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Assessment of Olive Growing and Processing Practices for Oil in Northern Iraq Best Practices Program and Recommendations to Correct Problems

December, 2010

This publication was produced for review by the United States Agency for International Development. It was prepared by Paul Vossen, short term consultant for *Inma* Agribusiness program a consortium led by the The Louis Berger Group, Inc.

Assessment of Olive Growing and Processing Practices for Oil in Northern Iraq: Best Practices Program and Recommendations to Correct Problems

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The author's views expressed in this publication do not necessarily reflect the views of the United States Agency for International Development or the United States Government.

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Executive Summary

This report covers an assessment of local olive production for oil processing; the current conditions found in the nascent olive oil processing sector and recommends improvements to both. The consultant met with a group of growers and processors in the Al Zaytoon cooperative and evaluated both olive production and oil processing. The consultant also visited the Bashiqa Ministry of Agriculture olive oil processing mill. With each organization he made many recommendations for improvements in olive production including; irrigation, pruning, fertility, variety selection and weed control. Recommendations for improving the quality of oil processed included; purchasing inputs, sorting, sanitation, temperature control, equipment maintenance, and additional equipment and storage tanks required, developing an understanding of quality and training. The consultant also discussed developing the local market for olive oil. Training materials developed were; “Best Growing Practices for Producing Excellent Quality Olive Oil in Iraq”, “Best Processing Protocols for Producing Excellent Quality Olive Oils in Iraq”, “Olive Irrigation Chart for Iraqi Growers based on 7 X 7 meter spacing, and a presentation to growers, millers, and Ministry of Agriculture Personnel at the USAID-*Inma* office in Erbil covering the topics; overview of world olive oil production, growing olives in Iraq and processing olives, as well as conducted and olive oil tasting to demonstrate fruit quality and the characteristics of a good oil. In conclusion a list of nine recommendations was presented to USAID-*Inma* to provide direction for how the project can continue to assist with the development of the new olive oil processing industry in Iraq.

Background

The United States Agency for International Development-*Inma* program has been promoting economic diversification and job generation, in the agriculture and agribusiness sectors in the provincial, regional, and sub-regional Iraqi economies in order to improve security and stability. The program has linked farmers, agribusinesses other small and medium-sized businesses and local and national government officials, associations and cooperatives, and financial services institutions.

There has long been an established olive industry in Northern Iraq, but it lags far behind other regional producers of olives in both production and processing technology. USAID-*Inma* has been working with the Al Zaytoon Olive Growers Association in Bashiqa for about 18 months. The Al Zaytoon Association traditionally cures olives for table use. USAID-*Inma* recently provided a small, 3 unit olive oil pressing plant to the association to diversify their program while making use of existing trees more suitable for oil than for curing.

USAID-*Inma* contracted a specialist to assess the association's harvest, post harvest and processing practices to develop a program that improves those processes. USAID-*Inma* also plans to further help the association to improve production within their existing olive groves and provide information on best practices for new plantings.

Short Term Consultant

Olive oil expert Paul Vossen, of Paul Vossen Agriculture Consulting and current University of California Cooperative Extension - Farm Advisor, was hired to assess local conditions, recommend improvements and to develop a written program of best management practices for growing olives and processing them into oil. He visited orchards and processing facilities from December 8-19 including travel dates. A follow up visit may be necessary prior to June 2011. He was told upon arrival that the concentration of efforts should be placed on olive oil production, rather than table olives.



Paul Vossen

World Olive Oil Situation and Iraq (Profitability – Quality – Marketing)

Like many other developing Mediterranean and Middle Eastern countries, Iraq seems to have the potential to expand and greatly improve their production of olives for both oil and table fruit. Regional production is increasing due to new plantings, and improvements in existing plantings in Morocco, Tunisia, Jordan, Lebanon, and others. New sources of irrigation water have been developed in many places with new dams, reservoirs, and wells. Olives are attractive because it is a crop that makes good use of limited water resources. Harvest mechanization and continuous flow processing are new technologies that are lowering the costs of production and improving quality at the same time. This has led to a significant expansion in

production in Spain, Portugal, California, Australia, Chile, and Argentina where labor is either difficult to manage or very expensive.

Market demand, especially for olive oil, has been expanding rapidly, fueled primarily by the many documented health benefits of olive oil. Culinary recognition of the condiment qualities and uses of olive oil have also brought this old crop into a new light. Consequently, over a million hectares have been planted in the last ten years and hundreds of thousands more will continue to be planted all over the world. New processing facilities are also being developed and existing facilities are being upgraded in order to keep up with the greater amount of fruit that needs to be processing in a timely manner in order to make quality oils for more gourmet-type niche markets.

Economic competition, especially over the last two years during the world economic crisis, has lowered bulk prices for olive oil (currently at about 2.00 € per liter – bulk) so that only the most efficient producers can make money in that market. Some less efficient orchards are being abandoned, because of low profitability caused by (1) low production usually due to insufficient water resources in areas with shallow soils, and or low rainfall or (2) high costs usually due to steep ground or huge old trees that make it difficult or impossible to mechanize the harvest.



Because of low prices, many bulk producers are suspected of lowering costs by mixing in refined olive oils or seed oils into their extra virgin product. Recent news about oils on market shelves not meeting the labeled extra virgin standards in the USA, Australia, and Spain has confirmed this. Differentiation between brands through quality differences (flavor) has become an important way of opening up new markets. Several producers have expanded into specialty markets based on the culinary qualities of their oils, which has raised their prices and increased sales at the same time. In some small-scale niche markets all over the world olive oils are being sold at prices far above world bulk oil prices. These are often based on direct sales, interest in supporting local producers, ecological production, or super premium quality beyond the extra virgin standard.

Iraqi producers therefore need to make sure that they have a profitable market that is willing to pay a premium price for their oils, or they will have to be able to produce olive oil at a cost that is competitive in the world market. The first option requires the production of a product that can be differentiated and the second option requires low

Al Zaytoon oil costs and high yields.
2010

The Iraqi cuisine I observed did not include olive oil, especially in the sense of condiment quality oil used for spicing food. Olive oil was not served in the restaurants at meals. The olive oil in the hotel at breakfast was from Turkey and was quite rancid right from the bottle – that brand was sold in a local supermarket for \$1.90 for a 500 ml bottle. It is unclear to me the extent of the local market and the demand for a differentiated olive oil product either by actual quality (flavor) or because it might be produced locally.

Producing olive oil is a relatively new thing for the farmers and processors at the Al Zaytoon Association mill. They had much more knowledge about table olives. The Iraqi farmers and processors I met had little to no knowledge about olive oil quality and standards of quality. They indicated to me that there was a good market for their oil locally at a good price (\$3.50 per 500 ml bottle – an 84% premium), but the Iraqi oil (Al Zaytoon) I tasted was of very low quality. The Iraqi oil was equivalent to low quality virgin (not extra virgin) oils on the world market that are available in bulk at very low prices (< \$3 per liter – December 2010). The large supermarket I visited had no Iraqi products, but had olive oils from Spain, Italy, Lebanon, Turkey, and Syria for about \$5.08 per liter and about \$4.00 per half liter. There may be an

opportunity to sell local oils, but if the Iraqi growers and processors are banking on selling the same quality oil as their competitors at a higher price just because it is local, this may be a very small market. The price for Iraqi produced olive oil would have to be the same or lower otherwise, reflecting a need to be able to produce it at a lower cost. This is probably quite difficult, because Iraq has only small-scale producers and is therefore at a competitive disadvantage, unless their production costs are extremely low.

On the other hand, if the Iraqi producers take the opportunity to learn about making and actually make very high quality olive oils, with the minimum being - no defects (extra virgin), they might be able to differentiate their product and sell it for a high enough price to make a decent profit. They have a chance now to learn how to do it right as they are just getting started, instead of developing all sorts of bad habits and customs that could be hard to change later. There should be enough local consumers to support a local niche market. As prosperity expands, this market could grow as it has in other countries.

I also feel there is a good opportunity to sell a high quality Iraqi olive oil as an export product to the United States and Europe. I think consumers there would buy it to try, partly to support this new industry in a recovering war torn country, and once they tasted how good it is, they would buy it again. Iraqi export oil should include on the label a story about the area farmers and their new association business. It should also include the variety name (Bashiqa), harvest and processing date; and an indication that it is extra virgin grade, fresh, and heart healthy.



Erbil Supermarket olive oils 2010

Assessment: Field Observations and Discussions

December 8 & 9, 2010

o Travel through Amman Jordan

December 11, 2010

Visited Bashiqa Association Mill (NW of Arbil)

- Met with a group of growers and processors in the Al Zaytoon cooperative (I got their names the next day).
- They buy olives at about \$900 per ton in the early part of the season, because at that time most olives are sold for table olive processing at that price. Later they can purchase olives at \$650/ton when there is much more fruit for sale.



- The fruit they are buying ranges from 4-40% oil.
- Local variety Bashiqā – green table olives = 40 L oil/t, colored fruit = 100 L oil/t, black fruit = 120 L oil/t.
- Spanish varieties (mostly Manzanillo) green = 120 L oil/ton, black has not been processed yet
- They sell a 250 ml size bottle of oil for \$3.50, which is a good price for them – they can make money.
- **They need a way to determine, however, the value of olives based on oil content, so they either need a method to determine the oil content of a sample (Autolec or NIR) or just pay the growers by the amount of oil produced.**
- The mill has three Pieralisi II Molineto machines set up next to each other. One has an elevator and washer – the others do not. Capacity of “1 ton/hour”.
- The glass decantation tanks have been removed, because that process is too slow and so they do not have anything to remove excess water and sediments after the decanter other than decantation in a stainless steel tank.
- They run the mill for 6-7 hours at a time and can process 1 ton per hour (with all 3 lines running at once).
- Crushing with 5 mm screen size in hammermill
- Malaxation temp is 65°C water jacket and 35°C paste.
- Paste injection into the decanter can be regulated – slower = better quality oil.
- Oil from the decanter goes into a large stainless steel tank for 2 days – it is purged and then put into blue table olive plastic fermentation barrels for storage.
- After 2 weeks in storage in the barrels, the oil is filtered with diatomaceous earth and paper filters and bottled.
- I tasted some of their early harvest Bashiqā variety oil. It was vegetative-green, herbaceous and quite pungent. It was also slightly bitter. BUT it was fusty (fermented) and they confirmed that the olives had been allowed to sit around for a few days prior to processing.
- They asked for clear written protocols for making high quality oil and had an interest in making good extra virgin oil for sale in the USA.
- They have Picual, Arbequina, Arbequina I-18, and Hojiblanca planted just recently as new varieties.
- They also have Bashiqā, Khastawy, and Digall as local table varieties plus Gordal (Sevillano) and Manzanillo table olives from Spain.
- The orchard next to the mill had 7 year old trees that were irrigated 2 x per week in basins around each tree. There is some discrepancy as to irrigation frequency.
- They were fertilized with animal manures – about 2 kg per tree per year.
- The trees were quite small for being 7 years old
- The trees had been pruned to multiple trunks and the suckers had been removed periodically.



Al Zaytoon Association Mill 2010



Al Zaytoon Association Orchard 2010

- Some trees had brown leaves and branches which looked somewhat like the symptoms of Verticillium Wilt symptoms or had been severely drought stressed and sunburned.
- Past history of crops, mostly grains, lessens the likelihood that the problem is Verticillium Wilt
- Some growers have drip irrigation systems on 1-2 Ha of land.
- Wells are about 150 m deep with water at about 30 m – producing 450m³/hr
- **Discussed varieties, propagation, pruning, fertility, irrigation, weed control, harvest, fruit handling, milling, oil storage, bottling, and marketing.**
- **Milling should cover crushing, malaxation, decanter plates, vertical centrifuge, tank purging, filtering, and oil storage.**
- Met with USAID-INMA regional operating manager – Abeer M. Saleh for logistics.
- Met with Samir Esmail – General Manager for the Northern Iraq Region – Ministry of Agriculture & Water Resources – working in the area of Horticulture and Forestry and the 2nd in command who is a Horticulture expert. We discussed:
 - 500 new Ha of olives for oil planted each year.
 - The Ministry has in the past and still is donating 1.2 Ha worth of trees to farmers and paying for 90% of the drip irrigation system for the trees.
 - They have their own nursery with mother trees of some Northern Iraq varieties and outside varieties.
 - Also have their own oil mill in Bashiqa, which is also an association of growers.
 - Also work with some private large growers, one with 5,000 trees (24.5 Ha) and another with 14,000 trees (70 Ha).
 - They indicated that they needed help with all aspects of agricultural production even beyond olives to stone fruits, pistachio, almonds, and IPM, fertilization, irrigation, pruning, propagation, and new varieties.
 - They want to bring in some new varieties; focusing on olives for oil.
 - Met Ashgi Ahmed USAID-Inma staff working on agricultural projects 07504632423.

December 12, 2010

- Visited Bashiqa Association Mill grower's orchard
- Met with the following people (names given to me in writing by translator)
 - Silam Sileem Jadik – Association Manager
 - Ryansalw – Engineer of Association Mill
 - Dasin Suliman – Assistant of Association
 - Ayad Al-Bna
 - Salwan Hussin-Midiya
 - Emad Edo-Midia
 - Monawer Adel
 - Evansalw – Translator/Manager
- Discussed irrigation – with furrow and drip systems – timing and volume.
- They told me that they have been applying 60,000 liters for 200 trees every 3-5 days, which takes 2 hours to apply via drip. This is impossible and way too much water. Something is wrong with their math or numbers were wrong in the translation
- Drip system has one emitter right next to the tree trunk.
- **Need info on when to irrigate – emphasis on springtime, less in the summer. Want 40 cm growth in year with heavy crop + 50 kg fruit per tree and 204 trees/Ha = 10 tons per Ha.**
- **Need to know how irrigation influences growth, production, fruit size, oil flavor, oil color.**



Al Zaytoon Association orchard 2010

- **Discussed fertilizing olive trees with conventional nitrogen sources (urea & DAP).**
- They have been applying sheep manure at a rate of about 2 kg per tree = 8-12 kg of actual N per Ha.
- **Discussed methods to reduce alternate bearing.**
- Tree bloom is in early April.
- Some trees showed sunburn.
- Bermudagrass problem.
- **Discussed pruning – opening up larger trees with one or two saw cuts – small trees – leave alone so growth will not be stunted with over pruning.**
- I was told they had harvested 500 kilos on one tree, which is impossible. Normal high yields would be about 50 kilos per tree on a large tree and the most I have ever heard of is about 130 kilos per tree (which is 26 tons per hectare – 12 tons per acre).



Sunburned olive tree leaves 2010

December 13, 2010

- Worked on presentation to growers for Wednesday, December 15th – 10:00 am meeting.
- Produced a PowerPoint presentation on olive oil – **Best Processing Protocols for Producing Excellent Quality Olive Oils in Iraq** – suitable for copying and using as a handout for growers and millers.
- Developed **Olive Irrigation Chart for Iraqi Olive Growers Based on 7 x 7 Meter Spacing.**
- Developed a PowerPoint presentation and handout on – **Best Growing Practices for Producing Excellent Quality Olive oil in Iraq.**



Ministry of Agriculture Mill 2010

December 14, 2010

- Traveled to the Bashiqa area
- Visited the Ministry of Agriculture olive oil processing mill with the manager and some association members attending.
- Peralisi “Fattoria” olive reception, blower, washer, crusher, and malaxer – BUT very small decanter – and ok vertical centrifuge.
- Kerosene boiler to heat hot water for malaxation jackets and addition to vert. cent.
- Used only once for processing rotten cull olives from the table industry.
- Left dirty with rotten fermented olive paste throughout.
- Fine machine – can make great oil – only need great olives.
- Visited old orchard with 100+ years old olive trees in an area where olives have been growing for about 1,000 years.
- Trees had been planted 3 trees per hole – just like Spain – producing about 100 kg/group of 3 trees.
- Bashiqa variety – 5-8 meters apart.
- **Needs pruning – trees are too tall – over 5 meters and touching.**



Dry shriveled fruit

- **Talked about olive knot, alternate bearing, irrigation, weed control, harvest, and fertility.**
- The demonstrated harvest with a ladder leaned into a tree.
- Visited a small-scale orchard in the same area.
- 10 year old small trees that had suffered drought stress – olives were shriveled and trees were quite small for 10 years old – grower admitted not giving them much water.
- **Discussed irrigation, weed control, fertilizers, and demonstrated pruning.**
- Urea and DAP (di-ammonium phosphate) are available.
- Visited Ministry of Ag nursery near the road between Bashiqa and Mosul.
- Khabat District Minister of Ag Northern Iraq – 1999 FAO Project.
- 2 wells, 5 plastic greenhouses, 10,000 olive cutting per year – 16,000 pistachios
- Varieties available:
 - Sourani
 - Khthaery
 - Khalkhaly
 - Qesy
 - Bashiqa
 - Fathlea
 - Armeta
 - Picual
 - Arbequina
 - Hojiblanca
 - Mission
 - Manzanillo
 - Ascolana



Ministry of Agriculture greenhouse for olive cuttings 2010

December 15, 2010

- **Presentation to Growers, Millers, and Ministry of Ag Personnel USAID-Inma office in Erbil:**
 - Part 1: **Overview of world olive oil production** (10 am to noon).
 - Part 2: **Growing olives in Iraq** (noon to 3 pm).
 - Part 3: Processing olives (we ran out of time and did not get to this part).
 - We tasted 4 oils with the attendees and staff (1) from Spain in a 250 ml tin can purchased at a local sidewalk market for \$2.00. It tasted like Picual, but old and slightly rancid; (2) from Turkey in a 250 ml bottle purchased at a local sidewalk market for \$2.00. It tasted bland and refined, but had no defects; (3) the Al Zaytoon oil made this year (recently bottled) in a 250 ml bottle. It tasted strongly fermented as made from rotten olives; and (4) a freshly made Arbequina olive oil made in Italy that I brought with me directly from a recent visit there. It tasted fresh, very fruity, with a slightly bitter and pungent mouth feel. It had no defects.
 - **Tasting discussion centered around fruit quality and the characteristics of a good oil.**
 - Attended by 7 people and USAID-Inma staff Laith J, Jallo plus Al Williams
 1. Rayan S. Kheder
 2. Salwan H. Kadi
 3. Dasin H. Savo
 4. Selyman Omar Ali
 5. Tahssin Jaboon
 6. Silam Sileem Jadik
 7. Nujat M. Oadir

- Attendees were very pleased and were complimentary of the information. Much lively discussion occurred during the presentation among the producers, who had lots of questions.
- I gave a pdf of the PowerPoint presentation to USAID-*Inma* for translating and distribution.

December 16, 2010

- Visited Citadel – old city of Erbil
- Visited grocery store to look at available olive oils and prices
- Wrote report

December 17, 2010

- Finished report
- Wrote PowerPoint presentation on olive oil best growing practices for Iraqi growers – suitable for copying and distribution to growers as an educational tool.



USAID-*Inma* Presentation 12-15-2010

December 18 & 19

- Travel back to California.

Assessment: Summary of Problems Observed

Olive Growing Problems:

1. Young trees are very small for their age. Trees 7 to 10 years old are only one-third their normal size, leading to low production and very slow return on investment.
2. Young trees are not irrigated enough, possibly due to a lack of water, or partitioning water to other crops, or just not understanding the value of frequent irrigations.
3. Young trees have too much weed competition - poor weed control reducing production.
4. Young trees have inadequate nutrition – not enough nitrogen fertilizer was being used.
5. Young trees not being pruned properly – in some cases too much, in other cases not enough.
6. Most trees had multiple trunks, ok for hand harvest, but inefficient for trunk shaker harvest.
7. Some trees were sunburned, possibly caused by severe drought stress or Verticillium wilt.
8. Some growers were using furrow irrigation, which is inefficient and wastes water.
9. Growers with drip irrigation had emitters right next to the trunks.
10. Drip irrigation frequency and duration was not understood by farmers.
11. Growers said they have problems with hot winds, which could reduce fruit set during bloom.
12. Climate provides inadequate rainfall to grow olives profitably without irrigation.
13. The farmers have a limited number of varieties available – actual performance information about local Iraqi varieties for comparison is unknown (vigor, precocity, annual bearing, yield, oil content, cold hardiness, disease resistance, fruit size, maturity date, pollination requirement, oil flavor, oil polyphenol content).

14. Parcels are small, which limits economies of scale and ability to afford machines or tools that would be worthwhile investments in larger parcels. Things like: mini shakers or electric rake harvesting aids, ground nets for harvest, tractors and tillage equipment for cultivation and weed control, drip irrigation systems, fertilizer injectors, or herbicide sprayers.
15. Poor production on larger trees – alternate bearing (large crop one year and almost nothing the next) caused by poor pruning, irrigation, fertility, and crop size management.
16. Old trees are too tall, shaded, difficult and expensive to harvest, with low productivity.
17. Old trees were not irrigated sufficiently or at the correct/best time of year. There is a lack of understanding of the importance of irrigation.
18. Some trees, especially in the nursery had mites that were stunting growth.
19. Farmers were waiting too long to harvest their fruit and processing over-ripe fruit. They do not understand that the best quality oils come from early harvested fruit.



Olive Processing Problems:

1. The Al Zaytoon Association Mill was purchasing early season table olives with low oil content at prices competitive with table fruit – and paying way too much.
2. Much of the oil produced is based on a salvage operation of reject olives from the table industry, which produces VERY low quality oil.
3. There is a lack of olives grown exclusively for oil.
4. They have no laboratory equipment to determine oil or moisture content or quality parameters such as free acidity %, and therefore no way of knowing at the time of purchase how much the olives are really worth. **Al Zaytoon II Molinetto Mill 2010**
5. The equipment I saw was not cleaned properly. Residues from one batch could easily contaminate the quality of the next batch of oil.
6. The Al Zaytoon Association Mill lacked a vertical centrifuge to clean the oil at the end of the separation process (out of the horizontal decanter). This produced oils with a very high water and sediment content, which created a logistical problem in purging those sediments prior to storage



and bottling. It also creates a quality problem as the larger than normal quantity of sediment ferments and ruins the oil's flavor.

7. Both mills I observed had inadequate stainless steel storage tank capacity. The Al Zaytoon mill was storing oil in used plastic table olive pickling barrels, which is not appropriate for high quality oil.
8. The operators of the mills had a lack of understanding of the basic manipulations at their disposal for influencing mill production efficiency or the quality of their oils such as: washing fruit, leaf removal, stem removal, paste fineness, malaxation temperature, malaxation time, vertical centrifuge water volume and temperature, sediment purging, and filtration.
9. The olive oil farmers and processors did not express a passion for making high quality olive oil or using/tasting fresh olive oil in their food. I don't think they really know much about olive oil. The passion for olive oil certainly exists in many parts of the world (their competitors) and is reflected in quality, fancy bottles, nice labels, and promotional efforts.



Al Zaytoon Mill storage tanks for oil 2010



Dirty malaxation tank 2010

Assessment: Summary of Positives – Opportunities

Olive Growing Positives:

1. No olive fruit fly damage observed – this is a huge problem and costly pest to control in most parts of the world.
2. No significant disease problems (did not observe any foliar or bark diseases).
3. Climate for growing olives seems to be quite adequate (low risk of freeze damage).
4. They have trees growing in the area that are over 100 years old.
5. Fruit quality on the trees looked quite good.
6. Some irrigation water is available.
7. There seems to be a lot of adequate land available to grow olives, moderate slope, deep well drained soil, and without significant soil mineral toxicity



problems.

8. Some new varieties are being evaluated and are available (Picual, Hojiblanca, Arbequina, Manzanillo, Mission, Gordal Sevillano).
9. Growers are enthusiastic and interested in new information and seem willing to learn.

Olive Oil Processing Positives:

1. The mill equipment and buildings were new and up to date – very similar to olive oil processing equipment in other parts of the world that produce very high quality olive oils, so they have the potential to produce very high quality oils as efficiently as anyone.
2. Since the mills are located close to the orchards, there should be very little time lag between harvest and processing of fruit into oil.

Best Management Practices

Iraq Best GROWING Practices

- PowerPoint presentation and handout for growers (attached)
 - Site Conditions
 - Varieties
 - Tree Spacing
 - Planting
 - Tree Training & Pruning
 - Irrigation
 - Fertilizing
 - Weed Control
 - Harvest Efficiency
 - Table Olives

Iraq Best PROCESSING Practices

- PowerPoint presentation and handout for growers (attached)
 - Variety Characteristics
 - Fruit Handling
 - Washing
 - Crushing
 - Malaxation
 - Vertical Centrifuge
 - Oil Storage
 - Mill Cleanliness

Recommendations

1. Provide farmers and processors with follow up “Best Management Practices” information in writing and via group presentations.
2. Set up an olive oil taste panel to teach the olive oil producers about olive oil quality (international standards, laboratory evaluation tests, and sensory evaluation). If they are going to try to make good olive oil, they need to know what good olive oil is.
3. Put in some demonstration orchards
 - a. Show and compare new varieties with existing Iraqi varieties
 - b. Demo drip irrigation systems and irrigation timing
 - c. Show proper weed control methods and how that influences growth and productivity
 - d. Show how fertilizers can help advance growth and productivity
 - e. Show how to properly prune young and mature olive trees
 - f. Demonstrate harvest and olive transport techniques
4. Demonstrate renewal pruning on some old orchards.
5. Have an olive oil expert present when they make olive oil to show them how to make really good oils – not just how to run the equipment.
6. Conduct some marketing studies regarding the potential for sales of local Iraqi olive oils.
7. Enter some high quality fresh Iraqi olive oils into international competitions starting with the Los Angeles competition in May 2011.
8. Make a test shipment of olive oils to be sold in the USA market.
9. Help the Association mills with procurement of:
 - a. Al Zaytoon Mill needs a vertical centrifuge to clean the output from 3 decanters
 - b. Both mills need more stainless steel tanks for oil storage and purging sediments
 - c. Laboratory equipment: Autolec or NIR for analysis of oil & water content, and free acidity percent.



Paul Vossen's sensory panel



Vertical centrifuge



Stainless steel storage tanks for oil