-Gol (Ganja area), is also a multi-species or polyculture facility, but much smaller in size. While it also has five carp ponds, it has only ten raceways, all currently unusable due to a lack of a suitable water supply system, although there is more than sufficient water available from wells in the immediate vicinity. Currently, it houses its brood stock, hatchery, nursery, and Growout tanks inside a single, small building and has limited production of less than 10 MT of fish in total for the farm. The facility is also under-capitalized and the owner is seeking financing or partners to expand and restore operations.

There are two companies planning significant aquaculture operations in Azerbaijan. Davachi Broilers, a PSCEP client company and one of the leading poultry producers in the country, is planning to construct a carp farm near its poultry operations at Davachi designed to produce 1,200 MT of carp per year for an export market to Russia. The farm is planned to use rendered poultry by-product meal as a base for a formulated feed for carp that will provide rapid growth in a semi-intensive system.

The Caspian Fish Company has started rearing European Sea Bass (*Dicentrarchus labrax*) using ocean type fish pens in the Mingechevir Reservoir and with the assistance of an Israeli consultant. Long range plans for this project include expansion to a total of 40 net pens.

There is also a large government run sturgeon restoration hatchery near Neftchala that is operated by the Ministry of Environment. The facility was started in early 2004 under grants from the UN Food and Agriculture Organization (FAO) had has received subsequent funding from the government of Azerbaijan and reportedly from British Petroleum Caspian the latter of which has an extensive environmental interest. Sturgeon aquaculture is permitted under the laws of Azerbaijan, but only males may be sold and females must be released to the Caspian Sea and its tributaries. All varieties of sturgeon from the Caspian Sea and its tributaries are on the Convention on International Trade in Endangered Species CITES list and exports of sturgeon or sturgeon products, most notably caviar, are prohibited internationally. Unfortunately, there is significant poaching of both immature and mature sturgeon severely hampering steps to correct the situation. Of the Caspian Sea countries, only Iran is permitted to export caviar and that is due to an extensive, strongly enforced management plan.



Azerbaijan State Sturgeon Hatchery, Neftchala



Injecting gonadotropin into a Bighead Carp, Massali

Genetic Quality: Producers have introduced various varieties of carp throughout Azerbaijan. Fish farmers buy their fingerlings from a few hatcheries in the Neftchala and Massali regions and others have imported fingerlings from Russian and Georgia with limited success due to unofficial problems at the borders. Still others rely upon natural spawning. There is at least one carp hatchery, Massali Geribler Fish Farm, has been producing carp fingerlings reportedly since 1967. The owner has been trained in Moscow, Hungary, Israel and the United States. He has excellent brood stock and uses gonadotropin injections to regulate the ovulation of the parent fish and a system of Fyke jars for initial rearing of the larvae. He also stated that he would be available to teach other Azeri how to operate hatcheries and assist them in establishing their own similar operations.

The trout reared in Azerbaijan derive from brood stock left over from Soviet Times and is of poor quality in general. Most are classic rainbow trout with some “amber” or golden variants of rainbow. There are no established trout hatcheries with the exception of a small operation located near Oguz which has very limited production from residual brood stock. The owner requested assistance in securing eyed eggs from North America so that he could expand his fingerling sales operation. He sold over 50,000 fingerlings in 2008 and received as much as 2 AZN per fish for his larger fingerlings. He was unable to produce enough eggs this year so his production will be down to 15,000 fingerlings.

A few other trout farmers have small hatcheries using carryover fish for brood stock. Efforts have been unsuccessful to import better brood stock or fingerlings from Georgia and Russia.

It should also be noted that there is at least one species of trout or salmon native to the Caspian Sea, the Caspian Salmon (*Salmo trutta caspius*) a variant of the Brown Trout (*Salmo trutta*) found in the United States. Harvest of these fish total 3.5 to 4.0 thousand fish or about 500 MT from the Kura River prior to 1950 when the river was dammed and runoff regulated. Two salmon hatcheries were reportedly constructed to mitigate this problem, but their operational status could not be ascertained.

Feed: There are no fish feed mills in Azerbaijan. However, there are several poultry feed mills which do have the capacity to also produce fish feed if they had appropriate formulations and inputs.

Most carp operations do not require formulated feeds with the exception of more intensive operations such as that planned by Davachi Broilers. Most carp farmers simply do not feed their fish nor do they appear to have the technical knowledge to do so, even though much of this technical knowledge has been around for fifty years. Some farmers do fertilize or plant grass in their ponds when these are idle and still others do supplement the ponds with grain or milling by-products. Only one carp farm visited, the newly constructed Neftchala Carp Farm used manure, a common practice around the world, to prepare the ponds prior to filling and the introduction of fish. The same company also purchases poultry by-product meal from Davachi which it blends with local cereals and milling by-products and has an organized system of regularly feeding their fish.

Trout are a different matter and cannot be reared without feed in commercial fish farming. Imported fish feeds are very expensive and in the case of that from Russia are of very poor quality. The Apek LLC farm purchases trout growout feed from Turkey which it blends with waste fish, sunflower press cake, and barley. The same food is ground by hand to make a smaller particle size which is fed to fingerlings. Larvae are fed screened, boiled egg yolks. The owner also used a liquid poultry vitamin mix that had only vitamins A, D and E and was two years out of date. He reported a FCR of approximately 7:1.

The Qirxbulag farm uses a “wet feed” based upon a 1974 formulation and using cow liver, animal entrails ground with barley and dried alfalfa. This is a very inefficient feed and one that can lead to serious disease problems amongst the fish as well. The owner reported a FCR of 16:1. Under the best conditions, such feeds normally have an FCR of 8:1. The problem with this feed is that the barley and alfalfa quickly dissolve into the water before the fish have a chance to ingest it resulting in contaminated water and wasted nutrients. The feed that is ingested is not readily digested and much of it just passes thru the fish and into the water where it also leads to degradation of the water quality and excessive growth of algae which in turn seriously diminishes the dissolved oxygen of the water. This was readily apparent in this case when the feeding process was observed at the Qirxbulag Fish Farm and as evidenced by the resulting water turbidity, serious fouling of the raceways with filamentous algae, and excessive deposits of fish feces.

The Caspian Fish Sea Bass project in the Mingechevir Reservoir uses quite expensive prepared feed imported from Israel.

Marketing: There appears to be a very good, albeit small, domestic market for the production from fish farms as there is for wild carp and related species that are harvested from irrigation canals and other bodies of water. The owner of the Qirxbulag farm at Sheki reports that he receives 50 AZN/Kg (\$62.50 USD) for 300gr (10.6 Oz) trout delivered to Baku, an amazing price when compared to the current world market price for Rainbow trout that is nearer 7 AZN/Kg. While this high price is probably not sustainable as production and competition increases, the market does appear to be strong and capable of growth.

The owner of the Apek LLC farm stated that he the local Ganja market wanted 100-110 gr fish at a price of 25 AZN/Kg while the Baku market preferred a larger fish of approximately 150-200gr at a price of 30 AZN/Kg.

Finally, the owner of the Oguz farm stated that he sold most of his growout fish to wedding palaces that paid about 30AZN/Kg for 70gr fish. He also stated that he felt that the market needs to get to about 15 AZN/Kg to really take off and that the fish should be approximately 200 gr.

Retail prices observed as part of this assessment in Baku were more subdued with live carp at 13 AZN/Kg; dressed trout, tray pack at 26 AZN/Kg (still an excellent price), and smoked Amur (grass carp) at 8 AZN per fish (est. wgt 1kg).

The majority of farmers sell their fish live to brokers who take delivery of the fish into live tanks at the farm. A few farmers market direct to end users. Unfortunately Azerbaijan fish farmers tend to all harvest their crops in a rather small annual window which drives the price down as compared to that which would be realized thru a more systematic marketing effort. Trout for instance, can be started at just about any time with the use of eyed eggs and can be brought to market the year round permitting farmers to schedule their production to meet forecast demand spikes such as the spate of weddings following Ramadan, the summer tourist seasons, or the winter holidays.

Most retail fish shops in Azerbaijan are relatively small and feature fresh, smoked, dried and live fish. There is only one large chain, Caspian Fish, which imports and distributes the majority of seafood in the country. Caspian Fish has a large reprocessing plant located near Xirdalan (near Baku) that was originally constructed to process “Kilka” or sprat (a relative of the herring) from the Caspian Sea but, after the sprat fishery collapsed, branched out to become a vertically integrated seafood producer/distributor/retailer and the only legal producer of sturgeon caviar authorized in Azerbaijan.

The market for Aquaculture fish in Azerbaijan can be summarized as in its infancy with considerable potential for expansion.

Financing: Every fish farm visited in Azerbaijan to date has appeared to be undercapitalized and in each case their owners have expressed the desire to secure financing to support capital

expansion or increased production and the associated operating costs. The exceptions to this were Caspian Fish with its net pen project and Davachi Broiler's proposed carp project. Lenders in Azerbaijan are not familiar with funding aquaculture projects and appear reluctant to develop new sectors in view of the present worldwide financial situation.

D. Value Chain Description and Mapping

The diagram on page 16 presents a typical aquaculture value chain. Referring to the inputs to hatchery operations, eyed eggs are unique to the propagation of salmonid and some other species. Eyed eggs are fertilized eggs that have developed to the stage that the eyes of the larvae can be seen. These eggs can be shipped by air around the world and are commonly used by fish farmers as a source of high quality fish. The hatchery receives the eggs, disinfects them and places them in incubators until they hatch. Commonly, 90% of the eyed eggs successfully complete this procedure. There are no trout eyed egg providers in Azerbaijan although there are in Iran. The largest producer of eyed eggs in the world is Troutlodge Inc. of Sumner, Washington in the USA. Eyed eggs from Iran are priced at 0.05 AZN (\$0.062) USD per egg while those from the Troutlodge certified for international shipment are currently priced at 0.024 AZN (\$0.03USD) or lower dependent upon the volume ordered.

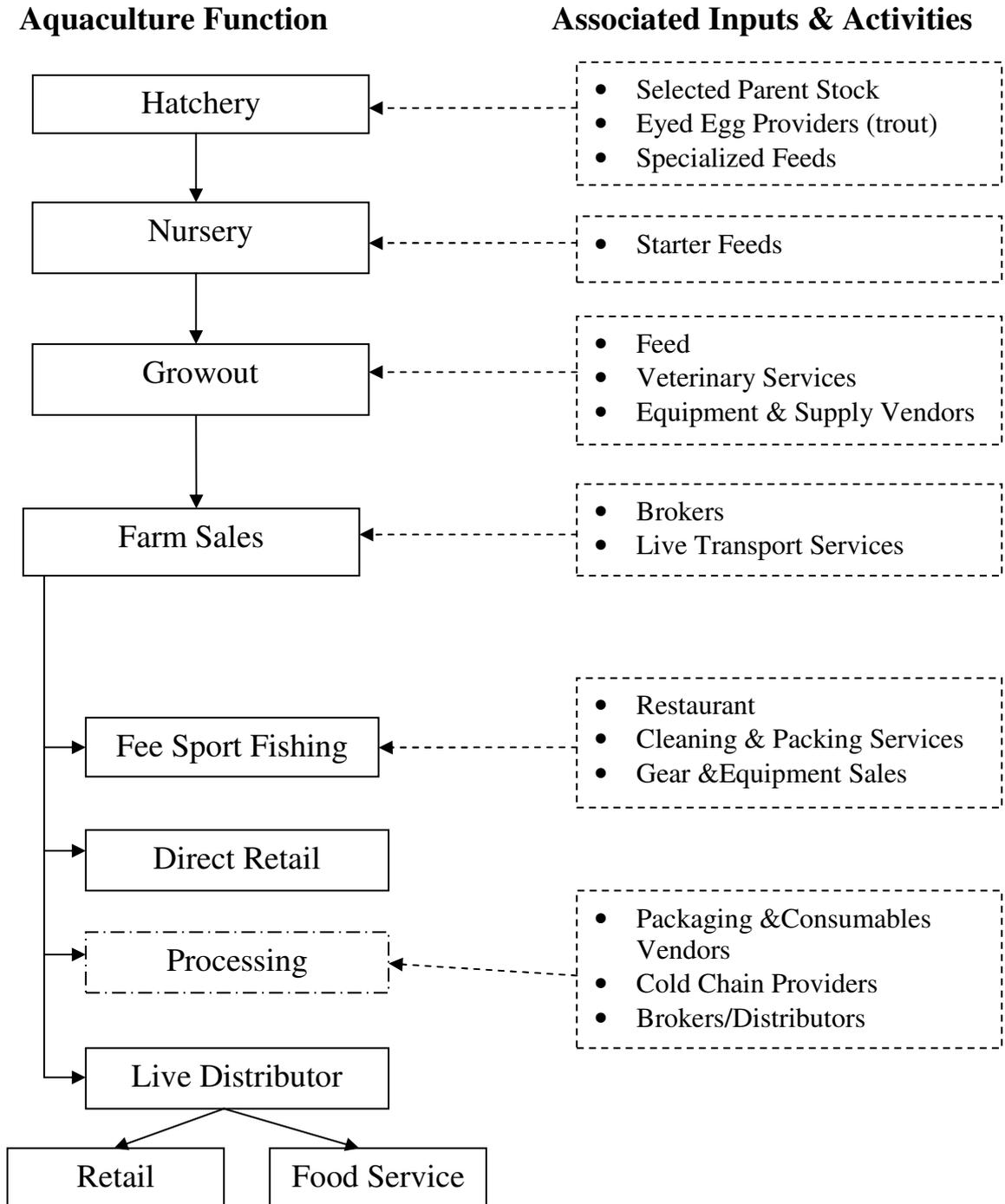
From the hatchery, the young fish or fingerlings are transferred to a nursery. This may be part of a hatchery when the hatchery is in the business of producing fingerlings for sale, or may be part of the fish farm where the fish will be reared to market size. The fish require special feeds at this stage and normally it is impractical for small farms or feed mills to manufacture these specialty feeds. Although these feeds are expensive, the volume used is very little in total and the FCR of these feeds approach 1:1 for trout. Therefore, it is generally more practical for the farmers to purchase this feed from specialty producers or in the case of Azerbaijan to import it.

From the nursery the fish progress to the Growout phase. Here they experience their greatest growth and feed is the main component responsible for this growth. Few farms are large enough to produce their own feed and even the largest of companies tend to purchase their feed from nearby feed mills. An exception is in developing economies where farmers may purchase concentrates or simply use local feedstuffs combined with vitamin and mineral mixes where required or available. As previously stated, Azerbaijan currently does not have any fish feed mills and this deficiency must be remedied for the sector to achieve its full potential.

Veterinary services are provided by specialist and supported by diagnostic clinics; the latter being normally funded by the government and located at universities specializing in this discipline. Fish farmers' associations may also fund laboratories or veterinary services such as is the case in Bangladesh.

Fig. 4

Simplified Aquaculture Value Chain



Equipment and supply vendors also play a key role in supporting the primary value chain and many are international. There are no such vendors in Azerbaijan and as the industry grows, this will become an opportunity for some entrepreneur to exploit.

Farm sales in Azerbaijan are most commonly made to live fish distributors or traders in Azerbaijan who transport the fish to markets, or other distributors, with next level being retail or food service (restaurants and wedding palaces). Some farmers are developing their own markets, transporting the fish directly to retail and food service outlets and others have consumers that purchase directly from the farm. There are no primary or secondary processors in the sector at this time with the exception of Caspian Fish.

A unique element of the aquaculture value chain is “Fee Sport Fishing” or Pay Fishing. Fish farmers may establish separate ponds or areas where individuals can come and angle for the fish on a fee basis paying for what they catch. Often, the farmer has a restaurant or other ancillary facilities to serve the guests and their families. The can become quite elaborate and at least one farm in Central Asia has developed the farm as a destination facility with cabins, horses, play areas, gift shops and a large restaurant serving the fish caught by the guest or freshly harvested from showcase ponds. The owner of the Qirxbulag Fish Farm has expressed his desire to develop such a facility and has plans for the facility for which he has been seeking financing for the past two years. Several of the carp farmers have also expressed the desire to open some of their ponds to pay for fishing. The owner of the Zagatala carp farm has constructed several covered areas about his main pond and has requested assistance in developing a management and marketing plan to start fee fishing.

E. Strengths, Weaknesses, Opportunities, and Threats

A summary of these characteristics is presented in Table 1 on the following page. Sector strengths for aquaculture include an identified market with a growing demand for fisheries products. The bulk of this demand is presently met with imports leaving room for absorption of increased production to meet increased demand and for import replacement. There are also several existing facilities many of which are operating at least at partial capacity and many can be restored to previous production levels if not increased beyond that with the application of current technology. The sizeable investments planned by two larger, financially capable companies as explained above, coupled with the plans of many smaller operators to construct new or to restore existing facilities should provide sustainability to the sector as well as to enable production to reliably meet demand on a consistent basis. Finally, there are many feedstuffs available within Azerbaijan that can be utilized as the primary components for fish feed.

Table 1

S.W.O.T. Summary

Strengths:

- An identified, historical market, most of which is currently being met with imports
- Existing facilities some of which are operational
- Individuals are reportedly constructing new farms and restoring older ones
- Strong interest by a limited number of financially capable individuals
- Primary feed ingredients available domestically

Weaknesses:

- Technology being used is outdated and inefficient, Owners and staff lack basic technological skills, there are no formal training programs for aquaculture in the country that can disseminate new technology and methodology, and most available reference materials are out of date
- Most facilities are in need of repair and are poorly maintained
- Brood stocks and available fingerlings are of poor genetic quality
- There is a lack of hatcheries
- No domestic source of fish feed of acceptable quality
- Most fish farms are undercapitalized and affordable financing is not available
- There are no effective associations of growers

Opportunities:

- Increased production and reduced operating cost by applying updated technology supported by the development of one or more demonstration facilities would provide an effective venue for dissemination and demonstration of these technologies.
- Taking advantage of markets, land and water to support a growth in the number of farms as well as restoration and expansion of existing fish farms
- Developers of hatcheries with improved genetic stocking will find an excellent market for fingerlings
- Introduction of new species should increase profitability and market penetration
- Producers of quality and economic fish feed will find a ready market
- Financial institutions, including farmers financing association, should be profitable and result in beneficial growth of the industry
- Farmers working together to form associations will provide the joint capacity to serve and develop growing markets

Threats

- Lack of defined system of water usage rights
- Some producers may become disinterested as increased volume results in decreased unit prices
- Non-supportive government regulation
- Unchecked corruption within the Azerbaijan infrastructure

There are significant sector weaknesses, but none that cannot be overcome in time. Most have been described elsewhere in this document and are summarized in Table 1. A key weakness is the lack of effective associations of growers; such associations make strong beneficial contribution in most countries, whether economies are developed or developing. There is positive movement amongst growers though to work together so this weakness may be overcome in the near future. Finally, like the technology in use, reference materials that are available are out of date and there are no current educational programs for the formal teaching of aquaculture as a discipline.

There are several opportunities for successful operations within the Sector. Again, most have been described elsewhere in more detail. One that has not is the opportunity to develop one or more demonstration facilities that would provide a venue for upgrading technology. Sector Threats are not significant and can be overcome. A significant threat is the lack of a defined system of water usage rights. The Ministry of Agriculture of the Republic of Azerbaijan has primary jurisdiction over both aquaculture and water usage rights. Legislation in October 2004 established the State Melioration and Water Economy Agency within the Ministry of Agriculture. This agency has not directly addressed existing water rights to date but will eventually have to do so. How it will adjudicate conflicts, in view of past government performance, could pose a significant threat to this sector particularly in view of past corruption activity. There also appears to be a lack of knowledge within this ministry and others of aquaculture that could lead to regulation that would be contrary to the interests of those in the Sector. The lack of a cohesive effort, particularly an association of fish farmers, makes this threat of even more concern. Finally, some smaller producers may become disinterested in continuing operations as increased volume results in decreased unit prices as should be the case in the very high current prices paid for trout. However, farmers who look at the greater net return on investment that will stay in and make up for any losses from such an action.

SECTION III

ACTION PLAN

A. Introduction

PSCEP's overall strategy to enhance the sector competitiveness is based upon the following four pillars: (1) firm level assistance, especially of key "anchor" enterprises, focused on addressing key constraints to increasing sales, increasing investment, creating jobs, and enhancing productivity; (2) regionally and nationally focused sector level assistance, especially select multi stakeholder training opportunities that address sector-wide issues and constraints; (3) access to investment and finance, including sustainable commercial bank lending and equity investments; (4) development of associative relationships. In implementing this approach, PSCEP's efforts will be based the following six pillars constitute strategy that PSCEP will apply in the Aquaculture Sector.

1. **Demonstrate early, achievable results:** Fortunately, many of the improvements needed in the aquaculture can be undertaken with relatively small investments and implemented over the short run. PSCEP will initially focus on a few select farms where visible results can be achieved, to catalyze similar improvements in other farms.
2. **Technology:** PSCEP will provide direct assistance and training to PSCEP participating fish farmers and fish farm associations in modern aquaculture technology and applied methodologies applicable to each element of the value chain and also including assistance in the design of new facilities and establishing at least two demonstration farms.
3. **Improve Genetic Stock:** For trout, PSCEP will initially assist selected participating fish farmers to import eyed eggs of genetically superior varieties from sustainable U.S. sources providing the technological assistance necessary to hatch these eggs and to establish hatcheries from which fingerlings will be sold to others. For carp and related species, PSCEP will provide technical assistance and training to participating fish farmers and/or fish farm associations to establish regional hatcheries. PSCEP will also assist Azeri fish farmers to develop their own brood stock from indigenous strains and to introduce other species with the potential for sustainable and economic benefits.
4. **Feed:** PSCEP will provide technical assistance to fish farmers, feed mills, and input providers to develop feed formulations that maximize the use of locally available inputs and that provide economical, quality feeds.
5. **Marketing:** PSCEP will focus on providing direct assistance to associative groups of fish farmers, but will also provide individual farmers with assistance in marketing their current and future production.

6. **Capitalization:** PSCEP will provide assistance to fish farmers in the preparation of sound operations plans, with supporting documentation, and guidance on how to present proposals to lenders in order to receive loans. This effort will also include assisting lenders to learn how to fund fish farms and encouraging fish farmers to develop associative funding entities.

PSCEP's actions will focus on delivering timely, effective, and highly focused technical assistance geared to addressing concrete firm needs, especially addressing the demands of current and potential clients particularly those identified thru the PSCEP BDS contractors. This assistance will be provided by world class international experts where necessary, as well through the BDS providers, who will be the beneficiaries of continual "on the job training" by the international consultants and the international assistance provided to these enterprises will be channeled through the BDS. The needs assessments conducted to date indicate needs in several key areas. PSCEP expects to provide direct support to no less than 20 aquaculture related enterprises and indirect support to a multiple of this number. The BDS providers will develop competitiveness plans for each firm or association to be assisted which will contain the details of assistance and activities to be provided.

B. Specific Actions

This Action Plan emphasizes early, achievable results. To do so, PSCEP initiated several projects in June and July, including direct support to Qirxbulag Fish Farm near Sheki in June to assist it in modernizing its culture practices and to improve their feed formulation. The first intern/technician from the United States was also placed at this farm on 14 June 09 to provide hands on training to that enterprise. PSCEP has also arranged for five trout farms which have joined together to acquire 300,000 eyed eggs from the United States with delivery expected in mid-August. This will increase their current production collectively by over 1,300%. PSCEP is also engaging fish farmers in the Sheki area with the aim of establishing an aquaculture association. Carp-producing stakeholders of this nascent association are also preparing a proposal to build two joint carp hatcheries, one in Zagatala and one in the Sheki Region by the end of September. PSCEP will assist them in planning the facilities, in securing matching grant funding for the hatcheries, and providing training on carp hatchery operations. Finally, a fish farming conference for fish farmers nationwide will be held in Sheki in September. Troutlodge Inc., the world's largest provider of eyed eggs, at their expense, will send two individuals to the conference to present modern technology on the rearing of trout as well as to introduce other species that may be suitable for Azerbaijan. These and other activities are explained further as follows.

B1. Firm Level Assistance

Technology: Beginning in year one, PSCEP will provide direct assistance and training to the Qirxbulag Fish Farm near Sheki, the Oguz Trout Farm in Oguz, the Anar and Razi Mammadov Carp Farm also near Sheki, The Apek LLC Fish Farm in Goy-gol, the Lovain Fish Farm new Astara, and the Geribler Carp Farm and Hatchery near Masalli.

The Qirxbulag Fish Farm is joining with PSEP to develop a model demonstration farm for the rearing of trout and carp. PSEP is providing technical assistance to the owner to improve current physical facilities, restore the farm's hatchery and nursery, to improve feed formulation, introduce updated rearing methodology as well as improved genetic stocks, and to assist in planning for expansion of the farm. The Qirxbulag Farm has five ponds, two raceway complexes with a total of 28 raceways, a nursery and a trout hatchery. The facility has excellent water resources, all originating from natural springs and is readily accessible from the Samaxi – Seki highway and was built in 1970.

The Geribler facility offers a unique opportunity as the owner is most likely the most experienced carp farmer and hatchery operator in Azerbaijan, having been educated in this discipline in Russia, Hungary, Israel, China and the United States. More importantly, he is willing to train others in the development and operation of carp hatcheries. PSCEP will take advantage of this opportunity developing this farm as a country-wide demonstration facility for carp reproduction and propagation.

PSCEP will also initiate a pilot project where will bring an undergraduate student with demonstrated practical experience in the application of current aquaculture technology from the United States to work directly on the Qirxbulag Fish Farm providing hands on training in the application of this technology. The individual selected for this effort is an experienced technical advisor/intern from Trinity State College's Aquaculture Program in Colorado, USA. He will spend two months living on the farm introducing modern methodologies as well as to conduct feed trials and assist in developing improved stock thru the use of eyed eggs. He will spend a third month at another farm yet to be determined.

In year two, technical assistance will be provided to Davachi Broilers to design a carp farm capable of rearing 1,200 MT of carp per year and the commissioning of the farm. Technical assistance will also be provided to the Davachi Broiler staff as they establish the hatchery for their farm. PSCEP will also provide technical assistance to selected Azeri fish farmers to develop their own brood stock from indigenous strains such as the Caspian Salmon, Caspian catfish (*Silurus glanis*), and sturgeon (*Huso sp. and Acipenser spp.*) as well as to introduce other species such as tilapia (*Oreochromis nilotica*) that have the potential for sustainable and economic culture.

Technical assistance will continue to be provided to the Geribler Carp Farm and the Qirxbulag Farm both of which will be used as demonstration farms.

A suggestion was made to the General Director of Caspian Fish, Sabutay Hasanov by the PSCEP Senior Aquaculture Technical Advisor that Caspian Sea consider contracting with

local fish farmers in the Mingechevir area to contract rear sea bass for the company if the company's initial development work proves successful. The suggestion was accepted and Director Hasanov wants to proceed in this endeavor. Under such a program, Caspian Fish would provide the contract farmer with a net pen, fingerlings, feed, and an agreement to purchase the fish upon harvest. This would create approximately 35 individual operations, jobs for approximately 110 individuals and an initial investment of approximately 3.5 million AZN. PSCEP would provide technical assistance including training to the contract farmers in cooperation with Caspian Fish.

Technical assistance will also be provided to at least seven additional fish farms identified by PSCEP thru its BDS providers. PSCEP will continue to provide technical support to sector associations and those desiring to form associations.

Contingent upon the success of the undergraduate intern pilot project at the Qirxbulag, PSCEP will field three such interns in 2010 and will expand the program further to include three students from the Azerbaijan State Agrarian University at Ganja to partner with their American counterparts on selected fish farms. Further, PSCEP will assist the University to develop an aquaculture program with the intent that this program become a sustainable source of technical assistance to the sector after the PSCEP program terminates in 2011.

In year three, technical assistance will continue to be provided to the Geribler Carp Farm and the Qirxbulag Farm demonstration farms and to Davachi Broilers as its carp farm comes on line. Technical assistance will also continue to the contract farmers of the Caspian Fish project contingent upon success in the effort in year two and to at least seven additional fish farms identified by PSCEP thru its BDS providers. .

PSCEP will field another three undergraduate interns in 2011 that will again partner with three students from the Azerbaijan State Agrarian University at Ganja on selected fish farms. PSCEP will also continue to assist the University in developing the aquaculture program and will facilitate the University to partner with an American university to develop programs jointly in this discipline.

Improve Genetic Stock: Beginning in year one, PSCEP will participating fish farmers to import at least 300,000 eyed eggs of genetically superior varieties from Troutlodge Inc. U.S.A. Technological assistance will provided to the Oguz Trout Farm, Apek LLC, the Lovain Astara Fish Farm, and to Qirxbulag as well as to other participants in this initial joint purchase to insure the successful hatching of these eggs. The various BDS providers will advise fish farmers in their areas of operations of the availability of the fingerlings once hatched and of suitable size.

Feed: A critical element in successful fish farming is the availability of quality fish feed at reasonable prices; something that is currently lacking in Azerbaijan. Thus PSCEP will undertake the project of identifying appropriate feedstuffs available in Azerbaijan. Technical assistance will be provided in an effort that will span the remainder of year one and continue into year two to such companies as the Baku based Asena Company (fabricator of feed mill equipment), to fish farms that produce their own fish feed, to Azerbaijan feed mills capable

of producing fish meal, and vendors of feed components to develop reliable feed sources. One such vendor is the AVC Group of Baku, a provider of vitamin and mineral mixes to the poultry and livestock sectors, to develop and supply such mixes to those producing fish feed in Azerbaijan. PSCEP will also provide technical assistance to the conduct feed trials of proposed formulations and will disseminate formulations that are found to be beneficial and appropriate for Azerbaijan's various farmed fish species. A joint project that will be initiated in the first year and continue into the second with Davaci Broilers to develop trout and carp feeds based upon rendered poultry by-product meal. There is also a regional feed mill (Adalat, Imishli) near Zagatala that will participate in the project.

In the third year, PSCEP will continue to provide technical assistance to the fish feed sub-sector to develop feeds for the Caspian Fish project as well as for the State Sturgeon Hatchery.

B2. Regional and National Sector Level Assistance

A technical conference open to all fish farmers will be held in Sheki in September presenting a number of subjects including aquaculture technology, genetics and hatchery operations, feed, and finance. Key note speakers at this conference will be representatives from Troutlodge Inc. who will be traveling to Azerbaijan at their own expense to deliver presentations on rearing trout, other salmonids and sturgeon.

Also in year one, the PSCEP aquaculture technical advisors, along with owners of the companies being initially provided aquaculture technical assistance, will participate in The 3rd International Scientific-Practical Conference "Modern Methods of Feed Production and Feeding" to be held on 14, 15 July 2009 in Baku.

PSCEP will also provide technical assistance to carp farmers in the Sheki/Zagatala area to jointly develop at least one, if not two, carp hatcheries that will provide a regional source for fingerlings.. These farmers will include Anar and Razi Mammadov of Sheki, Kamaladdin Maharramov of Zagatala, as well as Hamid Mikailov and Vagif Gafanaov both also from Sheki. This assistance will include assistance in designing the facility as well as contracting with the owner of the Geribler Carp Hatchery in Masalli to provide training for these farmers at the Geribler farm and in the new hatchery once it is constructed. The group will also be assisted in securing a matching grant for the equipment required for establishing and operating the hatchery(ies) which will provide fingerlings to farmers throughout the Sheki/Zagatala regions.

In year two, PSCEP will provide similar assistance to establish a second regional hatchery at the Azerbaijan State Agrarian University that will be a fee for service facility funding its continued operations upon sales of fingerlings and services to Azerbaijan's fish farmers. This facility will provide a regional source for carp fingerlings, something that does not now exist.

In year three, PSCEP will provide technical assistance for a third jointly owned, regional carp hatchery will be developed in a region to be determined. Technical assistance will continued

to be provided to support activities originated in years two and three as required with the objective of having all self sustaining upon the completion of the PSCEP program.

The training associated with developing and operating the hatcheries will be open to as many other farmers as can be accommodated. Priority will be given to members of associations.

Marketing:

Assistance will also be provided to selected farms to develop fee or paid recreational fishing with associated restaurants, cabins and recreation services as well as to expand their markets to other recreation related enterprises such as resorts and restaurants. The possibility to provide fish for mitigation and restoration purposes to BP Caspian and the Azerbaijan government will also be evaluated. This has proven to be a lucrative market in many areas where private enterprises have proven to be more efficient and cost effective providers of stocking fish than government operated facilities. Conventional market assistance will be provided to individual participating farms as well, but the major marketing effort will be directed toward collective marketing thru associations.

B3. Access to Investment and Finance

Under capitalization is a ubiquitous and chronic problem amongst Azerbaijan fish farmers as it is with most fish farmers in developing economies. PSCEP will provide technical assistance to fish farmers in the preparation of sound operations plans, with supporting documentation, and guidance on how to present proposals to lenders in order to receive loans. This effort will also include assisting lenders to learn how to fund fish farms and encouraging fish farmers to develop associative funding entities. It will also include evaluating alternative sources of financing for the Sector. Fortunately, PSCEP has made a major effort with lenders in Azerbaijan to fund non-oil dependent enterprises and will bring the experience and contacts to bear in supporting this sector as well.

B4. Development of Associative Relationships

PSCEP will provide technical support to sector associations and those desiring to form associations. The aforementioned regional training and hatcheries are expected to be the catalyst for bringing fish farmers together and in developing associative relationships.

To the greatest extent possible, PSCEP will provide marketing assistance to the aquaculture sector on an associative basis as this has proven to be the most effective approach in almost all developing countries for all but the largest of fish farms. The effort will continue over the remainder of the PSCEP timeline and will be paced to provide market expansion matched to increased production from the sector. A fatal flaw in some past marketing experiences has been to develop markets with demands that exceed production capacity resulting in disillusioned buyers who are reluctant to return when producers are finally capable of filling orders. As the domestic market expands and rationalizes, efforts will be increased to support exports and serving developing international markets as Davachi Broilers will be doing in Russia.

PSEP will also provide technical assistance to associations within the sector to develop their own sources of lending and investment. One such effort will be providing technical assistance to these associations to develop fish farm lending institutions.

Table of Activity Timelines and Manpower Requirements June-December 2009

Activity	Start Date	Est. End Date	Sr Expat Time Req	US Intern Time Req	Others Time Req	Remarks
<u>Firm level assistance & Training</u>						
Qirxbulag Fish Farm	6/14/09	12/31/09	20	40		
Oguz Trout Farm in Oguz	5/30/09	12/31/09	3	2		
Mammadov Carp Farm	6/17/09	12/31/09	10	4		
Zagatala Caro Farm	7/18/09	12/31/09	4	4		
The Apek LLC Fish Farm	6/20/09	12/31/09	4	2		
Lovain Fish Farm	7/22/09	12/31/09	4	4		
Geribler Carp Farm	8/1/09	12/31/09	8	2		
US Undergraduate Assistance	6/14/09	9/14/09		80		
<u>Feed Development</u>						
Identify Feed Stuffs	5/16/09	7/15/09	6			
Develop Trout and Carp Feeds	6/23/09	12/31/09	12	12		
Technical Assistance to Feed Mills	7/14/09	12/31/09	10			
Eyed Egg import from USA	5/30/09	8/30/09	4			
Davachi Broilers to design a carp farm	8/1/09	12/31/09	12			
<u>Regional/National Sector Assist.</u>						
International Scientific-Practical Conf.	7/14/09	7/15/09	2			
Fish Farming Conference	9/5/09	9/6/09	4			2 Plan days
<u>Carp Hatcheries</u>						
Planning Sheki/Zagatala	7/18/09	8/1/09	2	2		
Construction Sheki/Zagatala	8/1/09	8/31/09	4	2		
Training on carp hatchery operations	8/1/00	9/15/09	10	4		
Planning Agrarian University	11/1/09	12/31/09	4			
<u>Access to Investment & Finance</u>						
Assistance to Farmers for Loans	8/1/09	12/31/09	10			
Assistance to Lenders - Loan Eval.	8/1/09	12/31/09	5			
<u>Develop Associative Relationships</u>						
Presentations to Fish Farmer Groups	6/14/09	12/31/09	6	4		
Form an aquaculture association	7/12/09	7/25/09	4	1	2	

*Sr ExPat will combine assistance with other journeys to the regions to reduce or eliminate travel time. and has volunteered weekends to the project for months of June, July and part of August

C. Expected Impact

Expected results from PSCEP's efforts through this Action Plan include:

- Over 30 enterprises directly assisted reversing a declining industry trend line to increase sales of participating fish farms by over 200% within the project time period with some firms experiencing increased sales in excess of 500%. The Davachi Broilers Carp Farm planned to be constructed with PSCEP assistance in the second year of this project will increase carp production by 1200MT all of which is expected to be sold in the Russian market. This will be matched by commensurate increases in employment and investment. The number of farms to be directly assisted is conservatively estimated in view of the limited resources available to the program. It is expected that the actual number will be much greater.

Those directly assisted should have few problems increasing their annual production in view of the low percentage of their existing capacity that they currently use due to a very limited supply of fingerlings for stocking and the expected results from PSCEP assisted eyed trout egg importation and the effects from increased hatchery capacity. This will result in increased sales as the market can and will absorb such increases as is indicated when one compares current consumption (predominantly from imports) and the low percentage of that consumption that comes from domestic aquaculture.

- A sustainable program for technology transfer and development will be established at the Azerbaijan Agrarian University in Ganja.
- Establishment of associative relationships at the national and regional levels.
- A sustainable source of trout fingerlings will be established providing fingerlings in excess of one million fish per year.
- Three regional jointly owned carp hatcheries will be developed in Azerbaijan providing a continuing reliable source of carp fingerlings to support existing farms and increased production.
- Reliable and affordable feed formulations based upon predominantly domestic Azerbaijan inputs will be developed and disseminated in the public domain.
- Markets will be developed for domestically produced aquaculture products in Azerbaijan and abroad.
- Members of the Sector will make investments exceeding 5 million AZN and sources of funding to provide effective financing for the Aquaculture Sector will be established.
- The aforementioned activities, including Davachi Broilers forecast sales, will help expand the market in Azerbaijan to over \$9.5 million USD; an increase exceeding

558%. PSCEP will have a dramatic impact in the resurgence of the aquaculture market.

- Beyond these more quantifiable indicators, the Aquaculture Sector by September 2011 will be more mature, structured and cohesive, with technology and methodology closer to meeting world standards. In the course of the next six months (December 2009), PSCEP will work to establish benchmarks for each of these indicators.

C. References

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Time Line of Key Activities Aquaculture	Jan				Feb				March				April				May				June				July				August				September				October				November				December			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Feed																																																
2009																																																
Identification and classification of Azeri Feed Stuffs																																																
Develop Feed Formulations and Assist Fish Feed Mills																																																
Conduct Feed Trials																																																
Participate in Feed Conference																																																
2010																																																
Develop Feed Formulations and Assist Fish Feed Mills																																																
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Participate in Feed Conference																																																
Develop Feed Formulations and Assist Fish Feed Mills																																																
Marketing Assistance																																																
2009																																																
Conduct Market Evaluation and Assist Fish Farmer Associations with Marketing																																																
Assist Individual Fish Farmers																																																
2010																																																
Continue to Assist Fish Farmer Associations with Marketing																																																
Introduce Fee Fishing and Recreation Activities Associated with Fish Farms																																																
2011																																																
Continue to Assist Fish Farmer Associations with Marketing																																																
Develop Non-traditional Markets																																																
Capitalization and Financing Assistance																																																
2009																																																
Assist Individual Fish Farmers to Develop Bankable Plans																																																
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Assist Individual Fish Farmers to Develop Bankable Plans																																																
Assist Associations to form Farm Banks																																																
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Assist Individual Fish Farmers to Develop Bankable Plans																																																
Assist Associations to form Farm Banks																																																
Assist Financial Institutions to Bank Fish Farmers																																																

Projected Level of Effort: It is expected that the services of an Ex-pat Technical Expert will be needed on a parttime basis as will the services of a PSCEP Value Chain Specialist.