# APPENDIXES

| Guidelines and Objectives | | Measures | Expected impacts of the measures | | | |
|---|---|---|---|---|---|---|
| Please Note that: Negative figure is a cost ; positive Figure is a benefit/revenue | | | Decrease/Increase in Irrigated Area | Loss in Agricultural Value (Millions $) | Gain in Agricultural value (millions $) | Investments costs' for implementation of water or agricultural projects (millions $) |
| Recovery of Operational and maintenance Costs of the Network (considering an homogenized water supply in the valley and a shift to treated waste water in the north) | | Increase of Public Water prices in the Valley | ∅ | ∅ | ∅ | ∅ |
| Change to 823 m3/dunum/year for all kind of crops | | | | 13,36 (Loss of citrus and bananas production in the north of the valley) | 31,893 | ∅ |
| Reallocation of freshwater from the agricultural sector to the domestic sector | | | | | | |
| | Shift to Treated Waste Water in the north of the Jordan Valley -blending ratio 1:4,5- | | ∅ | 1,924250[1] | ∅ | 1,387882 (0,735700 from local investments) |
| | New water mobilisation in the JV linked to the shift to treated waste water | Transfer to Amman | ∅ | ∅ | ∅ | Existing facility |
| | | Desalination plant | ∅ | ∅ | ∅ | Existing facility |
| | | New dams (used in irrigation) extra 25 Mcm | ∅ | ∅ | ∅ | U$ 38 millions[2] |
| | | **Total** | ∅ | **-1,9** | ∅ | **-39,4** |
| | **Free trade agreement** | | ∅ | 18,1[3] | ∅ | ∅ |
| | Diminution of the Irrigated Surfaces planted with Bananas: Impact of the Free trade agreement | Replacement of bananas by date palm trees in the south of the valley (bananas irrigated thanks to surface freshwater) | ∅ | -6,9711 | 14,4562 | we consider that, on the long term, the costs of implementation of date palm orchards is equivalent to the costs of implementation of banana orchards |
| | | Replacement of bananas by date palm trees in the south of the valley (bananas irrigated thanks to groundwater) | ∅ | -3,25 | 6,75 | |
| | | Disappearance of half the surfaces of Bananas -replacement b vegetables in the north of the valley- | ∅ | -1,2225 | 1,793 | ∅ |
| | | Bilan bananas (freshwater) | ∅ | **-29,5436** | **22,9992** | ∅ |
| | Increase waste water reuse in the Jordan Valley (Middle + South) | | ∅ | ∅ | ∅ | 150 |
| Extension irrigated perimeters in the South Ghor (14,5 km project) + implementation of a public management | | | 51 000 dunums | ∅ | 62,9 | 33,78 |
| **Bilan Valley (costs of the measures in the Jordan valley)** | | | **51000 dunums** | **-44,8036** | **117,7922** | **-223,18** |

[1] Obtained thanks to a linear extrapolation of the results obtained for two blending ratio 1:3 and 1:5

[2] Source: JVA 2003-2008 Strategic Plan

[3] i.e. 8% of the total agricultural value produced in Jordan

| Table X Continued: Expected impacts of the measures | | | | | | | |
|---|---|---|---|---|---|---|---|
| O & M costs ($/year) or other costs | Potential Fresh Water Savings (Mcm/year) | Costs of water mobilization and transfer to consumption centres linked to water projects (including O&M costs) or use in irrigation | Relative gain -Comparison of water mobilization and transfer from DISI -0,801 $/m3- in terms of energetic costs | Bilan of Annual Costs or gains (US$ millions) non discounted | Schedule of implementation | Cumul over the next 20 years annual costs or gains (US$ millions) discounting rate of 8% | Cumul over the next 20 years investment costs (US$ millions) discounting rate of 8% |
| ∅ | | ∅ | ∅ | 5,48 | Valid from 2005 | 59,3 | |
| ∅ | | ∅ | ∅ | 18,533 | Valid from 2005 | 200,49 | |
| | | | | | | | |
| (0,165) * 30 mcm (Treatment costs) average cost of water treatment | The total amount of water used in agriculture in the northern part of the valley increases from 120 to 145 Mcm/year and 15 Mcm/year of extra freshwater will be used in the valley. Cost: O&M costs at 0,06 $/m3 | -0,06*25 Mcm = -1,5 | | -8,37 | Valid from 2010 (Investments done between 2005 and 2010) | -75 | -1,39 |
| | | -0,423 * 30 Mcm | (0,801-0,423)*30 mcm | 11,35 | Progressive from 2005 to 2010. then constant | 101,7 | |
| | | -0,803*10 Mcm | (0,801-0,803)*10 mcm | -0,02 | Valid from 2005 | -0,22 | |
| | | | | ∅ | Valid from 2005 | ∅ | -38 |
| **-4,95** | | **22,2** | **11,15** | **2,96** | | **26,48** | **-39,39** |
| ∅ | ∅ | ∅ | ∅ | - 18,1 | Valid from 2005 | -195,8 | |
| ∅ | 20,41 (freshwater) | 0,423*20,41 Mcm | (0,801-0,423)*20,41 Mcm =7,715 | 15,2001 | Progressive shift from 2005 to 2010 (one fifth every year then constant | 136,2 | |
| ∅ | 9 mcm (brakish groundwater) | =0,1*9 Mcm =0,9 | Relative Gain- no Treatment of water (0,380* 15 Mcm=5,7 millions) | 10,1 | Progressive shift from 2005 to 2010 (one fifth every year then constant | 90,5 | |
| ∅ | 0,81 (freshwater) | 0,423*0,81 Mcm | (0,801-0,423)*0,81 Mcm =0,3062 | 0,8767 | Progressive shift from 2005 to 2010 (one fifth every year then constant | 7,9 | |
| ∅ | **21,22** | **0,423*21,22 Mcm** | **(0,801-0,423)*21,22 Mcm** | **-2,0232** | | **38,76243435** | |
| (0,165)* progressive amount from 2005 until 2020 where the amount wil reach 45 Mcm (=43,3 Mcm over the next 20 years) | 40 to 45 Mcm a year of blended water will be used in the Jordan Valley to irrigate the new perimeters to be implemented | -0,06*42,5 Mcm=-2,55 | ∅ | | Progressive shift from 2005 to 2020 then constant | -43,3 | -150 |
| Paid by water bills (0,006 $/m3) | | | ∅ | 60,35 | Investment between 2005 and 2010. And development of irrigated surfaces in 10 years | 428,5 | -33,78 |
| **-7,115** | **21,22 Mcm** | **-32,19 i.e. 0,526 $/m3 (for 61,22 Mcm/year)** | **19,17 i.e. 0,313 $/m3** | **85,30** | | **710,2324344** | **-223,17** |

| Presence/Absence of the Measure considered | | Comparison of the two scenarios: (Costs and relative benefits of the virtuous scenario) minus (costs and benefits of the 'business as usual' scenario) Annual Costs | Comparison of the two scenarios: (Costs and relative benefits of the virtuous scenario) minus (costs and benefits of the 'business as usual' scenario) Investment Costs |
|---|---|---|---|
| Business as Usual | Virtuous scenario: change in water management | | |
| NO | YES | 59,3 | |
| NO | YES | 200,49 | |
| | | | |
| NO | YES | -75 | -1,39 |
| YES | YES | 0 | 0 |
| YES | YES | 0 | 0 |
| YES | YES | 0 | 0 |
| | | | |
| YES | YES | 0 | 0 |
| YES | YES | 0 | 0 |
| YES | YES | 0 | 0 |
| YES | YES | 0 | 0 |
| | | | |
| YES | YES | 0 | 0 |
| YES | YES | 0 | 0 |
| | | 184,79 | -1,39 |

| Guidelines and Objectives | Measures | | Table X continued: Expected impacts of the measures | | | |
|---|---|---|---|---|---|---|
| Please Note that: Negative figure is a cost ; positive Figure is a benefit/revenue | | | Decrease/Increase in Irrigated Area | Loss in Agricultural Value (Millions $) | Gain in Agricultural value (millions $) | Investments costs' for implementation of water or agricultural projects (millions $) |
| | Implementation of the By-Law | | ∅ | ∅ | ∅ | ∅ |
| | Disappearance of Any Irrigated Olive trees orchards irrigated thanks to groundwater[4] | | 82 212 dunums (72 535 in AZB) | -11 | ∅ | -32,5 (Buy out wells) |
| | Disappearance of Any production oriented towards exportation developed in the Highlands | Fruits | -1000 | -1,77 | ∅ | -22 (Buy out wells) |
| | | Vegetables | -22500 | -9,45 | ∅ | -12,9 (Buy Out wells) |
| | Total costs buy Out of wells | | | | | -67,4 |
| | Use of treated Waste Water in the Highlands + supply to the farmers | | ∅ | ∅ | ∅ | 0,8 millions As Samra is not considered since it has been compiled when we studied the increase of treated water use in the Jordan Valley |
| Irrigation Advisory Service and on farm Water Management | | | ∅ | ∅ | ∅ | ∅ |
| **Bilan Highlands (costs of the measures in the Highlands)** | | | **105712 dunums (90 635 in AZB and 15077 in Yarmouk)** | **-22,22** | ∅ | **-68,2** |
| **TOTAL (Relative Added costs/benefits linked to the implementation of the different measures) Highlands and Jordan Valley** | | | | | | |
| **Costs linked to the scenarion 'business as usual'** | **Cumulated Value over the next twenty years** | | **-24500** | **-74,98** | ∅ | ∅ |
| **TOTAL (Relative Added costs/benefits linked to the implementation of the different measures) comparison with Business as usual scenario** | | | | | | |

[4] We have considered the irrigated surfaces planted with olive trees in the following areas : Eastern desert, Transition and Suburban Area (cf. Chapter IV)

Table X Continued: Expected impacts of the measures

| O & M costs ($/year) or other costs | Potential Fresh Water Savings (Mcm/year) | Costs of water mobilization and transfer to consumption centres linked to water projects (including O&M costs) or use in irrigation | Relative gain -Comparison of water mobilization and transfer from DISI -0,801 $/m3- or savings in terms of energetic costs | Bilan of Annual Costs or gains (US$ millions) non discounted | Schedule of implementation | Cumul over the next 20 years annual costs or gains (US$ millions) discounting rate of 8% | Cumul over the next 20 years investment costs (US$ millions) discounting rate of 8% |
|---|---|---|---|---|---|---|---|
| ∅ | 5,9 Mcm i.e. 0,5 in the Yarmouk Basin and 5,4 in the Amman-Zarqa Basin (assuming that vegetables farmers will decrease their water allocation per unit of surface from 960 M3/dunum/year to 750 m3/dunum/year) it can become possible thanks to IAS, increase in irrigation efficiency... | ∅ | 0,185*5,9 Mcm | 1,01 | Valid from 2005 | 10,9 | |
| ∅ | 28,8[5] (25,4 in AZB and 3,4 in Yarmouk) | ∅ | 0,185*28,8 Mcm | -5,67 | Progressive shift from 2005 to 2015 then constant | -40,26519931 | -32,5 |
| ∅ | 1 | ∅ | 0,185*1 Mcm | -1,585 | Progressive shift from 2005 to 2010 then constant | -14,17963201 | -22 |
| ∅ | 14,625 | ∅ | 0,185*14,625 Mcm | -6,75 | Progressive shift from 2005 to 2015 then constant | -47,93476109 | -12,9 |
| | 50,325 Mcm | | 0,185*50,325 Mcm=9,3 | -14,005 | | -102,3795924 | **-67,4** |
| 0,165*5 Mcm =0,825 for industrial purposes. The irrigated purposes is considered after | 12 Mcm (7 Mcm in agriculture and 5 Mcm in industry) | 0,540*10 Mcm= 5,44 millions | -(0,540-0,185)*7 Mcm=-2,5 millions Added costs comparing to the present water exploitation costs in the Highlands Attention negative value | -6,265 | Progressive from 2005 to 2010. then constant | -55,8 | -0,8 |
| -0,5 on the five years period of implementation | 4,15 Mcm in AZB (already counted in impacts of By-Law) and 3,1 in Yarmouk (on which 0,5 due to the By-law implementation) | ∅ | 0,185* 2,6 Mcm=0,48 | 0,48 | Progressive from 2005 to 2010. then constant | 5 | -0,5 |
| **-1,325** | **64,925 Mcm/year (54,05 in AZB and 10,875 in Yarmouk)** | **-5,44** | **8,7 millions i.e 0,135 $/m3** | **-18,78** | | **-142,2795924** | **-68,7** |
| | | | | | | | |
| **-21,36** | ∅ | **-285,13** | ∅ | ∅ | | **-381,47** | |
| | | | | | | | |

[5] We have consider Olive trees are irrigated with 350 m3/dunum/year

| Presence/Absence of the Measure considered | | **Comparison of the two scenarios: (Costs and relative benefits of the virtuous scenario) minus (costs and benefits of the 'business as usual' scenario) Annual Costs** | **Comparison of the two scenarios: (Costs and relative benefits of the virtuous scenario) minus (costs and benefits of the 'business as usual' scenario) Investment Costs** |
|---|---|---|---|
| Business as Usual | Virtuous scenario: change in water management | | |
| YES | YES | **0** | **0** |
| NO | YES | **-40,3** | **-32,5** |
| NO | YES | **-14,2** | **-22** |
| NO | YES | **-47,9** | **-12,9** |
| | | | |
| NO | YES | **-55,8** | **-0,8** |
| NO | YES | **5** | **0** |
| | | **-158,1795924** | **-68,2** |
| | | **26,61040759** | **-69,59** |
| **YES** | **NO** | **381,47** | **0** |
| | | **408,08 (Relative Benefit)** | **-69,59** |

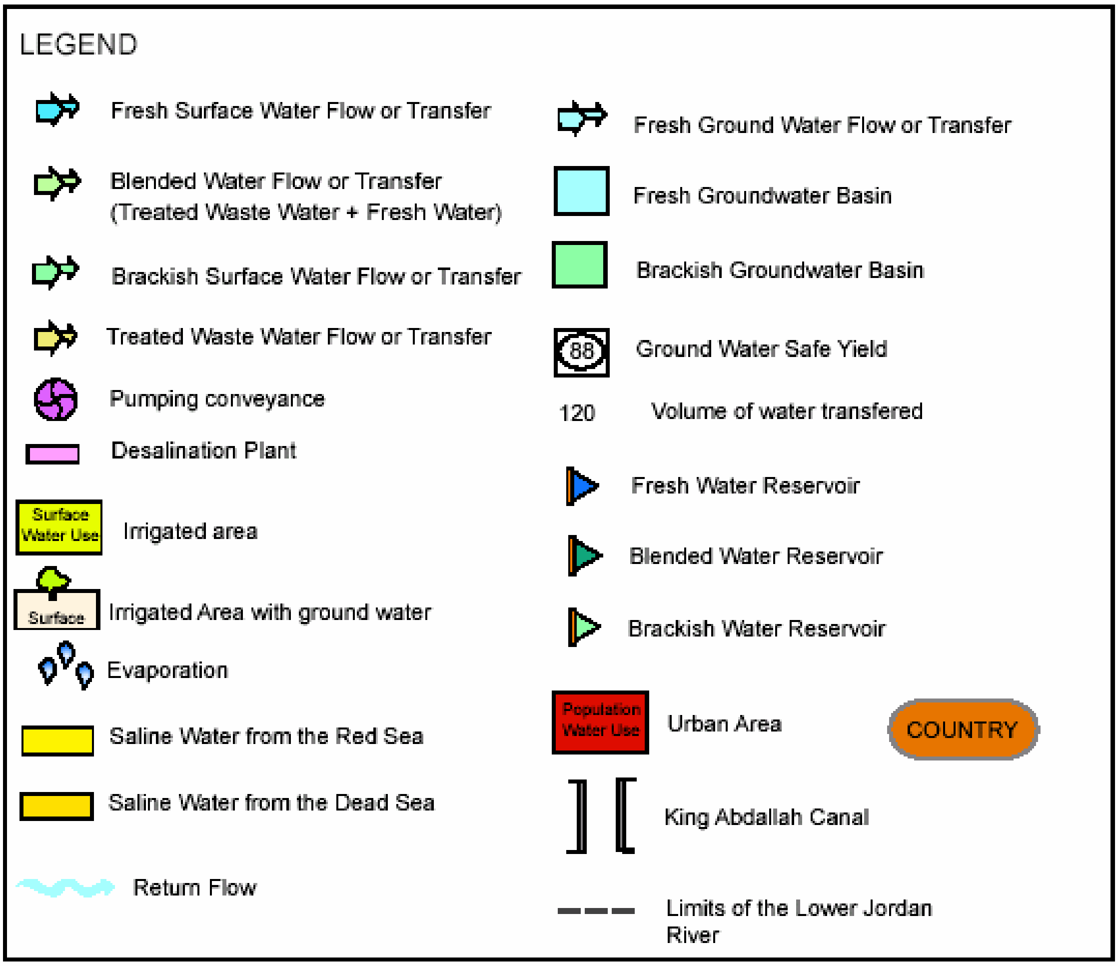
# *Appendix I: Evolution of the Water Balance in Jordan*[1] *-General Remarks, Legend and Figures Sources-*

All figures are presented in Mcm/ year and have been round off to 5Mcm/yr[2]. We used means on several years around a precise date indicated on the chart **(1950, 1975, 2000, and 2025)** and according to different given sources summarized in the table at the end of this document.
**This method implies that we don't take into account the high year-to-year variability.**

We choose a 25 **years time range** to keep the time period existing between 1950 which can be considered as "a state of art" and 1975 when a general review was done by the German Cooperation and finally 2000 for which main of the figures are available.

We used arrows to represent natural flows of river and transfers of water from one place to another. **The bigger the flow/transfer of water is, the larger the arrow is.** We used rectangles to represent the groundwater basin and geometrical shapes to represent the irrigated areas. **The larger the water reserves or the irrigated areas are, the bigger the rectangles/geometrical shapes are.**

We haven't done any difference between flood and base flow considering than both may be controlled




[1] Conception of the Charts: Courcier Rémy; Computer Graphics: Pain Patrice, Al-Qadomi Thabet & Venot Jean-Philippe, Explanation & Description: Courcier Rémy, Suleiman Rebieh & Venot Jean-Philippe.
[2] This can be explained by the important diversity of Figures from one author to another and from one publication to another.

| Scheme | Data Issue | Data Figure | Source/Estimation |
|---|---|---|---|
| | Volume of water are in Mcm/yr ; Population in inhabitants/ Surface in hectares (ha) | | * indicates the figure chosen in our Charts and round off to 5 Mcm/yr |
| **Hydrology** | **Surface Waters** | | |
| | Upper Jordan Natural Flow in Tiberius Lake | 475 | Internet:http://www.passia.org/publications/bulletins/water-eng/pages/water04.pdf |
| | | 600 | Al-Weshah, R. (2000). |
| | | 520 | Jayyousi, O. (2001). |
| | | 660 | Internet: http://www.unu.edu/unupress/unupbooks/80858e/80858E06.htm |
| | | 840 | Gotten & Gal, (1992) |
| | | 900 | Sofer, (1992) |
| | | 870 | Klein, (1998) |
| | | 890* | Internet: http://www.unu.edu/unupress/unupbooks/80858e/80858E06.htm |
| | It is interpretive that the four first figures evaluate the Net Inflow into the Tiberius Lake after 1975 | | |
| | Evaporation in Tiberius Lake | 283* | Klein, (1998) |
| | | 210 | GTZ, (1998). |
| | | 270 | Internet: http://www.unu.edu/unupress/unupbooks/80858e/80858E06.htm |
| | Natural Outflow of Tiberius Lake | 605* | El-Nasser, H. (1988). and Salameh, (1993). Calculation from the difference between Data Issue 1 and 2 |
| | | 590 | Klein, M. (1998). |
| | | 600 | Beaumont, P. (1997) |
| | Yarmouk River Natural Average Flow (All tributaries) | 455 | Jayyousi, O. (2001). |
| | | 438 | Khori, R. (1981). |
| | | 480 | Hof, F. C. (1998). |
| | Variability of the evaluations we are presenting for the Yarmouk river flow are mainly linked to the period during when the measurements have been done. We can observe the figure of 470 Mcm/year has the highest frequency and we choose it as the historical flow of the Yarmouk River before any water development projects. The following tables will present lower figures according to the Yarmouk water use of the period considered. | 300 | Qaisi. K. (2001). |
| | | 475 | Klein, M. (1998). |
| | | 170-440 | Jayyousi, O. (2001). |
| | | 400 | Internet: http://www.unu.edu/unupress/unupbooks/80858e/80858E06.htm |
| | | 470* | Baker, Harza, 1955 |
| | | 467 | Salameh, E and Bannayan, H.(1993). |
| | Lower Jordan River flow into the Dead Sea | 1100-1400 | Klein, M. (1998). |
| | | 1400 | Al-Weshah, R. (2000). |
| | | 1400 | Jaber and Mohesen .(2000). |
| | | 1350* | El-Nasser, H. (1988). |
| | | 1850 | Internet: http://www.unu.edu/unupress/unupbooks/80858e/80858E06.htm |
| | | 1250-1600 | Mimi and Sawalhi. (2003) |
| | | 1500 | http://www.fsk.ethhz.ch/encop/13/en13-ch1.htm#Surface_water_resources |

| | | | |
|---|---|---|---|
| | | 1850 | http://www.gefweb.org/Projects/Pipeline/Pipeline_6/Jordan_water_Quality.pdf |
| | | 1450 | Baker, Harza, 1955 |
| | | 1350* | Personal Calculation |
| | North (Eastern) Side Wadis flow in the Lower Jordan River (Natural flow) | 65+25= 90* | NWMP, 1977, Potential surface water resources map , Baker, Harza 1955 |
| | Zarqa River flow in the Lower Jordan River (Natural flow) | 90* | NWMP, 1977 Baker, Harza 1955 |
| | | 92 | Baker, Harza, 1955 |
| | South (Eastern) Side Wadis flow in the Lower Jordan River (natural flow) | 30 | NWMP, 1977, Potential surface water resources map , Baker, Harza 1955 (total, on which 22 Base flow) |
| | | 35* | NWMP, 2004 |
| | North (Western) Side Wadis flow in the Lower Jordan River (Natural flow) | 25* | Orthofer, 2001, calculation according to Baker, Harza, 1955 |
| | Middle (Western) Side Wadis flow in the Lower Jordan River (Natural flow) | 10* | Orthofer, 2001, calculation according to Baker, Harza, 1955 |
| | South (Western) Side Wadis flow in the Lower Jordan River (Natural flow) | 25* | Orthofer, 2001, calculation according to Baker, Harza, 1955 |
| | Total western Side Wadis flow in the Jordan River | 58* | Baker, Harza, 1955 |
| | **Ground Waters** | | |
| | Yarmouk Basin | 127* | El Nasser 1991; Salameh and Bannayan, 1993 |
| | Yarmouk Basin flow drained into the Northern Side Wadis (drainage water) | 25* | El Nasser 1991; Salameh and Bannayan, 1993 |
| | Yarmouk Basin flow drained into the Yarmouk River (drainage water) | 80* | El Nasser 1991; Salameh and Bannayan, 1993 |
| | Jordan Valley Basin flow drained to the Southern Wadis (drainage water) | 22* | NWMP, 2004 |
| | | | |
| | Amman Zarqa Basin safe Yield | 88* | Salameh,E and Bannayan,H.(1993). |
| | Amman Zarqa Basin flow into Zarqa River (drainage water) | 35* | Salameh,E and Bannayan,H.(1993). |
| | | | |
| | Jordan Valley Basin safe yield (East bank) | 20* | Salameh, 1993 (30 Mcm for the entire Jordan Valley Basin, recharge occurring on the west bank considered) |
| | Jordan Valley Basin flow into the Jordan River | 30* | NWMP, 1977, Potential surface water resources map. |
| | | | |
| | For information: Water drained from the West Bank Aquifers to the Jordan Valley | 125 | http://www.gci.ch/GreenCrossPrograms/waterres/gcwater/jordan.html |
| | | 100 | http://law.onzaga.edu/borders/water.htm |
| | | 100-150 | http://www.mena.gov.ps/part340_m.htm |

| Scheme | Data Issue | Data Figure | Source |
|---|---|---|---|
| 1950s | Volume of water are in Mcm/yr ; Population in inhabitants/ Surface in hectares (ha). | | * indicated the figure choosen in our Charts and round off to 5 Mcm/yr |

| | | |
|---|---|---|
| We only present Figures which differs from the precedent table | | |
| North (Eastern) Side Wadis flow in the Lower Jordan River | 60* | NWMP, 1977 |
| Zarqa River flow in the Lower Jordan River | 70* | NWMP, 1977 |
| South (Eastern) Side Wadis flow in the Lower Jordan River | 15* | NWMP, 1977 |
| NB: Natural flows remain unchanged | | |
| Jordan river flow reaching the Dead Sea | 1255* | Personal calculation |
| Surface of the Northern plots irrigated in the Jordan Valley thanks to Yarmouk River water | 1500<br>500* | Interview M. Avedis Serpekian (JVA) October, 2003<br>Baker, Harza, 1955 |
| Surface of the middle plots irrigated in the Jordan Valley thanks to Northern Side Wadi water (East) | 1000<br>3500* | Interview M. Avedis Serpekian (JVA) October, 2003<br>calculation according the Baker, Harza 1955 (7 000 ha are classified as irrigated land but cropping recorded are around 50 % each year) |
| Surface of the Middle plots irrigated in the Jordan Valley thanks to Zarqa River water | 1000<br>2500* | Interview M. Avedis Serpekian (JVA) October, 2003<br>calculation according the Baker, Harza 1955 (5 000 ha are classified as irrigated land but cropping recorded are around 50 % each year) |
| Surface of the Southern plots in the Jordan Valley from the Southern wadis (East) | 1000<br>2 100* | Interview M. Avedis Serpekian (JVA) October, 2003<br>calculation according the Baker, Harza 1955 (4 200 ha are classified as irrigated land but cropping recorded are around 50 % each year) |
| Surface of irrigated plots in the Jordan Valley thanks to Side Wadi water (West) | 3 100* | Baker, Harza, 1955 |
| Surface irrigated in the Zor | 1 200* | Baker, Harza, 1955 |
| Surface irrigated along side wadis thanks to springs in the North | 450* | Baker, Harza, 1955 |
| Water used to irrigate the Northern plots in the Jordan Valley from the Yarmouk | 5* | Personal Rough evaluation |
| Water used to irrigate the Northern plots in the Jordan Valley from the Northern wadis (East) | 30* | 25+5 Personal Rough evaluation |
| Water used to irrigate the plots located on the West Side of the Jordan river | 35* | Personal Rough evaluation |
| Water used to irrigate the Middle plots in the Jordan Valley from the Zarqa River | 20* | Personal Rough evaluation |
| Water used to irrigate the Southern plots in the Jordan Valley from the Southern wadis (East) | 20* | Personal Rough evaluation |
| Water used to irrigate side wadis plots in the north (East) from Yarmouk basin | 5* | Personal Rough evaluation |
| Water used to irrigated plots in the Zhor from the Jordan | 15* | Personal Rough evaluation |
| NB: for the agricultural water use we used an average figure of 1 Mcm for 10 ha | | |
| Water from the Yarmouk Basin to Irbid Municipality | 0,2* | Personal Rough evaluation |
| Water from the Amman-Zarqa Basin for Amman municipality | 2* | Personal Rough evaluation |
| Population of Amman-Zarqa | 120 000* | Baker, Harza, 1955 |
| Population of Irbid | 25 000* | Baker, Harza, 1955 |

| Scheme | Data Issue | Data Figure | Source |
|---|---|---|---|
| 1975s | Volume of water are in Mcm/yr ; Population in inhabitants/ Surface in hectares (ha)<br>We only present Figures which differs from the precedent table | | * indicated the figure choosen in our Charts and round off to 5 Mcm/yr |
| | Upper Jordan Natural Flow in Tiberius Lake | 770<br>790* | Klein, M. (1998).<br>Internet: http://www.unu.edu/unupress/unupbooks/80858e/80858E06.htm |
| | The Israeli Water abstraction from Upper Jordan (Huley Valley) | 100*<br>100* | Klein, M. (1998).<br>http://www.unu.edu/unupress/unupbooks/80858e/80858E06.htm |
| | Yarmouk flow after Syrian Pumping | 380* | personnal evaluation |
| | Natural Outflow of Tiberius Lake | 70<br>60<br>70*<br>65* | ANTEA-BRL<br>Hof, F.C. (1998)<br>Klein, M. (1998).<br>Average figure chosen |
| | The Syrian Water abstraction from Yarmouk | 90* | Hof, 1998 according to the 1987's treaty between Syria and Jordan and according to the Johnston Plan |
| | The Israeli Water abstraction from Yarmouk to The Tiberius Lake | 45* | 45 El-Nasser, 1998? |
| | Israeli abstraction from the Yarmouk to the Yarmouk Triangle | 25* | El-Naser, 1998 |
| | Total Israeli exploitation of water from the Yarmouk | 70*<br>65<br>100<br>70-100 | El-Naser, (1998) & Hof H.C. (1998)<br>http://www.passia.org/publications/bulletins/water-eng/pages/water04.pdf<br>Jayyousi, O. (2001).<br>http://www.transboundarywaters.orst.edu/projects/casestudies/jordan_river.html |
| | The Israeli Water abstraction from Tiberius Lake (National water Carrier) | 420-460*<br>420-450<br>450<br>450<br>405 | Internet: http://www.passia.org/publications/bulletins/water-eng/pages/water04.pdf<br>http://www.fsk.ethhz.ch/encop/13/en13-ch1.htm#Surface_water_resources<br>http://www.gefweb.org/Projects/Pipeline/Pipeline_6/Jordan_water_Quality.pdf<br>Beaumont, P. (1997)<br>Klein, M. (1998). |
| | Irrigation return flow from Israel | 40<br>45* | Internet: http://www.passia.org/publications/bulletins/water-eng/pages/water04.pdf<br>(20 in the north + 25 in the south) Orthofer, R. (2001) |
| | Water diverted from the Yarmouk River to the KAC | 130*<br>90-110<br>100-105<br>100-110<br>135<br>125 | Hof, 1998<br>http://www.passia.org/publications/bulletins/water-eng/pages/water04.pdf<br>Jayyousi,O. (2001)<br>Qaisi, K. (2001)<br>JVA personal communication<br>NWMP, 1977 |
| | | | |
| | Lower Jordan flow after the Kac diversion and after Israeli pumping | 245* | Personal evaluation |

| | | | |
|---|---|---|---|
| | Lower Jordan flow reaching the Dead Sea | 450*<br>325 | Personal evaluation<br>NWMP, 1977 |
| | Northern Ghor irrigated Area | 6700* | NWMP, 1977 Map of Location and acreage of irrigated areas. |
| | Middle Ghor Irrigated Area | 6700* | NWMP, 1977 Map of Location and acreage of irrigated areas. |
| | Surface of the southern plots in the Jordan Valley | 4185* | 1300+1400+1485, Evaluation thanks to the NWMP, 1997 |
| | Irrigated Area along the Northern Wadis | 700* | NWMP, 1977 Map of Location and acreage of irrigated areas. |
| | Irrigated Area along the Zarqa River | 1450* | NWMP, 1977 Map of Location and acreage of irrigated areas. |
| | Irrigated Surface in the Yarmouk basin | 530* | NWMP, 1977 Map of Location and acreage of irrigated areas. |
| | Irrigated Surface in the Amman-Zarqa Basin | 5450* | NWMP, 1977 Map of Location and acreage of irrigated areas. |
| | Water from KAC to Northern Ghor | 65* | NWMP, 1977 map of Water for irrigation, average year conditions |
| | Water from KAC to Middle Ghor | 50* | NWMP, 1977 map of Water for irrigation, average year conditions |
| | Water pumped from Jordan Valley Basin to irrigate southern ghor | 10* | NWMP, 1977 map of Water for irrigation, average year conditions |
| | Water from Wadis to irrigate southern plots in the Jordan Valley | 30* | NWMP, 1975 area balances map (13+12) |
| | Water from Wadis to irrigate areas along the Northen Wadis | 10* | NWMP, 1977 map of Water for irrigation, average year conditions |
| | Water from the Zarqa River to irrigate areas along the Zarqa river | 15* | NWMP, 1977 map of Water for irrigation, average year conditions |
| | Northern side wadis discharge | 75* | NWMP, 1977 |
| | Northern side Wadis flow into the Lower Jordan River | 60* | personal calculation according to water use |
| | Zarqa River natural discharge | 85* | Khori, R. (1981). |
| | Zarqa River flow in the Lower Jordan River | 80* | Calculation |
| | Southern Side Wadis flow into the Jordan River | 5* | personal calculation according to water use |
| | Water from northern Wadis to Municipal and Industrial Use in Irbid | 3,5 | NWMP, 1977 |
| | Water pumped from the Yarmouk basin to irrigate farms in the Yarmouk Basin | 5* | NWMP, 1977 |
| | Water pumped from the Yarmouk basin for Municipal and Industrial use in Irbid | 2,3* | NWMP, 1977 |
| | Water pumped from the Amman-Zarqa basin to irrigate farms in the Amman-Zarqa Basin | 65* | NWMP, 1975 area balances map |
| | Water pumped in the Amman-Zarqa Basin for Municipal and Industrial use in Amman-Zarqa | 25* | NWMP, 1975 area balances map |
| | Water pumped from Azraq for Municipal Use in Irbid | 2,3* | NWMP, 1977 |
| | Population of Amman | 1100000* | NWMP, 1977 |
| | Population of Irbid | 360000* | NWMP, 1977 |

| Scheme | Data Issue | Data Figure | Source |
|---|---|---|---|
| 2000s | Volume of water are in Mcm/yr ; Population in inhabitants/ Surface in hectares (ha) | | * indicated the figure choosen in our Charts and round off to 5 Mcm/yr |
| | We only present Figures which differs from the precedent table | | |
| | Upper Jordan Natural Flow in Tiberius Lake | 475* | Personal evaluation |
| | Natural Outflow of Tiberius Lake | 35* | Calculation and Orthofer, 2001 |
| | The Israeli Water from Yarmouk according to the Peace Treaty, 1994 | 25* | 12 in summer + 13 in winter , Peace Treaty, 1994 |
| | Winter concession to Israel from Yarmouk | 25* | concession in winter, Peace Treaty, 1994 |
| | The Jordanian Water from Tiberius Lake according to the Peace Treaty, 1994 | 50* | 25 (retro-concession in summer) + 20 in winter + 10 desalinated water, peace treaty 1994 (NOT YET) |
| | Syrian Water abstraction from Yarmouk River | 200* | El-Nasser, H. (1988). |
| | | 160 | Internet: http://www.passia.org/publications/bulletins/water-eng/pages/water04.pdf |
| | | 180 | ANTEA-BRL. Schema directeur indicatif de gestion des resources en eau du basin du Jourdain |
| | | 170 | Jayyousi, O. (2001). |
| | | 220 | Hof, F. C. (1998). And http://jordanembassyus.org/112298002.htm |
| | | 130-180 | Klein, M. (1998). |
| | | 160-170 | Beaumont, 20002 En d of the 1980s/beginning 1990s |
| | The Israeli Water abstraction from Yarmouk to The Tiberius Lake | 70* | 45+25 (El-Nasser, 1998) & (Hof, 1998) |
| | Yarmouk flow after Syrian pumping | 240-280 | GTZ (1998). |
| | | 270* | NWMP, 2004 and Internet: http://www.jordanembassyus.org/112298002.htm |
| | Lower Jordan flow after the KAC diversion and after Israeli pumping | 150* | Personal evaluation |
| | Saline pumping from the Jordan River to Israel | 7* | Orthofer, R. (2001). |
| | Diversion of saline water from Israel to the Jordan River | 30* | 20 + 10 (Orthofer, 2001) in the north (and 15 Mcm to be rejected in the south of the Jordan Valley - Orthofer, 2001) |
| | Lower Jordan flow reaching the Dead Sea | 400 | Al-Weshah, R. (2000). |
| | | 220-250 | Klein, M. (1998). |
| | | 100-200 | Orthofer, R. (2001). |
| | | 250-300 | Salameh, E and Bannayan, H. (1993) |
| | | 290+40* | Personal evaluation |
| | Zarqa River natural discharge | 60* | Salameh, E and Bannayan, H.(1993), Jayyousi, O. (2001). + 15 Mcm of drainage water from AZB Basin |
| | Water from Tiberias to the KAC | 45* | Treaty of Peace, 1994 (storage for Jordan in Tiberius 25 + 20) |
| | Water from the Yarmouk to te KAC | 70 | ANTEA-BRL. Schema directeur indicatif de gestion des ressources en eau du basin du Jourdain |
| | | 60* | Hof, F. C. (1998). |
| | | 90 | Average on 1990-2001 according to the JVA Water Resources department database |
| | Total water to KAC before the Mukheibeh well jonction | 105* | mean of the figures observed in different articles |
| | | 90-110 | Internet: http://www.passia.org/publications/bulletins/water-eng/pages/water04.pdf |
| | | 100-105 | Jayyousi, O. (2001). |

| | | | |
|---|---|---|---|
| | | 130 | Hof, F. C. (1998). |
| | | 100-110 | Qaisi. K. (2001). |
| | | 90 | Interview: with Nayef Seder from JVA |
| | Water from Mukheibeh Wells to the KAC | 20* | Jayyousi, O. (2001). |
| | | 25 | Grawitz, B. (2001). |
| | North (eastern) Side Wadis total Base and flood flow | 56,5 | NWMP, 2004 |
| | | 40,5 | JICA, 2002 |
| | | 50* | According to JVA database + 20 Mcm of drainage water for a total of 70 Mcm (also presented in NWMP, 2004) |
| | North Wadis flow into Small Dams in the Northern Valley | 20* | Water Resources Department, JVA |
| | Non tapped water from North Side Wadis (Discharge in the Jordan River) | 20* | Personal evaluation |
| | Water from northern Side wadis to KAC | 20* | Water Resources Department, JVA |
| | Evaporation from northern Side Wadis Dams | 2* | Personal evaluation |
| | Evaporation from King Talal Dam | 2* | Personal evaluation |
| | Evaporation from Karamah Dam | 1* | Personal evaluation |
| | Water from Wadis to irrigate areas along the Northen Wadis (Upstream use) | 20* | Personal Rough Evaluation |
| | Water from the Zarqa River to irrigate areas along the Zarqa river (Upstream use) | 25* | Personal Rough Evaluation |
| | Water from Southern dams to irrigated Area along southern Wadis (hisban-Kafrein) | 25* | 10 + 15 Water Resources Department, JVA |
| | Non tapped water from South Side Wadis (Discharge in the Jordan River) | 5* | Personal evaluation |
| | Water pumped from the Yarmouk basin to irrigate farms in the Yarmouk Basin | 30* | According to JICA, 2004 and MWI database |
| | Water pumped from the Yarmouk basin for Municipal and Industrial use in Irbid | 30* | According to JICA, 2004 and MWI database |
| | Water pumped from the Amman-Zarqa basin for Municipal and Industrial use in Irbid | 20* | Water Authority of Jordan Data |
| | Water pumped from Azraq for Municipal Use in Irbid | 6* | Water Authority of Jordan Data, LEMA |
| | Water pumped from the Amman-Zarqa basin to irrigate farms in the Amman-Zarqa Basin | 60* | Ministry of Water and Irrigation Database |
| | Water pumped in the Amman-Zarqa Basin for Municipal and Industrial use in Amman-Zarqa | 70* | Ministry of Water and Irrigation Database |
| | Water pumped from Azraq for Municipal Use in Amman-Zarqa | 10* | Water Authority of Jordan Data, LEMA |
| | Water pumped from the Dead Sea Basin for Municipal and Industrial use in Amman-Zarqa | 17* | Salameh, E and Bannayan, H.(1993). |
| | Unaccounted Water from Amman-Zarqa Municipality to the Amman-Zarqa Basin (return flow) | 30* | Personal Rough Evaluation |
| | Unaccounted Water from Irbid Municipality to the Yarmouk Basin (return flow) | 10* | Personal Rough Evaluation |
| | Agricultural return flow in Amman Zarqa Basin | 15* | Personal Rough Evaluation |
| | Agricultural return flow in Yarmouk Basin | 5* | Personal Rough Evaluation |
| | Agricultural return flow along the Zarqa River | 10* | Personal Rough Evaluation |
| | For Indication: Total water pumped in Azraq | 55 | According to MWI digital database |
| | Amman Zarqa Basin flow into Zarqa River | 15* | Water Authority of Jordan Data |

| | | |
|---|---|---|
| Retreated waste water flow into the King Talal reservoir | 42 | Jayyousi, O. (2001). |
| | 40 | Qaisi. K. (2001). |
| | 50* | Average figure using WAJ database (the inflow of waste water in the As Samra Treatment plant has been evaluated at 60 Mcm/year) |
| Water from the King talal Dam to the KAC | 100 | Jayyousi, O. (2001). |
| | 85* | Personal Calculation |
| Water from the KAC to Amman-Zarqa Municipality | 45* | Salameh, E and Bannayan, H.(1993). |
| | 50* | Average Figure using the JVA database on the 1995-2003 period |
| Water from the KAC to the North-East and Northern Ghor | 60 | Jayyousi, O. (2001)., USAID, JVA (2000). |
| | 65* | Water Resources Department, JVA |
| Water from the KAC and the KTR to the Middle Ghor | 35-40 | Jayyousi, O. (2001). |
| | 45* | Water Resources Department, JVA |
| Water from the KAC to the Southern Ghor | 41 | Jayyousi, O. (2001). |
| | 25* | Water Resources Department, JVA |
| Water pumped from the JV Basin to Southern Ghor | 20* | JICA, 2004 (5+ 15) |
| Water from the North and North-East Ghor to the Jordan (return flow from agriculture) | 10* | Personal Rough Evaluation |
| Water from the Middle Ghor to the Jordan (return flow from agriculture) | 10* | Personal Rough Evaluation |
| Water from the Southern Ghor to the Jordan (return flow from agriculture) | 10* | Personal Rough Evaluation |
| Non controled water in the KAC (winter flows) | 5* | Personal evaluation |
| Irrigated Area along the Northern Wadis | 1 600* | Calculation according to DOS, 2002 and ARD, 2001 and WSSP, 2004 |
| Irrigated Area along the Zarqa River | 2 400* | Calculation according to DOS, 2002 and ARD, 2001 and WSSP, 2004 |
| Irrigated Area along the South Side Wadis | 1485* | Calculation according to DOS, 2002 and ARD, 2001 and WSSP, 2004 |
| North-east and Northern Ghor irrigated Area | 8280 | Salman, A. (2001). |
| | 11630 | Al-Weshah, R. (2000). |
| | 12100* | DOS, 2002+ GIS landuse analysis |
| Middle Ghor Irrigated Area | 9110 | Salman, A. (2001). |
| | 7770 | Al-Weshah, R. (2000). |
| | 7440* | DOS, 2002+ GIS landuse analysis |
| Southern Ghor Irrigated Area | 3950 | Khori, R. (1981). |
| | 4200 | Grawitz, B. |
| | 3400* | DOS, 2002+ GIS landuse analysis |
| Surface of the southern plots in the Jordan Valley (Hisban Kafrein) | 1660 | Jayyousi, O. (2001). |
| | 1500 | Khori, R. (1981). |
| | 1660 | Grawitz, B., 2001 |
| | 1600* | mean of the figures observed in different articles |
| The 14.5 km EGC extension non irrigated land | 6000 | Khori, R. (1981). |

| | | | |
|---|---|---|---|
| | | 4180 | Al-Weshah, R. (2000). |
| | | 5100* | mean of the figures observed in different articles |
| | Total Irrigated Land in the Jordan Valley | 24600 | Orthofer, R. (2001). |
| | | 30000 | Grawitz, B., 2001 |
| | | 23580 | Al-Weshah, R. (2000). |
| | | 22600* | DOS, 2002 |
| | Irrigated Surface in the Yarmouk basin | 5000* | WSSP GIS land use, 2004 |
| | Irrigated Surface in the Amman-Zarqa Basin | 14350* | Calculation according to DOS, 2002 and ARD, 2001 and WSSP, 2004 |
| | For indication: total irrigated areas in the Highlands | 23350* | WSSP GIS land use, 2004 |
| | Population in Amman Zarqa Municipality | 2700000* | JICA, WRMMP, 2001 |
| | Population in Irbid | 1100000* | JICA, WRMMP, 2001 |
| | M & I water consumption in Amman-Zarqa | 145* | Personal Calculation according to WAJ data (Unaccouted for water is considered) |
| | M & I water consumption in Irbid | 55* | Personal Calculation according to WAJ data |
| | Retreated waste water use in agriculture FOR Indication | 61 | Bataineh, F.; Najjar, M and Malkawi. S. (2002). AND MWI and USAID-WRPS. (2001). |
| | | 42 | Jayyousi, O. (2001) |
| | | 40 | Qaisi. K. (2001). |
| | | 61 | MWI and USAID-WRPS, (2001) |
| | For Indication: water demand in the Jordan Valley | 220 | Grawitz, B., 2001 |
| | | 218 | Jayyousi, O. (2001).1990-1999 |
| | | 140 | Jayyousi, O. (2001).1995-1999 |

| Scheme | Data Issue | Data Figure | Source |
|---|---|---|---|
| 2025s | Volume of water are in Mcm/yr ; Population in inhabitants/ Surface in hectares (ha) | * indicated the figure choosen in our Charts and round off to 5 Mcm/yr | |
| | We only present Figures which differs from the precedent table | | |
| | Lower Yarmouk flow after the Wehdah Dam | 190* | Personal evaluation according to the capacity of the Dam (110 Mcm/year) |
| | Evaporation in the Wehdah Dam | 20* | Personal evaluation |
| | Lower Jordan Flow after israeli pumping and KAC diversion | 60* | Personal evaluation |
| | Water initially diverted to the KAC | 115* | 45 from peace Treaty and 70 Mcm from the Yarmouk |
| | Lower Jordan River reaching the Dead Sea | 155* | Personal evaluation |
| | Water from the Red Sea to the Dead Sea | 1500* | Harza, 1998 |
| | Water for Irrigation Purpose at the KAC Intake | 55* | Personal evaluation |
| | Water for Municipal and Industrial purposes at the KAC intake | 60* | Personal evaluation |
| | Water from the Valley to the Amman-Zarqa Municipality | 90* | 60 + 20 from mukheibeh wells+ 10 from northern wadis |
| | Retreated waste water from Irbid to the KAC | 25* | Personal evaluation |
| | Water from the Northern wadis to the KAC | 35* | Personal evaluation |
| | Water from KAC to irrigate the North-East and Northern Ghor | 85* | Personal evaluation |
| | Water from Kac to irrigate the middle Ghor | 60* | Personal evaluation |
| | Water from Kac to irrigate the southern Ghor | 55* | Personal evaluation |
| | Water from the Jordan River Basin to the southern Ghor | 15* | Personal evaluation |
| | Flow from the King Talal Dam to the KAC | 100* | Personal evaluation |
| | Water pumped from the Wehdah Dam to Irbid | 60* | Personal evaluation |
| | Water pumped from the Yarmouk Basin to Irbid | 30* | Personal evaluation |
| | Water Pumped from the Yarmouk Basin to Irrigate farms in the Yarmouk Basin | 15* | Personal evaluation |
| | Water pumped from the AZB Basin to Irbid for domestic purposes | 20* | Personal evaluation |
| | Water pumped from AZB Basin to Amman-Zarqa for domestic purposes | 70* | Personal evaluation |
| | Water pumped from AZB for agricultural purposes in the Highlands | 20* | Personal evaluation |
| | Water from Amman-Zarqa Municipality to the Amman-Zarqa Basin (return flow) | 20* | Personal evaluation |
| | Water from Irbid Municipality to the Yarmouk Basin (return flow) | 5* | Personal evaluation |
| | Retreated waste water flow into the King Talal Dam | 75* | Personal evaluation |
| | Retreated waste water used in agriculture in the Highlands | 25* | Personal evaluation |
| | Unaccounted Water from the Amman-Zarqa Municipality to the Amman-Zarqa Basin (return flow) | 20* | Personal evaluation |
| | Agricultural Return flow in the Amman-Zarqa Basin | 10* | Personal evaluation |
| | Water flow from DISI | 100* | MWI NWMP, 2004 |
| | Water flow from Maïn | 35* | Water Resources Department, JVA |
| | Water flow from Hisban | 10* | Water Resources Department, JVA |

| | | | |
|---|---|---|---|
| | Water flow from Mujib Dam | 35 | Water Resources Department, JVA |
| | Desalinated water from the Red Sea | 50* | Personal evaluation |
| | Waste water flow into As Samra Treatment Plant | 100* | Personal evaluation |
| | Evaporation from northern Side Wadis Dams | 5* | Personal evaluation |
| | Evaporation from King Talal Dam | 5* | Personal evaluation |
| | Irrigated surface in AZB Basin | 5300* | Personal evaluation |
| | Irrigated surface in the Yarmouk Basin | 1500* | Personal evaluation |
| | Population in Amman Zarqa Municipality | 5000000* | Calculation based on demographic growth |
| | Population in Irbid | 2500000* | Calculation based on demographic growth |
| | M & I water consumption in Amman-Zarqa | 390* | Personal evaluation |
| | M & I water consumption in Irbid | 120* | Personal evaluation |

# APPENDIX II: LANDSCAPE OBSERVED IN THE DIFFERENT AGRICULTURAL AREAS IN THE LOWER JORDAN RIVER BASIN IN JORDAN[3]

## JORDAN VALLEY

### *Northern Valley or North Shunah*

Picture 1: The extreme north of the valley

Picture 2: Citrus orchard in the extreme north of the valley

[3] All the pictures have been taken by *Venot* between April and July 2003 unless otherwise stated.

Picture 3 & 4: Zone of open fied in Kreymeh and Wadi Ryan Area Area (middle-north area of the Jordan Valley)

## ***Middle valley or Middle Shunah***

Picture 5: The greenhouses area in the northern part of the Middle of the Valley (Deir Alla Area) February 2003, Source: J.Guillaud

Picture 6: Dry area in the southern part of the Middle of the valley (Karamah Area)

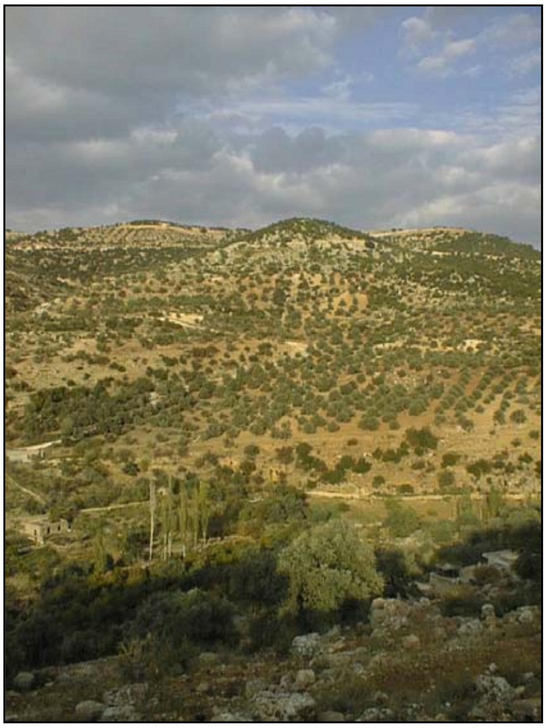
Picture 7: palm trees farm in the Middle Ghors

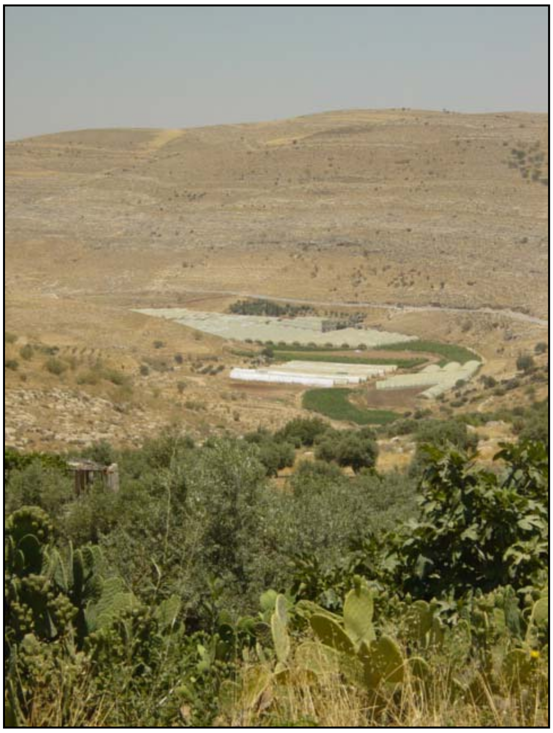
## ***Southern Valley or South Shunah***

Picture 8 & 9: “banana line” in the South of the Jordan Valley

# RAINFED UPLANDS

Picture 10: General landscape in the uplands





Picture 11: Hilly rain fed landscape
in the neighbouring of Ajloun
*Source*: R.Courcier

Picture 12: Vegetable farm
at the bottom of a small valley

Picture 13: Rain fed olive trees
*Source*: Remy Courcier

Picture 14: Rain fed vegetables in Salt's neighbouring

# PERIURBAN AREA

Picture 15 & 16: Agricultural landscape in surroundings of Amman

Picture 17: Open field farm near Amman
*Source*: J.Guillaud

## ZARQA AREA

Picture 18: vegetable farm on the Zarqa river Bank

Picture 19: Olive trees along the Zarqa River

Picture 20: Fruit tree farm on the Zarqa River bank

Picture 21: General landscape of the Zarqa River, greenhouses, open field and fruit trees along the banks

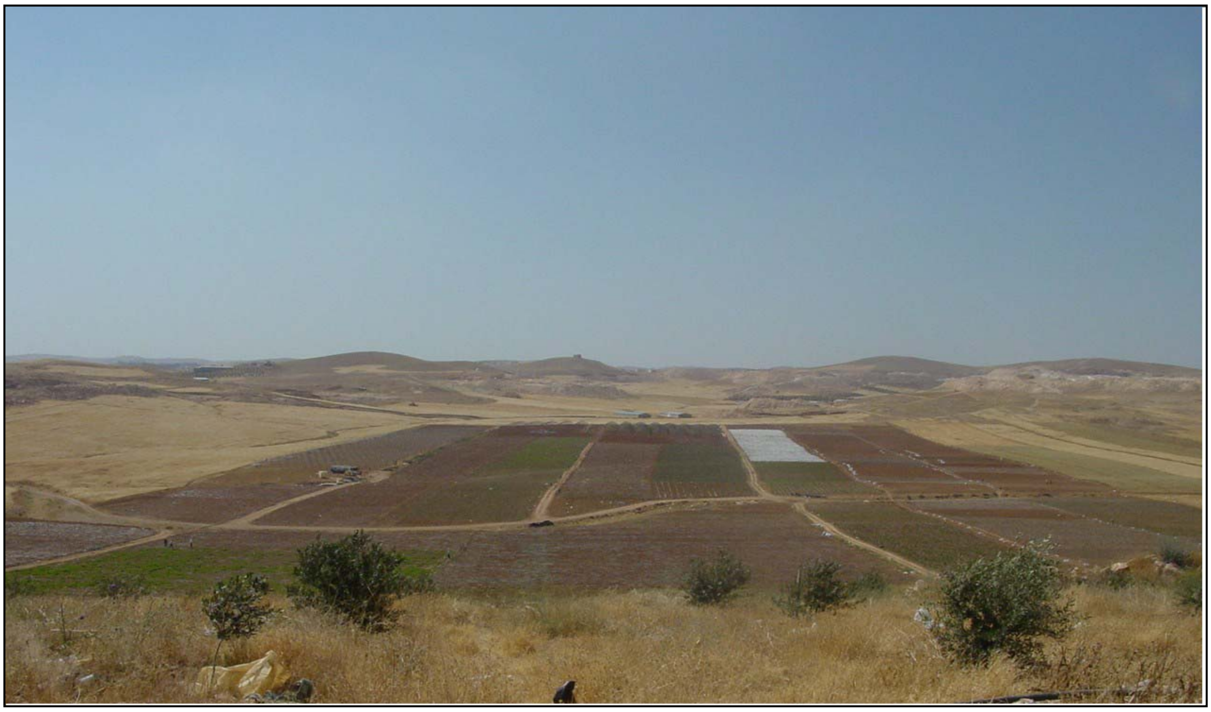
Picture 21-Bis: irrigated olive trees in a small hill above the Zarqa River

Picture 22: Mint and Parsley along the River banks

Picture 23: Small vegetable farm irrigated thanks to a *Wadi* in the uplands

# TRANSITION AREA

Picture 24: rain fed olive trees in the hilly transition area



Picture 25: Installation of a vegetable farm in the transition Area

# NORTHERN AREA

Picture 26 & 27: Irrigated vegetable farm in the north of Jordan

Picture 28 &29: Rain fed cereals fields

# EASTERN DESERT OR BADIA

Picture 30: The rain fed herding domain

Picture 31: Small plots of fruit trees in the desert

Picture 32: vegetables in open field in the middle of the desert

Picture 33: Green plot lost in the desert

Picture 34: greenhouses in the desert

Picture 35: Irrigated olive trees in the desert

Picture 36: Irrigated and cropped area in the desert

Picture 37: Classic olive trees orchards under drip irrigation in the Easter Desert

Picture 38: open field vegetable farm in the desert

Picture 39 & 40: Fruit trees farms in the eastern desert

# Appendix III: Vegetables cropped in open field or under greenhouses: operational sequence

## Vegetables in open field

### Operational sequence

For each crop, the operational sequence can be divided as follow

*Land preparation (2 ploughings and one passage of cultivator),
*Pipes installation,
*Manuring,
*Manure irrigation,
*Removal of the pipes,
*New use of the cultivator to incorporate the manure to the soil,
*New installation of the pipes, rows are generally 2 meters apart,
*Installation of the mulch (black plastic strip), one strip per line of drippers,
*Seedling of one grain or of one small plant in each hole of the black plastic strip. The choice of the holes used (and so of the sowing density) is function of the mulch and of the kind of crop,
*Irrigation and fertilization through the irrigation water,
*Manual or mechanical weeding,
*Spraying of pesticides (in general insecticides)
*Manual harvest, and transport (in several times),
*Putting off the mulch and land clearing.

*Land preparation*

Autumn crops are preceded by a short fallow during which two ploughings are done. In September manuring is done. Manure is irrigated before being mixed with the superficial soil horizon thanks to a cultivator. Spring crops are preceded by a more simple land preparation. Pipes then mulch are installed.

*Fertilization*

Vegetables cropping needs important provision of manure to maintain the rate of the organic matter in the soil. One application is done before the autumn crop (in general with chicken's manure but sheep's manure can also be used). Spring crop is not always preceded by a spreading.

Some chemical fertilizers are spread from the first weeks of cropping (ammonium sulphate). At the flowering, compound fertilizer is spread (20/20/20), all these fertilizer are spread thanks to the fertigation technique.

*Transplanting and seedling*

Purchase of seeds or small plants constitutes an important cost. Nurseries services are sometimes used by the farmers to avoid the seeds' handling

*Weeding*

In most of the cases, the manual weeding, added to the chemical one, is done by daily workers. Each crop is weeded two or three times.

*Plant pest control*

Every 7 to 10 days, plant pest control products are sprayed on the crops.

*Irrigation*

Irrigation period are regularly distributed along the year.

*Harvest, conditioning, transport, selling*

Vegetables are put in polystyrene boxes and sold generally in the central markets.

*Common grazing*

After harvest, farmers if they do not have any animals let the breeders grazed the plants for 2,5 to 3 JD/dunum before the next land preparation.

# *Vegetables under greenhouses*

Greenhouses are constituted by metallic hoops on which a translucent plastic can be found from September to May. One greenhouse is 60 meters long; 8 meters large and 3.5 meters high. Between two greenhouses an empty space of one to two meters is let without any crops. Each greenhouse thus covers 650 m².

## Operational sequence

At the end of September, beginning of October, before the Tomato (or cucumber) crop, two deep ploughings are done. Between these two labours, one cultivator run is done.

*Manure (chicken or lamb's one) is spread once or twice a year before the beginning of each cropping season (October and April), nine pipes are installed in order to humidify the greenhouse,
* Pipes are removed to run the cultivator once more,
* The translucent plastic is newly installed,
* Pipes are again installed, one line every meter,
* Mulch is installed, along the pipes lines
* Seeds are transplanted in October/November;
* The irrigation is done 2 or 3 times each week then one time after each picking.
* Chemical fertilizers (ammoniac, compound fertilizers) are used through the irrigation water (fertigation technique) and the plant pest control products are sprayed in the greenhouses thanks to a tanker,
* There is not too many work for the weeding because of the soil sterilization,
* After each picking, the workers remove the dead leaves; vegetables are put in polystyrene boxes,
* Between April and May, the translucent plastic is removed,
* After the last harvest, plants are digging out, the mulch is burn and the pipes will be reused during the next cropping season.
* Soil is ploughed ones more,
* Soil is sterilized to allow a new cycle of cropping

*About the harvest*

This one can last several months, for example tomatoes are picked once or twice a week from December to May.

*About the soil sterilization*

From June/July, the greenhouses are not cropped. In July/August the soil is sterilized thanks to gas or thanks to the solarization technique in order to get rid of the weeds and the soil parasites (for example nematodes)

The first sterilization method consists in an injection of a toxic gas (methyl bromide). After one ploughing, pipes and small bottle of gas are installed under a thick plastic tarpaulin which covers the entire greenhouse surface. The soil is irrigated in order to saturate it with water, and then gas bottles are pierced in order to let the gas being spread. The tarpaulin is removed 5 to 7 days after and some farmers plough the soil another time to remove all the gas traces. Another technique consists in dissolving the gas in the irrigation water (at 90 to 100°C) and in distributing it through the emitters under the mulch lines.

The second sterilization technique is called *solarization*. After one ploughing, the soil is entirely covered with a plastic tarpaulin under which 15 to 20 pipes are installed. During one week, an important irrigation is done (once every two days). Soil is saturated in water and deprived of oxygen. This method can last between two weeks and one month and it is less efficient than the methyl bromide method.

The soil sterilization permits to maintain high yields and decrease costs of weeding and pest plant control. The Ministry of Agriculture, following international laws for the environment encourage since 5 years the solarization technique in order to avoid the use of the methyl bromide, a polluting gas[4].

*Greenhouses displacement*

After 5 years of cropping, farmers observe a yield decrease. The reasons of such decrease are not clear. It might be linked to a loss in the efficiency of the soil sterilization; it might be linked to a soil salinization as well, linked to an over-fertilization… Only the consequence is clear: farmers need to move their greenhouses every 5 or 8 years.

[4] An interdiction of such gas is planned for 2005

# *Appendix IV: Citrus farms: operational sequence*

*Pruning*

The aim of pruning is to eliminate dead branches. It is generally done by Egyptian daily workers.

*Fertilization*

In general lamb manure is spread at the bottom of each tree once every two years at the first rainfalls. In winter, nitrogen is brought. Compound fertilizer is spread at the flowering and potash is added in September to favour fruits formation.

*Weeding*

Weeding is done two or three times a year: two times in winter (at the beginning and at the end) and eventually one time in summer. This work is done by daily workers who mainly use a hoe.

*Pest plant control*

Lime with insecticides product is applied once every 2 or 3 years on the trunks to avoid an invasion of aphids.

Sticky oil is applied to the leaves in summer if insects' attacks are recorded. The application is generally done once every two years.

In winter a friction is done to get rid of the lichen developed on the trunks because of the humidity.

*Irrigation*

Irrigation is done from April to the first rainfalls (in September/October). Each plot of trees is generally irrigated every 15 days (more often on sandy soil)

*Harvest, conditioning, transport and selling*

Fruits are stocked in polystyrene boxes, transported to Amman or Irbid and sold in the central markets.

# ***Appendix V: Farms in the Highlands, Investments and return on investments***

We will here evaluate the prices of the investments done in farms in the Highlands (mainly well and land) and will try to draw some conclusions as far as return on investment is concerned. We will present prices in 2001-JD or 2001-$. Our evaluations are drawn from surveys realized between March and September 2003.

If we consider a well allowing the irrigation of 250 dunums (and around 250 meters deep) we can present the following prices:

- ✓ Land➔ 50 000 JD (70 000 $) 300 JD/du[5]
- ✓ Digging of the Hole and pumps➔ 150 000 JD (210 000 $)
- ✓ Electric System ➔ 12 500 JD (17 500 $)
- ✓ Divers (Wages/buildings…)➔ 25 000 JD (35 000 $)
- ✓ Big pipes ➔ 12 500 JD (17 500 $)
- ✓ **Total costs around 250 000 JD (350 000$) and 200 000 JD for the well.**

A well can be used during 25 years without any big investment on it. After that new investments are needed (deepening of the well, replacement of the inner surface…). These costs can be evaluated at 30.000 JD -42.000 $.

After these economic considerations, we can focus on the financial aspects: how many years are needed to reimburse the initial investment the farmer has done?

| Year | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | MEAN |
|---|---|---|---|---|---|---|---|---|
| Price (current- JD/Ton) | 101 | 121 | 109 | 132 | 101 | 101 | 94 | 110 |

Price of Tomato in the central market of Amman[6]

We will first study the case of a vegetables farmer. For this rapid evaluation, we will consider he only crops tomatoes with the same way of cropping we have described in the report. Moreover, if we consider than the production costs have been constant along the years, the differences observed in prices have direct repercussions on the farmer income. Yields observed during the 1980-1986 period reached 20 to 25 tons/ha. In the 1980s, the Gross Output thus reached at least 220 JD/du/year in current money (1980) and the Net profit linked was around 50 JD/du/year in current money.

If we consider an exploitation of 250 dunums, the Net Profit brought out reached 12.500 current JD. In these conditions, a farmer who bought 250 dunums and who invested in a well to crop this area earns its money back in 8 years (in 1980, the current price of the well considered was around 90.000 JD).

If we consider an actual average model, a farmer who wants to buy an area and dig a well to crop it with vegetables will need 12 years to recover the money due to the investment. We consider here that no bad-year happened and that the farmer can bring out an average profit of 85 JD/du/year on 250 dunums.

In fact no true land-and-well market can be defined. There are some transactions, but rarely and no global dynamic on prices can be observed. The people who purchase wells are rich investors/engineers implementing large intensive fruit trees farms on large surfaces (200 to 400 dunums). To have an evaluation of the investment linked to such project we only can based ourselves on the few surveys we have done on this subject. In that way we estimated that a well and 300 dunums of land (which can be irrigated, 300 JD/du) have an actual value of 340.000 JD. The implementation

[5] For information, price of land in the middle of the Jordan valley seems to be around 2000 JD/du (it means 28.000 $/ha)
[6] In current money, data from "The Jordan valley Dynamic Transformation: 1973-1986."

of the orchard costs then 500 JD/du (100 JD for the land preparation, 50 JD for the pipes, 350 JD for the trees). The total amount thus reaches 490.000 JD (685.000 $) for 300 dunums (1635 JD/du)[7].

When can you expect recover your money?

| year | 1 | 2 | 3 | 4 | 5 | 6 and more |
|---|---|---|---|---|---|---|
| % of production | 0 | 15 | 25 | 50 | 75 | 100 |
| Gross Output (JD/du) | 0 | 270 | 450 | 900 | 1350 | 1800 |
| Costs (JD/du) | 300 | 350 | 350 | 450 | 500 | 600 |
| Net Profit (JD/du) | -300 | -120 | +100 | +450 | +850 | +1200 |
| Net Profit (300 du) | -90 000 | - 36 000 | 30 000 | 135 000 | 255 000 | 360 000 |

Evolution of mean costs and production during the first years of the production

During the two first years of cropping the farm is losing money and the total investment reaches 616.000 JD. From the third year, the orchards began to be profitable and after four years of production, the investment is entirely reimbursed. Return on investment is thus obtained after 6 years

*Price of land*

If no attention is paid to the local variability of soil quality, it is possible to have a global evaluation of land prices in the eastern desert. The following figures are drawn from diverse surveys:

| Period of time | 1960 | 1975 | 1985 to 1993 | 1997 to 2001 |
|---|---|---|---|---|
| Land price in current currency (JD/du) | 5 | 50 | 300 | 200 |
| Land prices in JD of 2002 | 10 | 40 | 550 to 350 | 200 |

This schedule shows prices have strongly increased from the 1960s to the beginning of the 1990s. Since then, prices are decreasing. We identify two reasons to this lower actual value: there is no incentive to invest (as it was the case two decades ago)[8] and the profitability of the agricultural sector is now decreasing compared to the 'gold age' of the 1980s because it is more difficult to market the production both on the local and on the export market.

[7] The USAID-ARD study presents an initial investment of 1000 JD/du mainly because of lower prices concerning the digging of the well.

[8] The government actually wants to limit agricultural water abstraction of the national water resources. No drilling licenses have been delivered since 1992 and that constitutes an obstacle to private investments. The only way existing to develop an activity being to buy an existing well.

## *Appendix VI: Main economic characteristics of the Farming systems within the Lower Jordan River Basin in Jordan*

Note: In all the tables, figures are in $ per dunum if there is no other indication
The identifier refers to the codification used by *Venot*, 2003

| FARMING SYSTEM | | Vegetables farms in open field -JORDAN VALLEY- North and middle-north Valley | | | |
|---|---|---|---|---|---|
| | | familial farm | | Entrepreneur's farm | |
| | | Drip Mulch | Drip Mulch & Minitunnel | Drip Mulch | Drip Mulch & Minitunnel |
| | | | | | |
| Renting cost ($/du) | | 50 | 50 | 50 | 50 |
| Water use (mm/day/du) | | 2 | 2 | 2 | 2 |
| Water use (M3/farm/year) | | 17 850 | 17 850 | 17 850 | 17 850 |
| Land tenure | | RENT | RENT | RENT | RENT |
| Technique | Irrigation technique | drip | drip | drip | Drip |
| | Cropping technique | Mulch intensive | intensive | Mulch intensive | Intensive |
| Range of surface (du) | | 5 to 60 | 5to 60 | 5 to 60 | 5 to 60 |
| Yield | | | | | |
| | | | | | |
| Gross Output in bad year | | 1140 | 1635 | 1140 | 1635 |
| Gross Output in good year | | 1580 | 1890 | 1580 | 1890 |
| **Mean Gross Output** | | **1360** | **1763** | **1360** | **1763** |
| Net Margin in bad year | | 455 | 840 | 455 | 840 |
| Net Margin in good year | | 805 | 1035 | 805 | 1035 |
| **Mean net Margin** | | **630** | **938** | **630** | **938** |
| Water costs in bad year | | 9 | 9 | 9 | 9 |
| Water costs in good year | | 9 | 9 | 9 | 9 |
| Production costs in bad year | | 685 | 800 | 685 | 800 |
| Production costs in good year | | 780 | 855 | 780 | 855 |
| **Mean production costs** | | **733** | **828** | **733** | **828** |
| Permanent Wages Cost (mean) | | 0 | 0 | 65 | 65 |
| Daily Wages Costs (mean) | | 295 | 405 | 295 | 405 |
| **Total Wages Costs** | | **295** | **405** | **360** | **470** |
| **Total costs** | | **1025** | **1245** | **1090** | **1310** |
| Net Profit in bad year | | 190 | 445 | 120 | 380 |
| Net Profit in good year | | 480 | 620 | 415 | 555 |
| **Mean Net Profit** | | **335** | **533** | **268** | **468** |
| **Return on Capital for investor's farms (Net profit – owner's salary)** | | | | | |
| | | | | | |
| **Net Profit/Total costs (%)** | | **32** | **43** | **24** | **35** |
| **Initial investment** | | **2500** | **3000** | **2500** | **3000** |

| FARMING SYSTEM | Vegetables farms in open field –JORDAN VALLEY- | | | | | | |
|---|---|---|---|---|---|---|---|
| | Middle Valley | | | | | | |
| | Small rented farm | Large rented farms | Sharecropping arrangement | | Farm in ownership | Sharecropping arrangement | |
| | | | owner | sharecropper | | sharecropper | owner |
| | Mulch Drip & Minitunnel Classic crops | | | | Mint Parsley & Classic crops | | |
| Renting cost ($/du) | 42 | 50 | 42 | 0 | 0 | 0 | 42 |
| Water use (mm/day/du) | 2 | 2 | 2 | 2 | 3 | 3 | 3 |
| Water use (M3/farm/year) | 17 850 | 53 550 | | 26 775 | 23 800 (30 dunums) | 23 800 | 95 200 |
| Land tenure | Rent | Rent | RENT | | Ownership | | Owner/tenant |
| Irrigation technique | Drip | Drip | DRIP | Drip | Drip | Drip | Drip |
| Range of surface (du) | 30 | 100 to 120 | 30 to 300 | 30 to 60 | <30 | 30 | 100 to 150 |
| Yield | | | | | | | |
| | | | | | | | |
| Gross Output in bad year | 630 | 735 | 395 | 380 | 775 | 385 | 385 |
| Gross Output in good year | 860 | 1010 | 560 | 510 | 985 | 500 | 500 |
| **Mean Gross Output** | **745** | **873** | **478** | **445** | **880** | **443** | **443** |
| Net Margin in bad year | 305 | 245 | 220 | 215 | 550 | 270 | 210 |
| Net Margin in good year | 475 | 455 | 365 | 305 | 730 | 365 | 305 |
| **Mean net Margin** | **390** | **350** | **293** | **260** | **640** | **318** | **260** |
| Water costs in bad year | 10 | 10 | 5 | 5 | 40 (well) | 0 | 40 (well) |
| Water costs in good year | 10 | 10 | 5 | 5 | 40 (well) | 0 | 40 (well) |
| Production costs in bad year | 325 | 490 | 175 | 165 | 225 | 115 | 175 |
| Production costs in good year | 385 | 550 | 195 | 200 | 255 | 135 | 200 |
| **Mean production costs** | **355** | **520** | **185** | **183** | **240** | **125** | **188** |
| Permanent Wages Cost (mean) | 0 | 30 | 0 | 0 | 135 | 0 | 0 |
| Daily Wages Costs (mean) | 30 | 55 | 0 | 56 | 105 | 80 | 0 |
| **Total Wages Costs** | **30** | **85** | **0** | **56** | **240** | **80** | **0** |
| **Total costs** | **385** | **605** | **185** | **240** | **480** | **205** | **182** |
| Net Profit in bad year | 280 | 175 | 220 | 175 | 330 | 205 | 210 |
| Net Profit in good year | 440 | 360 | 365 | 235 | 470 | 265 | 310 |
| **Mean Net Profit** | **360** | **268** | **293** | **205** | **400** | **235** | **260** |
| **Return on Capital for investor's farms (Net profit – owner's salary)** | | | **110** | | | | **120** |
| | | | | | | | |
| **Net Profit/Total costs (%)** | **93** | **44** | **72** | **85** | **82** | **115** | **73** |
| **Initial investment** | **15 500** | **40 000** | **0** | **30 000** | **1500** | **1150** | **35 000** |

| FARMING SYSTEM | | Vegetables farms in open field<br>-JORDAN VALLEY- | | |
|---|---|---|---|---|
| | | south of the valley | | |
| | | Small owned farms | Sharecropping arrangement | |
| | | | owner | sharecropper |
| | | - | | |
| Renting cost ($/du) | | 0 | 0 | 0 |
| Water use (mm/day/du) | | ?? | ?? | ?? |
| Water use (M3/farm/year) | | ?? | ?? | ?? |
| Land tenure | | Owner | owner | |
| Technique | Irrigation technique | DRIP | DRIP | DRIP |
| | Cropping technique | MULCH | MULCH | MULCH |
| Range of surface (du) | | 25 to 50 | 150 to 300 | 50 to 100 |
| Yield | | | | |
| | | | | |
| | Gross Output in bad year | 740 | 370 | 370 |
| | Gross Output in good year | 950 | 470 | 470 |
| **Mean Gross Output** | | **845** | **420** | **420** |
| | Net Margin in bad year | 190 | 95 | 135 |
| | Net Margin in good year | 370 | 165 | 210 |
| **Mean net Margin** | | **280** | **130** | **173** |
| | Water costs in bad year (well depreciation + pumping costs) | 50 (15 + 35) | 45 (10 +35) | 0 |
| | Water costs in good year (well depreciation + pumping costs) | 50 (15 + 35) | 45 (10+ 35) | 0 |
| | Production costs in bad year | 555 | 275 | 235 |
| | Production costs in good year | 625 | 305 | 265 |
| **Mean production costs** | | **590** | **290** | **250** |
| | Permanent Wages Cost (mean) | 85 | 0 | 0 |
| | Daily Wages Costs (mean) | 50 | 0 | 50 |
| **Total Wages Costs** | | **135** | **0** | **50** |
| **Total costs** | | **725** | **295** | **300** |
| | Net Profit in bad year | 60 | 95 | 95 |
| | Net Profit in good year | 165 | 165 | 145 |
| **Mean Net Profit** | | **113** | **130** | **120** |
| **Return on Capital for investor's farms (Net profit – owner's salary) 1400 $/month/ca** | | | **75** | |
| | | | | |
| **Net Profit/Total costs (%)** | | **15** | **43** | **38** |
| **Initial investment** | | **20 000** | - | **20 000** |

| FARMING SYSTEM | | Greenhouses farm –JORDAN VALLEY- | | |
|---|---|---|---|---|
| | | **North-middle valley** | | **south valley** |
| | | Familial farms | entrepreneur's farm | entrepreneur's farm |
| | | | | |
| Identifier | | C.4 | C.3 | E.7 |
| Renting cost ($/du) | | 50 | 50 | 0 |
| Water use (mm/day/du) | | 2 | 2 | 4 |
| Water use (M3/farm/year) | | 35 700 | 58 650 | 175 000 |
| Land tenure | | Owner/renter | Owner/renter | ownership |
| Technique | Irrigation technique | DRIP | DRIP | DRIP |
| | Cropping technique | Intensive 50% Open field | Intensive 20% Open field | 66% in open field |
| Range of surface | | 20 to 120 | 30 to 200 | 100 to 250 |
| Yield | | | | |
| | | | | |
| Gross Output in bad year | | 1910 | 2950 | 970 |
| Gross Output in good year | | 2490 | 3800 | 1150 |
| **Mean Gross Output** | | **2200** | **3375** | **1060** |
| Net Margin in bad year | | 595 | 995 | 445 |
| Net Margin in good year | | 990 | 1620 | 580 |
| **Mean net Margin** | | **795** | **1310** | **510** |
| Water costs in bad year (public water or well depreciation+ pumping costs) | | 9 | 9 | 40 (10 + 30) |
| Water costs in good year (public water or well depreciation + pumping costs) | | 9 | 9 | 40 (10 +30) |
| Production costs in bad year | | 1310 | 1955 | 525 |
| Production costs in good year | | 1500 | 2175 | 565 |
| **Mean production costs** | | **1405** | **2065** | **545** |
| Permanent Wages Cost (mean) | | 80 | 200 | 35 |
| Daily Wages Costs (mean) | | 260 | 190 | 80 |
| **Total Wages Costs** | | **340** | **390** | **115** |
| **Total costs** | | **1745** | **2455** | **660** |
| Net Profit in bad year | | 255 | 605 | 345 |
| Net Profit in bad year | | 625 | 1230 | 455 |
| **Mean Net Profit** | | **440** | **920** | **400** |
| **Return on Capital for investor's farms (Net profit – owner's salary)** | | | **725** | **285** |
| | | | | |
| **Net Profit/Total costs (%)** | | **25** | **31** | **70** |
| **Initial investment** | | **76 000** | **260 000** | **135 000** |
| | | **(70 dunnums) (+ 86 000 for the land)** | **(150 dunums) (+ 184 000 for the land)** | |

| FARMING SYSTEM | | Citrus farms –JORDAN VALLEY- | | |
|---|---|---|---|---|
| | | Extensive familial farm | Intensive familial farms | Absentee Owner extensive farm |
| Identifier | | B.1 | B.2 | B.3 |
| Renting cost ($/du) | | ∅ | ∅ | ∅ |
| Water use (mm/day/du) | | 4 | 4 | 4 |
| Water use (M3/farm/year) mean area | | 32 500 | 49 500 | 72 000 |
| Land tenure | | ownership | ownership | Absentee owner |
| Technique | Irrigation technique | surface | localized | Surface |
| | Cropping technique | extensive | intensive | Extensive |
| Range of surface (dunums) | | 30 to 60 | 30 to 60 | 10 to 50 … up to 200 |
| Yield (T/ha) | | 15 to 20 | 20 to 25 | 15 to 20 |
| | | | | |
| Gross Output in bad year | | 230 | 380 | 235 |
| Gross Output in good year | | 360 | 495 | 360 |
| **Mean Gross Output** | | **295** | **440** | **300** |
| Net Margin in bad year | | 125 | 210 | 135 |
| Net Margin in good year | | 225 | 290 | 225 |
| **Mean net Margin** | | **175** | **250** | **180** |
| Water costs in bad year | | 19 | 19 | 19 |
| Water costs in good year | | 19 | 19 | 19 |
| Production costs in bad year | | 105 | 170 | 105 |
| Production costs in good year | | 135 | 205 | 135 |
| **Mean production costs** | | **120** | **190** | **120** |
| Permanent Wages Cost (mean) | | 0 | 30 | 55 |
| Daily Wages Costs (mean) | | 65 | 75 | 85 |
| **Total Wages Costs** | | **65** | **105** | **140** |
| **Total costs** | | **185** | **295** | **260** |
| Net Profit in bad year | | 65 | 105 | 5 |
| Net Profit in good year | | 155 | 180 | 75 |
| **Mean Net Profit** | | **110** | **145** | **40** |
| **Return on Capital for investor's farms (Net profit – owner's salary)** | | | | **0 if 200 $/month for the owner (farm of 60 dunums)** |
| | | | | |
| **Net Profit/Total costs (%)** | | **59** | **49** | **15** |
| **Initial investment/farm** | | **2750 (21 100 with the land)** | **11 000 (54 000 with the land)** | **27 500 (150 000 with the land)** |

| | | Bananas farms –JORDAN VALLEY- | | | | | | Mixed farms |
|---|---|---|---|---|---|---|---|---|
| | | North of the valley | | South of the valley | | | | |
| **FARMING SYSTEM** | | Surface irrigation | Drip irrigation | Small Familial farms | | Large intensive farms | | North and South valley |
| | | | | Owner of well | Purchase of water | **entrepreneur farm** | **familial farm** | |
| Identifier | | A 1 | A 2 | E.3 | E.3 Bis | E.1 | E.2 | E.4 |
| Renting cost ($/du) | | ∅ | ∅ | 0 | 0 | 0 | 0 | 0 |
| Water use (mm/day/du) | | 8 mm | 8 mm | 15 | 15 | 15 | 15 | ?? |
| Water use (M3/farm/year) mean area | | 50 400 | 50 400 | 150 000 | 150 000 | 305 000 | 305 000 | |
| Land tenure | | Absentee owner | Absentee owner | owner | Owner | Ownership & renting | Ownership & renting | Ownership |
| Technique | Irrigation technique | surface | Drip | drip | drip | drip | Drip | Drip |
| | Cropping technique | Intensive | Intensive | Plants | Plants | Use of tissue | Use of tissue | 1/7 of bananas |
| Range of surface (dunums) | | 10 to 50 | 10 to 50 | 30 to 60 | 30 to 60 | 200 to 400 (1/4 of bananas | 100 to 200 (3/4 bananas) | 30 to 60 |
| Yield (T/ha) | | 20 to 30 | 30 to 40 | 35 to 50 | 35 to 50 | 50 to 65 | 50 to 65 | 15 to 25 |
| The following figures are in $/dunum | | | | | | | | |
| Gross Output in bad year | | 1240 | 1860 | 2125 | 2125 | 3175 | 3175 | 605 |
| Gross Output in good year | | 1800 | 2360 | 3035 | 3035 | 4125 | 4125 | 895 |
| **Mean Gross Output** | | **1520** | **2110** | **2580** | **2580** | **3650** | **3650** | **750** |
| Net Margin in bad year | | 965 | 1405 | 1490 | 690 | 2485 | 2320 | 105 |
| Net Margin in good year | | 1525 | 1900 | 2330 | 1600 | 3375 | 3200 | 285 |
| **Mean net Margin** | | **1245** | **1653** | **1910** | **1145** | **2930** | **2760** | **195** |
| Water costs in bad year | | 35 | 35 | 120 (15 +105) | 900 | 75 (10+65) | 80 (15 +65) | 9 |
| Water costs in good year | | 35 | 35 | 120 (15 +105) | 900 | 75 (10 + 65) | 80 (15 +65) | 9 |
| Production costs in bad year | | 275 | 460 | 530 | 1435 | 690 | 855 | 500 |
| Production costs in good year | | 275 | 460 | 700 | 1435 | 760 | 925 | 610 |
| **Mean production costs** | | **275** | **460** | **615** | **1435** | **725** | **890** | **555** |
| Permanent Wages Cost (mean) | | 205 | 65 | 110 | 85 | 140 | 70 | 0 |
| Daily Wages Costs (mean) | | 340 | 335 | 125 | 120 | 160 | 160 | 115 |
| **Total Wages Costs** | | **545** | **400** | **235** | **205** | **300** | **230** | **115** |
| **Mean Total costs** | | **820** | **860** | **850** | **1640** | **1025** | **1120** | **670** |
| Net Profit in bad year | | 420 | 1000 | 1270 | 495 | 2205 | 2110 | 40 |
| Net Profit in good year | | 980 | 1500 | 2075 | 1370 | 3045 | 2950 | 120 |
| **Mean Net Profit** | | **700** | **1250** | **1673** | **933** | **2625** | **2530** | **80** |
| **Return on Capital for investor's farms (Net profit – owner's salary) (1400 $/month/person)** | | **140 (1 person)** | **690 (1 person)** | | | **1060 (7 persons)** | **1765 (5 persons)** | |
| | | | | | | | | |
| **Net Profit/Total costs (%)** | | **85** | **145** | **197** | **57** | **256** | **226** | **12** |
| **Initial investment/farm** | | **4 000 (49 000 with the land)** | **4 500 (49 000 with the land)** | **50 000** | **30 000** | **200 000** | **110 000** | **15 000** |
| **(mean surface)** | | | | **land non included** | | | | |

| FARM SYSTEM | | Vegetables in open field –HIGHLANDS- | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | **Rented farms** | | | **Sharecropping farms** | | | |
| | | Eastern desert | | Yarmouk | Eastern Desert | | Suburban Area | |
| | | Classic crop | Particular crops | | sharecropper | owner | sharecropper | owner |
| | | | | | | | | |
| Identifier | | I.1 | I.1 | V.1 | I.3 | I.3 | VII.2 | VII.2 |
| Renting cost ($/du) | | 14 | 14 | 30 | 7 | 0 | 0 | 0 |
| Water use (mm/day/du) | | 4 | ?? | 2.5 | 4 | 4 | 2 | 2 |
| Water use (M3/farm/year) | | 215 000 | ?? | 45 000 | 30 000 | 150 000 | 12 500 | 75 000 |
| Land tenure | | RENT | RENT | RENT | | Owner | owner | owner |
| Technique | Irrigation technique | Drip | DRIP | DRIP | drip | drip | DRIP | DRIP |
| | Cropping technique | Mulch | | Mulch | | | | |
| Range of surface | | 200 to 250 | 50 to 100 | 50 to 100 | 15 to 45 | 100 to 200 | 20 to 30 | 100 to 200 |
| Yield | | | | | | | | |
| | | | | | | | | |
| Gross Output in bad year | | 855 | 775 | 805 | 295 | 400 | 520 | 520 |
| Gross Output in good year | | 1135 | 1055 | 1165 | 345 | 470 | 645 | 645 |
| **Mean Gross Output** | | **995** | **915** | **985** | **320** | **435** | **582** | **582** |
| Net Margin in bad year | | 140 | 180 | 230 | 30 | 15 | 145 | 390 |
| Net Margin in bad year | | 310 | 380 | 530 | 45 | 25 | 215 | 510 |
| **Mean net Margin** | | **225** | **280** | **380** | **37,5** | **20** | **180** | **450** |
| Water costs in bad year (well rent or Well depreciation + pumping costs) | | 130 | 130 | 210 | 0 | 90 | 0 | 60 |
| Water costs in good year (well rent or Well depreciation + pumping costs) | | 130 | 130 | 210 | 0 | 90 | 0 | 60 |
| Production costs in bad year | | 710 | 590 | 575 | 265 | 385 | 375 | 130 |
| Production costs in good year | | 820 | 680 | 635 | 305 | 445 | 430 | 130 |
| **Mean production costs** | | **765** | **635** | **605** | **285** | **415** | **402** | **130** |
| Permanent Wages Cost (mean) | | 30 | 40 | 140 | 10 | 0 | 0 | 0 |
| Daily Wages Costs (mean) | | 85 | 95 | 40 | 15 | 0 | 95 | 0 |
| **Total Wages Costs** | | **115** | **135** | **180** | **12,5** | **0** | **95** | **0** |
| **Total costs** | | **880** | **770** | **785** | **297,5** | **415** | **497** | **130** |
| Net Profit in bad year | | 40 | 55 | 60 | 10 | 15 | 60 | 390 |
| Net Profit in bad year | | 180 | 235 | 340 | 15 | 25 | 110 | 510 |
| **Mean Net Profit** | | **110** | **145** | **200** | **12,5** | **20** | **85** | **450** |
| **Return on Capital for investor's farms (Net profit – owner's salary)** | | | | | | **0 salary: 250$/month** | | **370** |
| | | | | | | | | |
| **Net Profit/Total costs (%)** | | **12** | **18** | **25** | **3** | **5** | **16** | **350** |
| **Initial investment** | | **40 000** | **40 000** | **20 000** | **850** | **280 000** | **5000** | **280 000** |

| FARM SYSTEM | | Vegetables in Open field –HIGHLANDS- | | | | |
|---|---|---|---|---|---|---|
| | | Owned farm –Eastern desert | | | | |
| | | classic crops | particular crop | Intensive classic crops | Intensive particular crop | Classic crop absentee owner |
| | | | | | | |
| Renting cost ($/du) | | 0 | 0 | 10 | 0 | 0 |
| Water use (mm/day/du) | | 4 | 4 | 4 | 4 | 4 |
| Water use (M3/farm/year) | | 215 000 | 215 000 | 215 000 | 215 000 | 215 000 |
| Land tenure | | Owner | Owner | Owner+rent | Owner+rent | Owner |
| Technique | Irrigation technique | drip | drip | drip | drip | drip |
| | Cropping technique | mulch | mulch | mulch | mulch | Mulch/extensive |
| Range of surface | | 200 to 250 | 200 to 250 | 200 to 250 | 200 to 250 | 200 to 250 |
| Yield | | | | | | |
| | | | | | | |
| Gross Output in bad year | | 685 | 695 | 855 | 780 | 685 |
| Gross Output in good year | | 885 | 900 | 1135 | 1025 | 885 |
| **Mean Gross Output** | | **785** | **797** | **995** | **902** | **785** |
| Net Margin in bad year | | 140 | 235 | 135 | 250 | 140 |
| Net Margin in bad year | | 275 | 375 | 380 | 405 | 275 |
| **Mean net Margin** | | **207** | **310** | **257** | **327** | **207** |
| Water costs in bad year (well rent or Well depreciation + pumping costs) | | 90 | 90 | 90 | 90 | 90 |
| Water costs in good year (well rent or Well depreciation + pumping costs) | | 90 | 90 | 90 | 90 | 90 |
| Production costs in bad year | | 545 | 465 | 670 | 535 | 545 |
| Production costs in good year | | 610 | 525 | 750 | 625 | 610 |
| **Mean production costs** | | **577** | **495** | **710** | **580** | **577** |
| Permanent Wages Cost (mean) | | 65 | 80 | 65 | 80 | 100 |
| Daily Wages Costs (mean) | | 80 | 115 | 80 | 105 | 55 |
| **Total Wages Costs** | | **145** | **195** | **145** | **185** | **155** |
| **Total costs** | | **722** | **690** | **855** | **765** | **732** |
| Net Profit in bad year | | 5 | 50 | 50 | 60 | 5 |
| Net Profit in bad year | | 110 | 175 | 220 | 220 | 105 |
| **Mean Net Profit** | | **57** | **112** | **135** | **140** | **55** |
| **Return on Capital for investor's farms (Net profit – owner's salary)** | | | | | | **2** |
| | | | | | | |
| **Net Profit/Total costs (%)** | | **8** | **15** | **15** | **19** | **7** |
| **Initial investment** | | **325 000** | **325 000** | **435 000** | **435 000** | **325 000** |

| FARM SYSTEM | | Vegetables under greenhouses -Highlands | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | **Eastern Desert** | | Upper Yarmouk basin | | | **suburban area** | Transition area |
| | | owner | tenant | tenant | sharecropper | Owner of the sharecropper | | |
| Identifier | | I.4 | I.4 | V.2 | V.2 alternative | V.2 alternative | VII.1 | VI.1 |
| Renting cost ($/du) | | 0 | 14 | 30 | 0 | 0 | 50 | 20 |
| Water use (mm/day/du) | | 5 | 5 | 5 | 5 | 5 | 2 | 5 |
| Water use (M3/farm/year) | | 150 000 | 150 000 | 54 000 | 30 000 | 108 000 | 17 000 | 150 000 |
| Land tenure | | owner | rent | RENT | | | RENT | RENT |
| Technique | Irrigation technique | drip | drip | DRIP | DRIP | DRIP | DRIP | DRIP |
| | Cropping technique | 75 % OF | 75 % OF | 100 % Greenhouse | 100 % Greenhouse | 100 % Greenhouse | 75 % OF | 75 % OF |
| Range of surface | | 100 to 200 | 100 to 200 | 40 to 50 | 20 to 30 | 80 to 100 | 20 to 60 | 100 to 200 |
| Yield | | | | | | | | |
| | | | | | | | | |
| Gross Output in bad year | | 1065 | 1065 | 2495 | 1075 | 1075 | 1400 | 1230 |
| Gross Output in good year | | 1340 | 1340 | 2875 | 1455 | 1455 | 1790 | 1560 |
| **Mean Gross Output** | | **1205** | **1210** | **2685** | **1265** | **1265** | **1595** | **1395** |
| Net Margin in bad year | | 345 | 158 | 300 | 435 | 165 | 160 | 435 |
| Net Margin in bad year | | 590 | 338 | 570 | 705 | 545 | 450 | 965 |
| **Mean net Margin** | | **467** | **248** | **435** | **570** | **355** | **305** | **700** |
| Water costs in bad year | | 100 | 168 | 210 | 0 | 110 | 270 | 75 |
| Water costs in good year | | 100 | 168 | 210 | 0 | 110 | 270 | 75 |
| Production costs in bad year | | 758 | 870 | 2205 | 640 | 910 | 1240 | 980 |
| Production costs in good year | | 850 | 955 | 2415 | 750 | 910 | 1340 | 980 |
| **Mean production costs** | | **805** | **915** | **2310** | **910** | **910** | **1290** | **980** |
| Permanent Wages Cost (mean) | | 100 | 140 | 220 | 260 | 0 | 100 | 115 |
| Daily Wages Costs (mean) | | 50 | 45 | 60 | 0 | 0 | 50 | 60 |
| **Total Wages Costs** | | **150** | **185** | **280** | **260** | **910** | **150** | **175** |
| **Total costs** | | **955** | **1100** | **2590** | **1170** | **910** | **1440** | **1155** |
| Net Profit in bad year | | 165 | -25 | 40 | 175 | 165 | 15 | 120 |
| Net Profit in bad year | | 335 | 125 | 275 | 445 | 545 | 300 | 360 |
| **Mean Net Profit** | | **250** | **110** | **157** | **310** | **355** | **157** | **240** |
| **Return on Capital for investor's farms (Net profit – owner's salary)** | | | | | | **220** | | |
| | | | | | | | | |
| **Net Profit/Total costs (%)** | | **26** | **10** | **6** | **26** | **39** | **11** | **21** |
| **Initial investment** | | **410 000** | **90 000** | **1500** | **750** | **360 000** | **40 000** | **75 000** |

| FARMING SYSTEM | | Fruit trees farms -HIGHLANDS- | | |
|---|---|---|---|---|
| | | Familial farm | Entrepreneur's farm | |
| | | | Intensive entrepreneur's farm | Absentee owner Investor farm |
| Identifier | | II.1 | II.2 | II.3 |
| Renting cost ($/du) | | 0 | 0 | 0 |
| Water use (mm/day/du) | | 4 | 4 | 3 |
| Water use (M3/farm/year) | | 150 000 | 300 000 | 405 000 |
| Land tenure | | ownership | ownership | Ownership |
| Technique | Irrigation technique | DRIP | Drip | Drip |
| | Cropping technique | | | |
| Range of surface (dunums) | | 100 to 200 | 200 to 400 | 400 to 800 |
| Yield (T/ha) | | 25 to 35 | 30 to 45 | 30 to 45 |
| | | | | |
| Gross Output in bad year | | 1550 | 2160 | 2020 |
| Gross Output in good year | | 2260 | 2920 | 2730 |
| **Mean Gross Output** | | **1905** | **2540** | **2375** |
| Net Margin in bad year | | 1075 | 1545 | 1390 |
| Net Margin in bad year | | 1665 | 2165 | 1960 |
| **Mean net Margin** | | **1370** | **1855** | **1675** |
| Water costs in bad year (well rent or Well depreciation + pumping costs) | | 80 | 75 | 75 |
| Water costs in good year (well rent or Well depreciation + pumping costs) | | 80 | 75 | 75 |
| Production costs in bad year | | 475 | 620 | 630 |
| Production costs in good year | | 585 | 760 | 770 |
| **Mean production costs** | | **530** | **690** | **700** |
| Permanent Wages Cost (mean) | | 55 | 100 | 115 |
| Daily Wages Costs (mean) | | 45 | 70 | 70 |
| **Total Wages Costs** | | **100** | **170** | **185** |
| **Total costs** | | **630** | **860** | **885** |
| Net Profit in bad year | | 985 | 1390 | 1200 |
| Net Profit in bad year | | 1545 | 1980 | 1770 |
| **Mean Net Profit** | | **1265** | **1685** | **1485** |
| **Return on Capital for investor's farms (Net profit – owner's salary)** | | **705** | **1605** | **1465** |
| | | | | |
| **Net Profit/Total costs (%)** | | **195** | **195** | **166** |
| **Initial investment** | | **475 000** | **686 000** | **928 200** |

| FARM SYSTEM | | Vegetables farms – UPLANDS-ZARQA- | | | |
|---|---|---|---|---|---|
| | | Sharecropping farms | | | |
| | | sharecropper | owner | Sharecropper Particular crop | owner Particular crop |
| | | | | | |
| Identifier | | III.1 | III.1 | III.1 alternative | III.1 alternative |
| Renting cost ($/du) | | 0 | 0 | 0 | 0 |
| Water use (mm/day/du) | | 6 | 6 | 8 | 8 |
| Water use (M3/farm/year) | | 25 000 | 140 000 | 35 000 | 190 000 |
| Land tenure | | | OWNER | | OWNER |
| Technique | Irrigation technique | surface | surface | surface | surface |
| | Cropping technique | | | | |
| Range of surface | | 10 to 25 | +/- 100 | 10 to 25 | +/- 100 |
| Yield | | | | | |
| | | | | | |
| Gross Output in bad year | | 540 | 555 | 470 | 485 |
| Gross Output in good year | | 690 | 705 | 580 | 595 |
| **Mean Gross Output** | | **615** | **630** | **525** | **540** |
| Net Margin in bad year | | 280 | 235 | 125 | 295 |
| Net Margin in bad year | | 400 | 355 | 425 | 380 |
| **Mean net Margin** | | **340** | **295** | **275** | **337** |
| Water costs in bad year | | 0 | 70 | 0 | 70 |
| Water costs in good year | | 0 | 70 | 0 | 70 |
| Production costs in bad year | | 260 | 315 | 340 | 185 |
| Production costs in good year | | 290 | 345 | 420 | 215 |
| **Mean production costs** | | **275** | **330** | **380** | **200** |
| Permanent Wages Cost (mean) | | 0 | 0 | | 0 |
| Daily Wages Costs (mean) | | 45 | 0 | 145 | 0 |
| **Total Wages Costs** | | **45** | **0** | **145** | **0** |
| **Total costs** | | **320** | **330** | **525** | **200** |
| Net Profit in bad year | | 195 | 235 | 215 | 300 |
| Net Profit in bad year | | 305 | 355 | 265 | 380 |
| **Mean Net Profit** | | **250** | **295** | **240** | **340** |
| **Return on Capital for investor's farms (Net profit – owner's salary)** | | | **175** | | **240** |
| | | | | | |
| **Net Profit/Total costs (%)** | | **67** | **90** | **84** | **166** |
| **Initial investment** | | **14 000** | **20 000** | **14 000** | **20 000** |

| FARM SYSTEM | | Vegetables farms– UPLANDS-ZARQA- | | |
|---|---|---|---|---|
| | | tenant | | |
| | | Classic crop | Particular crop | Forage farmer |
| | | | | |
| Identifier | | III.2 | III.2 alternative | III.3 |
| Renting cost ($/du) land and well | | 65 | 65 | 65 |
| Water use (mm/day/du) | | 6 | 8 | 4 |
| Water use (M3/farm/year) | | 25 000 | 35 000 | 45 000 |
| Land tenure | | RENT | RENT | RENT |
| Technique | Irrigation technique | SURFACE | SURFACE | SURFACE |
| | Cropping technique | | | |
| Range of surface | | 10 to 25 | 10 to 25 | 40 to 50 |
| Yield (T/ha) | | | | 80 to 100 |
| | | | | |
| Gross Output in bad year | | 1080 | 940 | 280 |
| Gross Output in good year | | 1375 | 1165 | 350 |
| **Mean Gross Output** | | **1227** | **1052** | **315** |
| Net Margin in bad year | | 250 | 365 | 150 |
| Net Margin in bad year | | 490 | 545 | 220 |
| **Mean net Margin** | | **370** | **405** | **185** |
| Water costs in bad year | | 255 | 255 | 15 |
| Water costs in good year | | 255 | 255 | 15 |
| Production costs in bad year | | 830 | 505 | 130 |
| Production costs in good year | | 885 | 620 | 130 |
| **Mean production costs** | | **857** | **562** | **130** |
| Permanent Wages Cost (mean) | | 0 | 0 | 45 |
| Daily Wages Costs (mean) | | 70 | 120 | 65 |
| **Total Wages Costs** | | **70** | **120** | **110** |
| **Total costs** | | **927** | **682** | **240** |
| Net Profit in bad year | | 195 | 280 | 45 |
| Net Profit in bad year | | 405 | 405 | 105 |
| **Mean Net Profit** | | **300** | **342** | **75** |
| **Return on Capital for investor's farms (Net profit – owner's salary)** | | | | |
| | | | | |
| **Net Profit/Total costs (%)** | | **32** | **48** | **30** |
| **Initial investment** | | **15 000** | **15 000** | **15 000** |

| | FARM SYSTEM | VEGETABLES FARMS | |
|---|---|---|---|
| | | Greenhouses | |
| | | **Owner** | **Tenant** |
| | | | |
| Identifier | | IV.1alternative | IV.1 |
| Renting cost ($/du) | | 0 | 30 |
| Water use (mm/day/du) | | 3 | 3 |
| Water use (M3/farm/year) | | 40 000 | 12 000 |
| Land tenure | | OWNER | RENT |
| Technique | Irrigation technique | drip | drip |
| | Cropping technique | 50% G | 100% G[1] |
| Range of surface | | 30 to 50 | 10 to 15 |
| Yield | | | |
| | | | |
| Gross Output in bad year | | 1605 | 1855 |
| Gross Output in good year | | 1985 | 2225 |
| **Mean Gross Output** | | **1795** | **2040** |
| Net Margin in bad year | | 630 | 280 |
| Net Margin in bad year | | 885 | 500 |
| **Mean net Margin** | | **757** | **390** |
| Water costs in bad year | | 15 | 200 |
| Water costs in good year | | 15 | 200 |
| Production costs in bad year | | 980 | 1580 |
| Production costs in good year | | 1105 | 1730 |
| **Mean production costs** | | **1042** | **1655** |
| Permanent Wages Cost (mean) | | 90 | 0 |
| Daily Wages Costs (mean) | | 40 | 135 |
| **Total Wages Costs** | | **130** | **135** |
| **Total costs** | | **1172** | **1790** |
| Net Profit in bad year | | 510 | 160 |
| Net Profit in bad year | | 750 | 350 |
| **Mean Net Profit** | | **630** | **255** |
| **Return on Capital for investor's farms (Net profit – owner's salary)** | | **210** | |
| | | | |
| **Net Profit/Total costs (%)** | | **92** | **14** |
| **Initial investment** | | **80 000** | **750** |

| FARM SYSTEM | | Fruit trees farms -ULANDS-ZARQA- | | Mixed farms -UPLANDS-ZARQA |
|---|---|---|---|---|
| | | **familial farm** | **Entrepreneur farm** | |
| | | | | |
| | | | | |
| Identifier | | III.4 | III.5 | IV.2 |
| Renting cost ($/du) land and well | | 0 | 0 | 30 |
| Water use (mm/day/du) | | 6 | 6 | ?? |
| Water use (M3/farm/year) | | 215 000 | 215 000 | ?? |
| Land tenure | | OWNER | OWNER | Rent/ ownership |
| Technique | Irrigation technique | DRIP | DRIP | SURFACE |
| | Cropping technique | | | extensive |
| Range of surface | | 100 to 200 | 100 to 200 | +/- 200 |
| Yield (T/ha) | | 30 to 40 | 31 to 40 | |
| | | | | |
| Gross Output in bad year | | 1695 | 1695 | 630 |
| Gross Output in good year | | 2215 | 2215 | 865 |
| **Mean Gross Output** | | **1955** | **1955** | **747** |
| Net Margin in bad year | | 1235 | 1235 | 350 |
| Net Margin in bad year | | 1695 | 1695 | 540 |
| **Mean net Margin** | | **1465** | **1465** | **395** |
| Water costs in bad year | | 10 | 10 | 10 |
| Water costs in good year | | 10 | 10 | 10 |
| Production costs in bad year | | 460 | 460 | 285 |
| Production costs in good year | | 520 | 520 | 330 |
| **Mean production costs** | | **490** | **490** | **308** |
| Permanent Wages Cost (mean) | | 75 | 75 | 45 |
| Daily Wages Costs (mean) | | 30 | 30 | 25 |
| **Total Wages Costs** | | **105** | **105** | **70** |
| **Total costs** | | **595** | **595** | **378** |
| Net Profit in bad year | | 1135 | 1135 | 285 |
| Net Profit in bad year | | 1585 | 1585 | 465 |
| **Mean Net Profit** | | **1360** | **1360** | **375** |
| **Return on Capital for investor's farms (Net profit – owner's salary)** | | **800** | **1250** | |
| | | | | |
| **Net Profit/Total costs (%)** | | **227** | **227** | **100** |
| **Initial investment** | | **125 000** | **125 000** | **25 000** |

# ***Appendix VII: Guidelines of surveys***

# SURVEY'S GUIDELINES

## General Data

Date of Survey

Name of the owner

Location of the farm

Name of the person interviewed

Relations between owner and interlocutor

Other remarks on the farm's environment

## Identification of the Farming System

### History

Date of settlement

Identity of the person who settled down –Relations with the interlocutor

Reasons of settlement

Mode of settlement

Reclamation of a familial property

Renting of land (price, kind of contract)

Purchase of land (price)

Other investment (Nature and economic evaluation)

* Well
* Orchard
* Irrigation System (Pipes, pumps, pools)
* Desalinization Plant

### Production System

Total Surface of the farm

Irrigated Surface

Land Tenure

Renting Contract
Ownership
Sharecropping — Description of the contract

Cropping pattern

Vegetables

Plantation method (Nature & Interest)

| | |
|---|---|
| Greenhouses | Crops, surface, yield, price of the production |
| Mini tunnel | Crops, surface, yield, price of the production |
| Open field + mulch | Crops, surface, yield, price of the production |

Fruit Trees (Kind of trees, Surfaces, yield)

In the valley — Licensed area (Bananas or Citrus)
Non-licensed area (Bananas or Citrus)

Non Cropped land (Surface, Reason(s))

Crop Rotations — Reasons and Nature

Data on labour

Use of permanent employees — Number, costs, for which activity

Use of seasonal employees — Number, costs, period of the year, for which activity

## Social belonging of the farmer

**Occupation of the owner**

Only agriculture
Other sectors of activity

**National/Social Origin of the Farmer**

'Trans-Jordanian'
'Palestinian 1948'
'Palestinian 1967'
Foreign farmer
(Pakistani, Egyptian, Bangladeshi)

**'Farmer' typology**

Familial Farm
(use of familial labour; which kind of activity)

Is the owner working on the farm

Working in the Field
Owner=manager
(entrepreneur farmer)

Is the owner absent

## Water on the farm

**Description of the irrigation system**

Surface (flood, furrow, closed tubes)
Pressurized (drip, sprinklers)
Irrigation efficiency

**Water tenure**

Buying water from a public service (JVA in the valley)
Buying water from a private well-owner by tanker
Well's renting in / Well's ownership

**Water Costs**

Water costs strictly (water bill)
Pumping costs
Electricity, diesel costs
Are these costs important regarding to the total costs of exploitation
Did these costs evolve since the last few years
*If yes for which reasons?
*Which prices exactly increased?
Pumping costs, purchase of new material, more often…
* Consequences on your way of farming…
decrease of the surface/change in crops
Could you afford increasing water costs?

**Quantity of water pumped or allocated**

Capacity of pumping
*Evolution since the last few years
*Do you observe a decrease, if yes since when?
*Consequences on your way of farming
(decrease of the surface/change in crops)

Water effectively pumped and used
Data on flow, pressure, volume and hours of supplying, evolution during the last few years
Water used on the farm
Other uses
Do you buy water in addition to water pumped in the well?
If yes at which price per $m^3$ and when? To whom?
Do you sell water by tanker? If yes at which price per $m^3$ and when? To whom?

**Concerning well's owners**

How many wells?
Depth, description of the equipment, economic evaluation
Licensed
Is there an abstraction limit, if yes which amount?
Not licensed

## Questions dealing with water considerations

**Is there problem (s) of water in Jordan**

If Yes can you qualify these problems: quality, quantity of water

Do you face particular problems of water?

If yes can you qualify them:

*Problems in supplying

Quantity/Quality/

Accuracy of the supplying period and rotations…

*General problems of quality

*Problems of costs

**Quality of water**

Have you seen an evolution in the water you used (improvement, decrease)

*If yes, since when?

*What are the reasons of such evolution?

Decline in water table/ surface pollutions/ Infiltration of chemicals…

**Has the quality of the soil evolved**

If yes, has the water you use a role in this phenomenon?

**Water policies to be implemented**

Do you know if the government already established policies concerning water consumption?

*If yes which kind of measures have been taken and since when?

Implementation of abstraction limits — Which ones?
Fees on water pumped — Prices?
General increase in water prices — Description
Change in allocation — Description

*Do you agree with these measures — Reasons?

*Had these measures any kind of consequences on your farm?

If yes which kind of consequences?

Decrease of water consumption
Change in cropping pattern (nature of crops/surface) — For which reasons
Change in yield observed, in quality of production… — Reasons?
Increasing costs (in what proportions)

Do you know if some measures concerning water consumption will be taken

* If yes can you qualify them?

Implementation of abstraction limits — Which ones?
Fees on water pumped — Prices?
General increase in water prices — Description
Change in allocation — Description
Shift from fresh to brackish water

*Do you agree with such measures — Explain

## Evolution of farming systems

Regarding these measures, which evolution do you expect for your farm?

*None
*Yield Decrease — Reasons
*Profitability decrease — Reasons
*Salinity problems
*Increasing costs — Which ones?

Which measures would you take to adapt yourself to these new conditions and why

*None
*Decrease in water consumption
*Stability in water consumption

By which means

Same quantity of pumping, purchase of water, renting of new wells

*Decrease in surface cropped
*Change in crop planted

Reasons? Crops water consuming, too sensitive to bad quality water

# Appendix VIII: The different classes of farming systems within the Lower Jordan River Basin A graphical representation according to Net Profit, Initial investment and annual costs

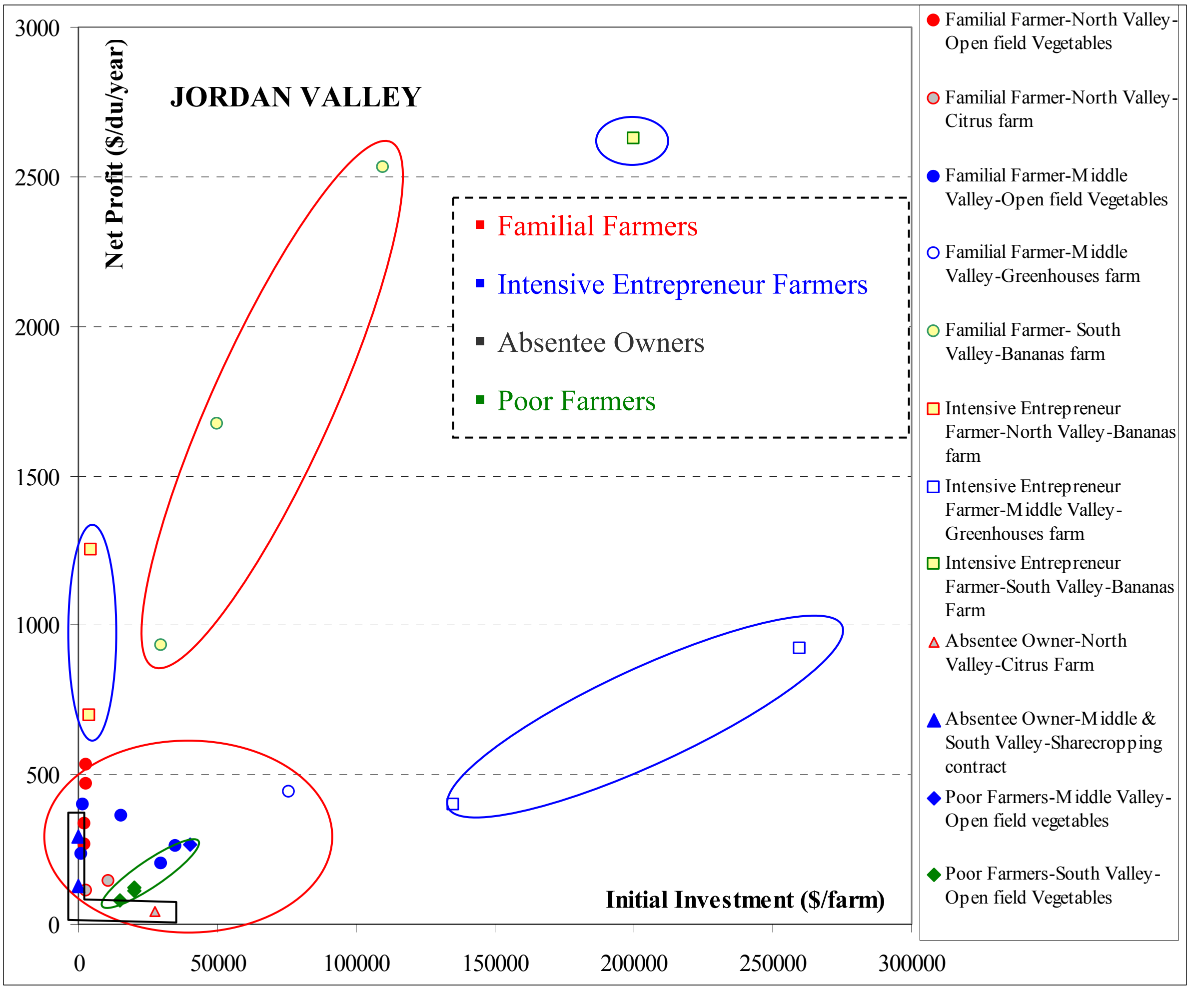
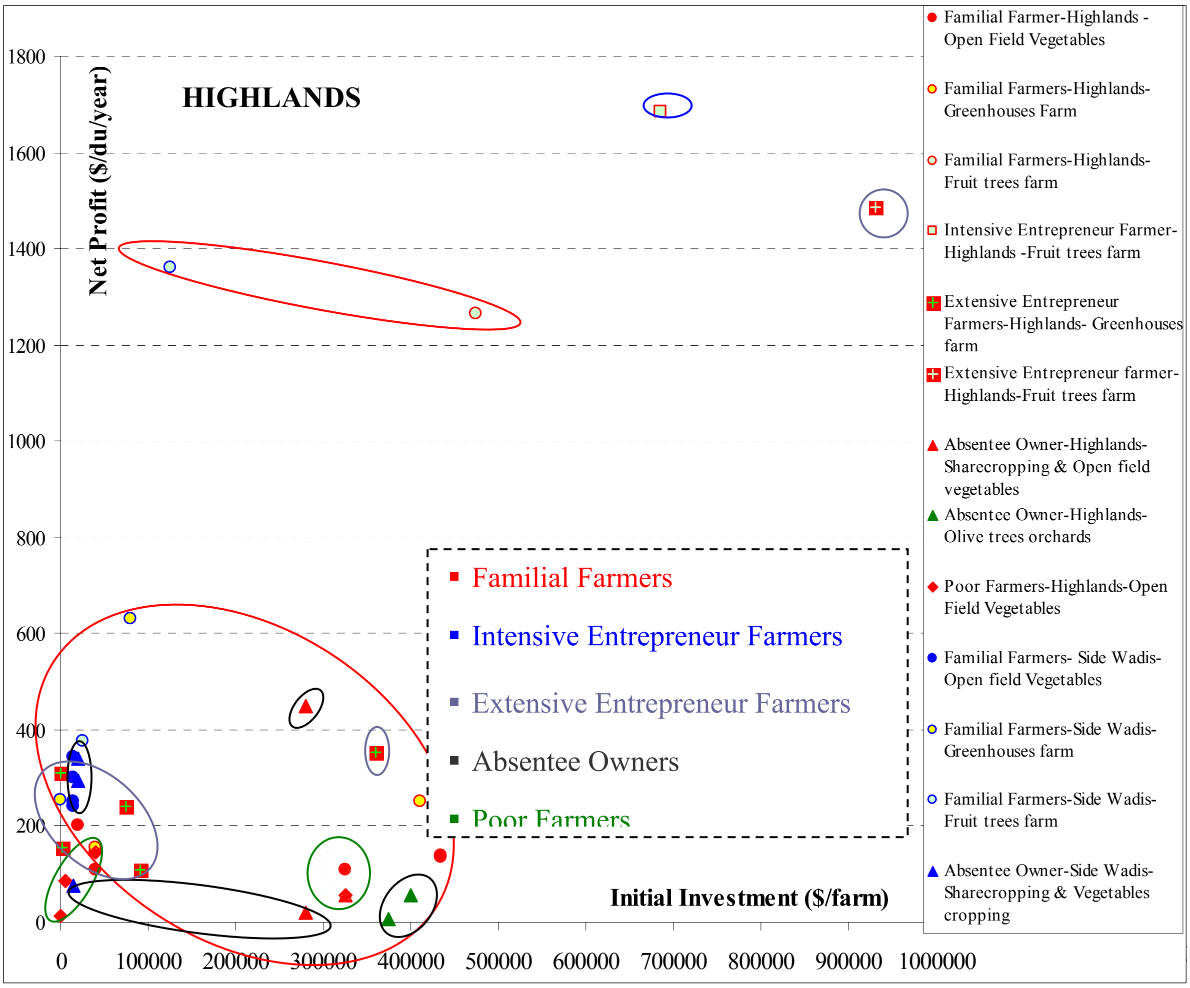



*Figure:* A Farming system's classification based on Net profit ($/dunum) and Initial Investment (Gross value)



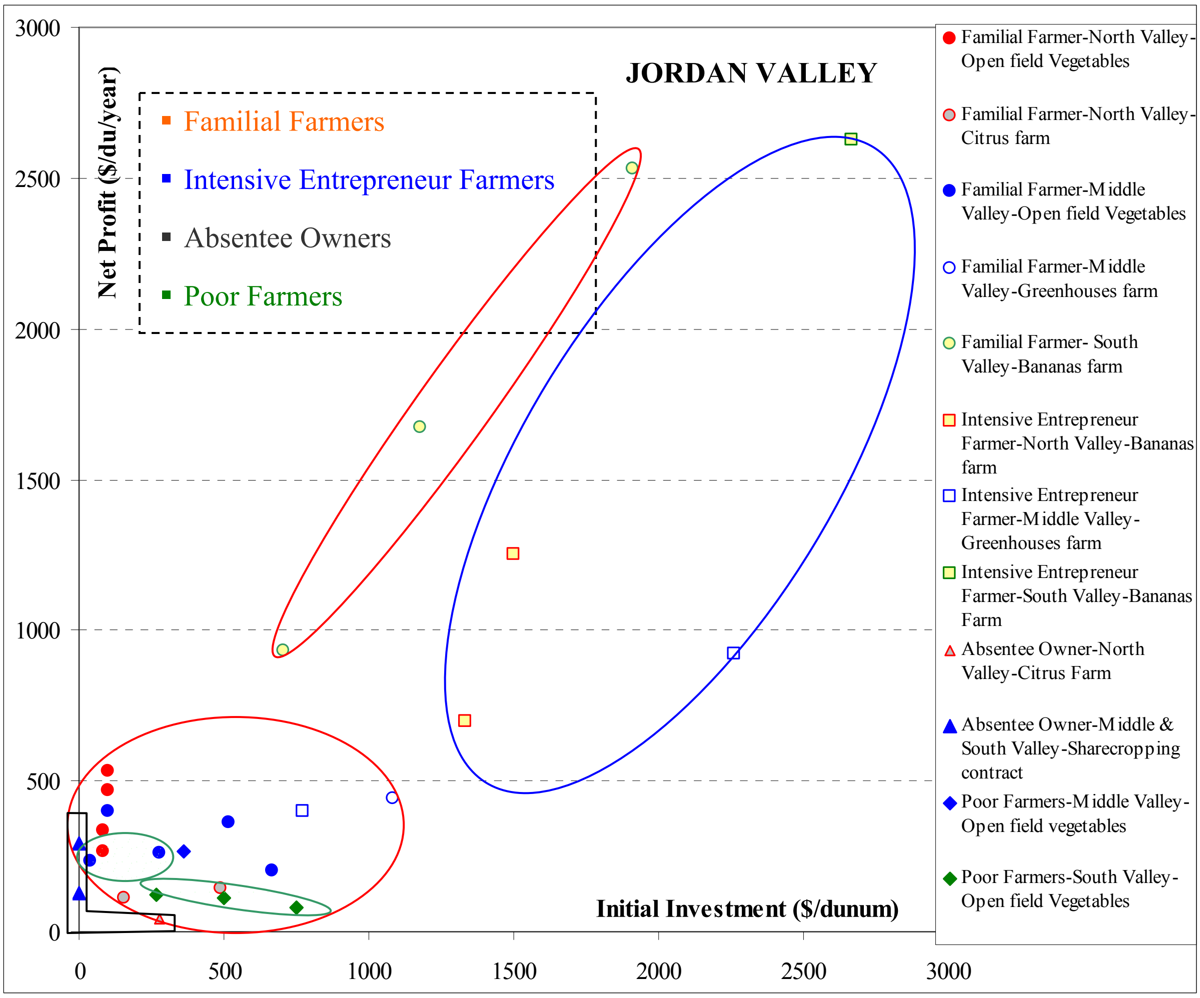
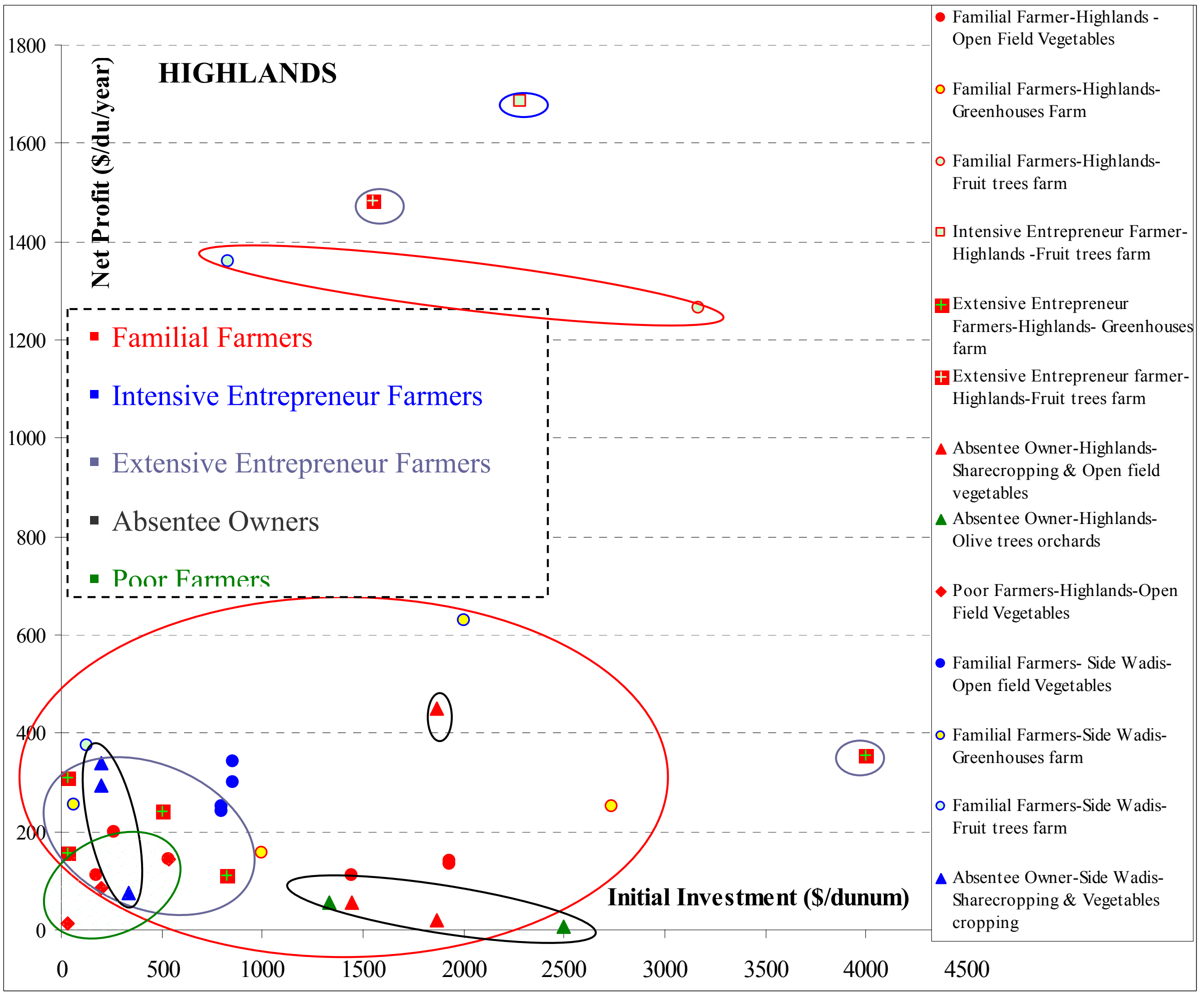



*Figure:* A Farming system's classification based on Net profit ($/dunum) and Initial Investment ($/dunum)



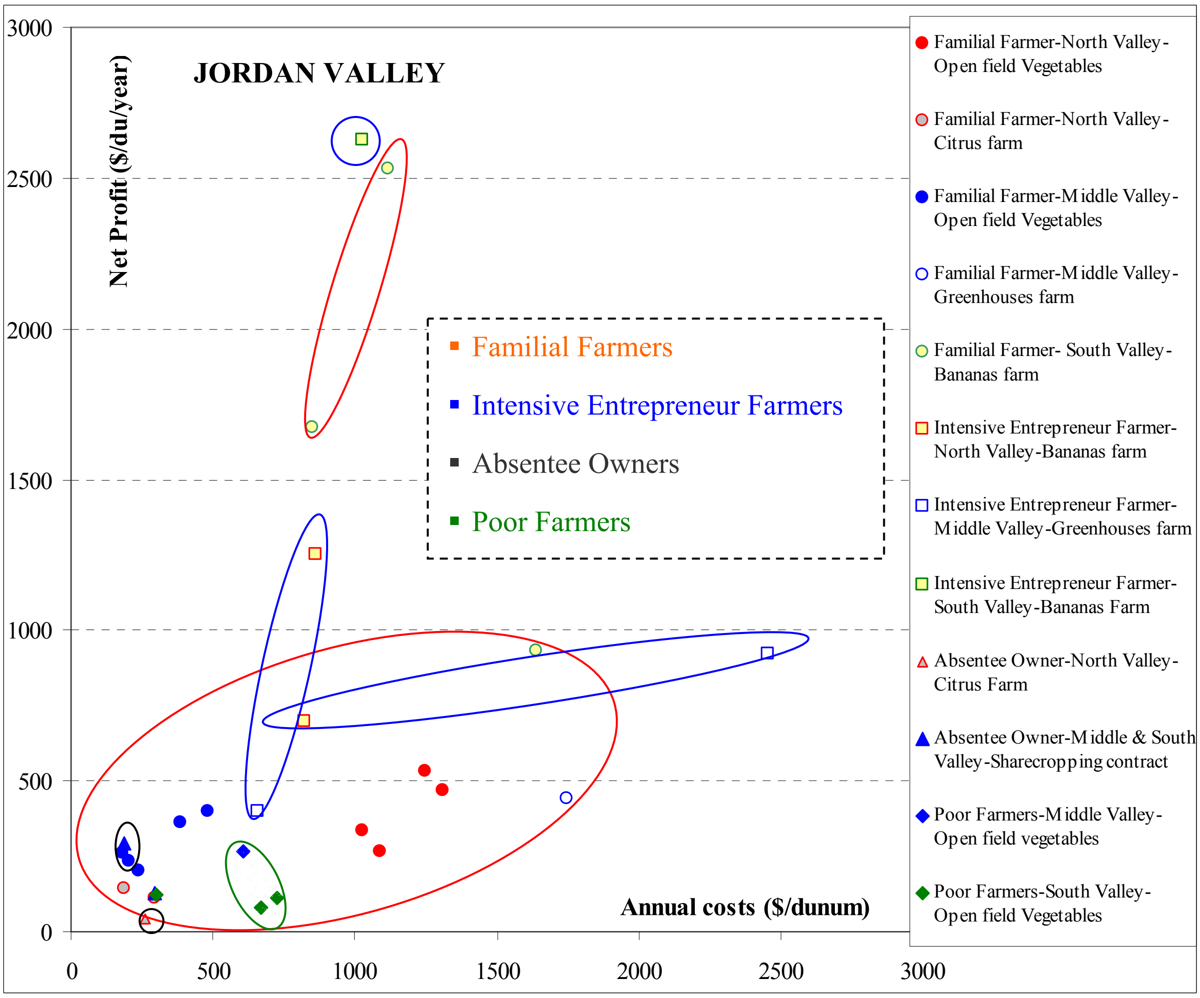
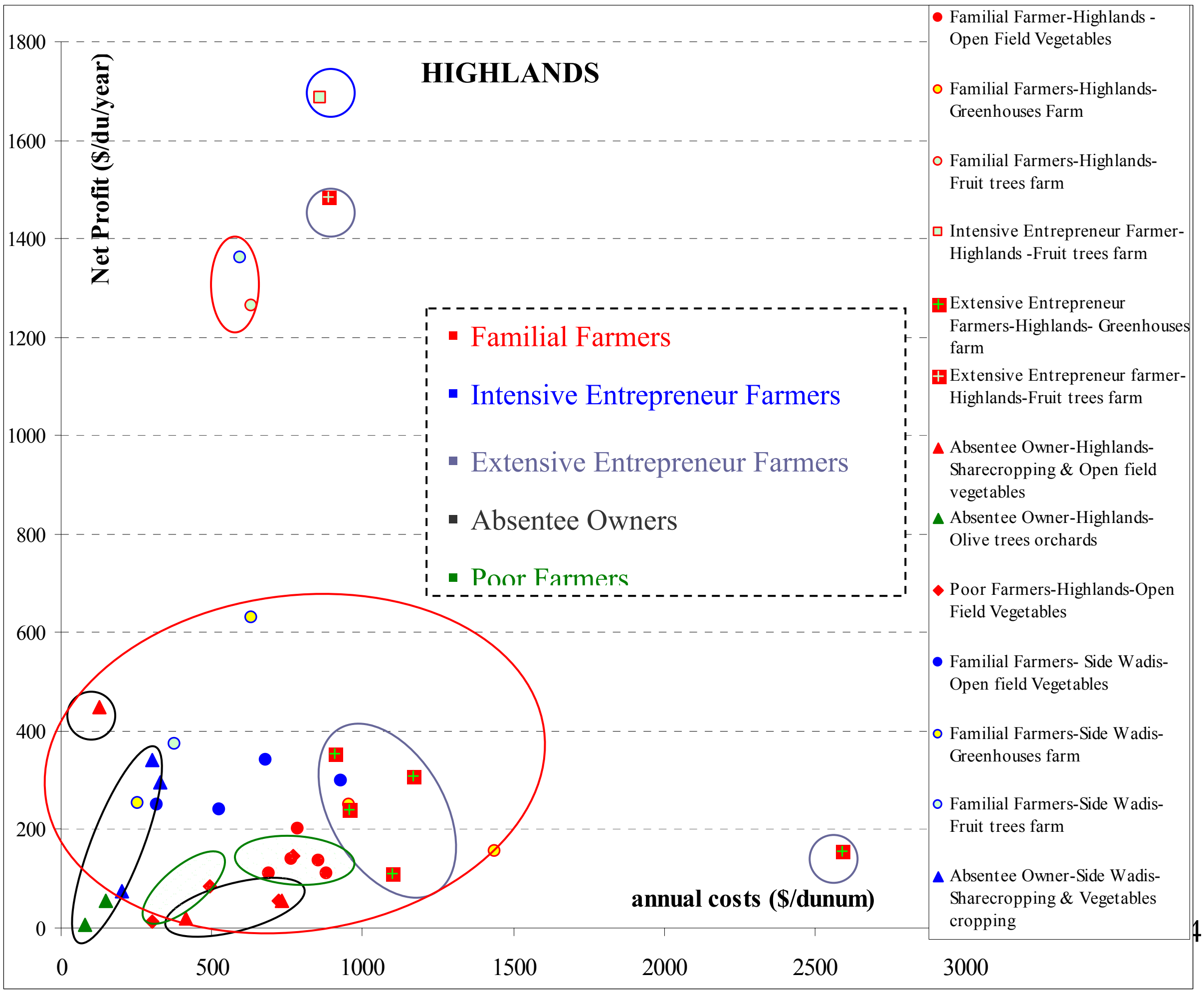



*Figure:* A Farming system's classification based on Net profit ($/dunum) and Annual costs ($/dunum)



# Appendix IX: WHO guidelines for waste water reuse in agriculture

| Category | Reuse conditions | Exposed group | Intestinal nematodes[b] (arithmetic mean no. of eggs per litre[c]) | Faecal coliforms (geometric mean no. per 100ml[c]) | Wastewater treatment expected to achieve the required microbiological guideline |
|---|---|---|---|---|---|
| A | Irrigation of crops likely to be eaten uncooked, sports fields, public parks[d] | Workers, consumers, public | $\leqslant 1$ | $\leqslant 1000$ | A series of stabilization ponds designed to achieve the microbiological quality indicated, or equivalent treatment |
| B | Irrigation of cereal crops, industrial crops, fodder crops, pasture and trees[e] | Workers | $\leqslant 1$ | No standard recommended | Retention in stabilization ponds for 8–10 days or equivalent helminth and faecal coliform removal |
| C | Localized irrigation of crops in category B if exposure to workers and the public does not occur | None | Not applicable | Not applicable | Pretreatment as required by irrigation technology but not less than primary sedimentation |

[a] In specific cases, local epidemiological, sociocultural and environmental factors should be taken into account and the guidelines modified accordingly.

[b] *Ascaris* and *Trichuris* species and hookworms.

[c] During the irrigation period.

[d] A more stringent guideline limit ($\leqslant$ 200 faecal coliforms/100 ml) is appropriate for public lawns, such as hotel lawns, with which the public may come into direct contact.

[e] In the case of fruit trees, irrigation should cease two weeks before fruit is picked, and no fruit should be picked off the ground. Sprinkler irrigation should not be used.

# *Appendix X: Agricultural Production in the Jordan Valley*

*Data according to the Department of Statistics*

| Total Production in the Northern Ghors -Jordan Valley- | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Production in Tons | **Production 1994** | **Production 1995** | **Production 1996** | **Production 1997** | **Production 1998** | **Production 1999** | **Production 2000** | **Production 2001** | **Production 2002** | **Average production** |
| Tomatoes | 27616,9 | 59744,2 | 47990,5 | 425594 | 33031,2 | 14187,9 | 88885,1 | 21221,4 | 25168,2 | 82604,4 |
| Squash | 6606,9 | 13406,7 | 6588,1 | 59346 | 5982,8 | 6760,5 | 5230,6 | 3483,6 | 9517,9 | 12991,5 |
| Eggplants | 8507,1 | 13313 | 1648,6 | 113186 | 4616,2 | 8714,7 | 5269,6 | 2696,6 | 6125 | 18230,8 |
| Cucumber | 8331,7 | 19743,1 | 16421,4 | 155758 | 13894,6 | 9359,1 | 33652,9 | 13555,8 | 17563,7 | 32031,1 |
| Potato | 10926,5 | 8352,5 | 29343,4 | 92047 | 12261 | 15736,6 | 9921,2 | 10561,2 | 21486,5 | 23404,0 |
| Cabbage | 3143,3 | 1918,4 | 3103,3 | 14109 | 1769,5 | 2596,7 | 3148,3 | 1838,7 | 3951,9 | 3953,2 |
| Cauliflower | 1790 | 1052,1 | 1532,9 | 14801 | 600,5 | 2236,1 | 3547,4 | 3879,1 | 3909,2 | 3705,4 |
| Hot pepper | 1672 | 2594,9 | 1210,6 | 31209 | 2176,8 | 2075,7 | 2451,7 | 2717,5 | 3383,3 | 5499,1 |
| Sweet pepper | 1065,4 | 2218 | 3406,6 | 23973 | 4085,7 | 5133 | 5609,9 | 4106,6 | 5003,4 | 6066,8 |
| Broad beans | 369,5 | 953,2 | 2215 | 3372 | 1142,8 | 930 | 314,7 | 2614,6 | 2333,2 | 1582,8 |
| String beans | 188,2 | 314,6 | 957,5 | 10469 | 2115,9 | 1494,7 | 1260,1 | 1236,7 | 2737,9 | 2308,3 |
| Cow-peas | 66,8 | 118,9 | 6,5 | 503 | 235,2 | 282,8 | 515,4 | 583,5 | 587 | 322,1 |
| Jew's mallow | 4965,6 | 8267 | 64,8 | 64150 | 2814,1 | 4517,3 | 2985,9 | 3723 | 9520,9 | 11223,2 |
| Okra | 120,1 | 252,4 | 3154,5 | 4141 | 565,5 | 961,5 | 356,9 | 2366,9 | 3625 | 1727,1 |
| Lettuce | 463 | 751,9 | 257,8 | 6186 | 3649 | 1527,1 | 935,7 | 1022,3 | 978,4 | 1752,4 |
| Sweet melon | 0 | 42,4 | 894,9 | 1574 | 348,7 | 99,8 | | 627,2 | 636 | 527,9 |
| Water melon | 107,3 | 325,8 | 71,3 | 819 | | | | | | 330,9 |
| Spinach | 1346,6 | 1712,9 | 188,2 | 21869 | 666,6 | 748,4 | 1200 | 707 | 647,6 | 3231,8 |
| Onion green | 47,9 | 465,3 | 135,8 | 8317 | 588,1 | 283,5 | 2351,3 | 496,7 | 1678,4 | 1596,0 |
| Onion dry | 5285,6 | 1674 | 6935,5 | 15766 | 400,2 | | 1559,1 | 33,1 | | 4521,9 |
| Turnip | 53,5 | 412,1 | 113,2 | 2599 | 55,6 | 188,3 | 2,1 | 17,3 | | 430,1 |
| Carrot | 195,4 | 69,4 | 90,7 | 50 | | 203,2 | 215,3 | | | 137,3 |
| Parsley | 376,3 | 391,7 | 343,3 | 3626 | 508,3 | 809 | 1108,3 | 1953,8 | 2128,6 | 1249,5 |
| Radish | 211 | 605,9 | 453,3 | 8794 | 1050,1 | 1402,8 | 213,1 | 434,6 | 444,1 | 1512,1 |
| Others | 1327,1 | 1021,5 | 64,2 | 959 | 1507,9 | 1694,1 | 4578,4 | 1448,7 | 673,6 | 1474,9 |

| Total Production in the Northern Ghors -Jordan Valley- | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Production in Tons | **Production 1994** | **Production 1995** | **Production 1996** | **Production 1997** | **Production 1998** | **Production 1999** | **Production 2000** | **Production 2001** | **Production 2002** | **Average production** |
| Lemons | 28015,4 | 29555,6 | 33832,2 | 42897,4 | 39876,7 | 20364,5 | 23555,1 | 31550,7 | 27934,4 | 30842 |
| Oranges local | 4171,6 | 2548,9 | 5347,2 | 2713,5 | 2816,1 | 1366,6 | 2613,7 | 2161,3 | 2407,8 | 2905 |
| Oranges navel | 9920,8 | 7005,4 | 7172 | 6246,2 | 12429,1 | 6355,3 | 14506,8 | 10265,7 | 14422,3 | 9814 |
| Oranges red | 4082 | 2605,4 | 2915,3 | 4764 | 6772,6 | 1807,9 | 4834 | 3939,6 | 2310,9 | 3781 |
| Oranges valencia | 5137,4 | 3336,6 | 4751,6 | 5262,1 | 3850,3 | 1672,4 | 5441,5 | 4743,9 | 3244 | 4160 |
| Oranges french | 257,2 | 382,4 | 312,5 | 2269,2 | 1669 | 486,8 | 388,5 | 1683,5 | 1201,1 | 961 |
| Oranges shamouti | 3593,1 | 2966,4 | 1468,2 | 5928,2 | 7790,6 | 2660,7 | 6351,9 | 5243,4 | 5236,9 | 4582 |
| Clementines | 43314,5 | 28072,5 | 37165,7 | 54200,3 | 44412,1 | 19146,8 | 26659,3 | 36569,6 | 29346 | 35432 |
| Mandarins | 36647,8 | 14434,5 | 22237,6 | 27236,1 | 23254,2 | 8400,1 | 15587,9 | 20375,1 | 17924,6 | 20678 |
| Grapefruits | 1382,2 | 699,8 | 648,6 | 1769,8 | 2983,7 | 2269,2 | 1358,8 | 2860,6 | 1727,1 | 1744 |
| Medn, mandarins | 1677,6 | 859,6 | 1343,2 | 267 | 600,6 | 229,6 | 25,8 | 222,1 | 142 | 596 |
| Pummelors | 828 | 1460 | 1251,4 | 2913,2 | 3887,1 | 4718,3 | 3602,5 | 3858,7 | 3505,1 | 2892 |
| Sour oranges | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Olives | 55,5 | 549,7 | 484,4 | 2408,6 | 1539,7 | 1178,7 | 2999,5 | 751,4 | 2510,9 | 1386 |
| Grapes | 616,1 | 605 | 475,4 | 334,9 | 406 | 230,3 | 148,6 | 267,4 | 169,8 | 362 |
| Figs | 13,2 | 30,6 | 19,7 | 18,2 | 20,4 | 16,9 | 6,9 | 18,2 | 11,8 | 17 |
| Peaches | 283,8 | 291,8 | 277,4 | 102,6 | 206,3 | 39,7 | 153,1 | 181,1 | 163,5 | 189 |
| Apples | 21,8 | 31,6 | 44,5 | 592,5 | 1283,6 | 1386,5 | 1275,1 | 1841,8 | 1161,8 | 849 |
| Pomegrantes | 35,4 | 136,9 | 223,8 | 1307,8 | 1262,1 | 1092,7 | 2143,6 | 2939,8 | 2388,6 | 1281 |
| Guava | 134,5 | 406,2 | 99,9 | 156,8 | 235,9 | 185,6 | 95,6 | 462,2 | 254,4 | 226 |
| Dates | 12 | 45,4 | 22,8 | 226,7 | 595,1 | 352,7 | 469,5 | 453 | 450,8 | 292 |
| Bananas | 2150 | 7236,6 | 2807,4 | 4606,5 | 3247,5 | 2577 | 1865,4 | 1605,3 | 4910,6 | 3445 |
| Others | 150 | 75,9 | 7,9 | 326,7 | 383,6 | 255,2 | 213,3 | 773,9 | 544,9 | 303 |
| Almonds | | | | 0,5 | 0,6 | 0,2 | 1,5 | 2,8 | 1,9 | 1 |
| Plums | | | | 0,4 | 0,6 | 0,6 | 1,2 | 1,1 | 1,3 | 1 |
| Apricots | | | | 55,4 | 55,3 | 75,8 | 106 | 88 | 124,5 | 84 |
| Pears | | | | 1,4 | 1,4 | 1,8 | 3,6 | 4,3 | 2 | 2 |

| Total Production in the Middle Ghors -Jordan Valley- Tons | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Production in Tons | **Production 1994** | **Production 1995** | **Production 1996** | **Production 1997** | **Production 1998** | **Production 1999** | **Production 2000** | **Production 2001** | **Production 2002** | **Average production** |
| Tomatoes | 22350,8 | 19455,5 | 17808,7 | 58135,6 | 25379,9 | 78054,5 | 56888,8 | 19576,9 | 93198,6 | 43427,7 |
| Squash | 7089,1 | 4545,3 | 6270,4 | 9575,4 | 8483,0 | 6991,2 | 4773,8 | 15023,0 | 16741,3 | 8832,5 |
| Eggplants | 9155,3 | 22912,5 | 10196,6 | 9335,0 | 9062,4 | 11799,5 | 6633,6 | 15809,0 | 22513,2 | 13046,3 |
| Cucumber | 14313,2 | 23871,3 | 22814,2 | 20364,8 | 26109,7 | 35099,9 | 32828,8 | 40228,1 | 66709,0 | 31371,0 |
| Potato | 10126,0 | 7550,5 | 20761,0 | 18414,5 | 12491,5 | 14688,4 | 20932,8 | 24214,8 | 30273,6 | 17717,0 |
| Cabbage | 958,4 | 351,3 | 1528,7 | 5565,8 | 1228,9 | 3236,7 | 2948,6 | 2874,5 | 8781,8 | 3052,7 |
| Cauliflower | 1976,6 | 652,4 | 866,6 | 1625,6 | 1395,4 | 2780,8 | 517,2 | 2523,5 | 1738,1 | 1564,0 |
| Hot pepper | 2545,9 | 4589,0 | 2579,8 | 3087,8 | 4288,3 | 8962,5 | 3699,1 | 5303,5 | 9113,3 | 4907,7 |
| Sweet pepper | 2486,4 | 1198,6 | 2761,1 | 2215,4 | 2918,8 | 2463,6 | 1870,3 | 4600,3 | 9816,7 | 3370,1 |
| Broad beans | 381,3 | 521,9 | 1216,9 | 983,7 | 1770,6 | 2324,1 | 445,6 | 467,4 | 2586,7 | 1188,7 |
| String beans | 389,4 | 1595,9 | 727,5 | 4757,4 | 3672,7 | 2788,1 | 2117,4 | 3566,6 | 6059,7 | 2852,7 |
| Peas | 21,3 | | 55,8 | 36,5 | 13,0 | 103,9 | 200,8 | 4,3 | | 62,2 |
| Cow-peas | 51,4 | 80,7 | 12077,5 | 95,0 | 26,4 | 45,7 | 96,4 | 98,3 | | 1571,4 |
| Jew's mallow | 11560,5 | 10712,5 | 144,6 | 6494,6 | 13257,0 | 11916,7 | 15850,0 | 16622,5 | 601,4 | 9684,4 |
| Okra | 43,3 | 40,4 | 2343,9 | 255,7 | 253,2 | 148,8 | 1098,9 | 1109,6 | 27254,8 | 3616,5 |
| Lettuce | 777,2 | 1537,6 | 28,1 | 4903,2 | 3091,0 | 5337,0 | 5001,8 | 6271,4 | 2830,3 | 3308,6 |
| Sweet melon | 192,2 | 167,2 | 644,3 | 373,1 | 565,9 | 175,9 | 297,0 | 73,5 | 4927,7 | 824,1 |
| Water melon | 975,8 | 1564,6 | 231,5 | 2885,8 | 1914,5 | 302,3 | | 1135,1 | 1011,8 | 1252,7 |
| Spinach | | | | 17,0 | | 70,4 | 383,0 | 319,1 | 4779,7 | 1113,8 |
| Onion green | 403,4 | 36,1 | 309,9 | 3076,5 | 310,2 | 3296,6 | 9023,5 | 3380,9 | 835,2 | 2296,9 |
| Onion dry | 12938,6 | 601,1 | 7893,0 | 9936,0 | 9889,8 | 4440,4 | 4417,4 | 8283,0 | 11934,7 | 7814,9 |
| Snake cucumber | | | | 260,7 | 175,0 | 54,3 | 794,4 | 513,4 | 5169,7 | 1161,3 |
| Turnip | 144,4 | 7418,3 | 95,8 | 75,0 | 353,0 | 243,9 | 41,4 | | 894,8 | 1158,3 |
| Carrot | 1221,6 | 718,1 | 3304,2 | 6722,3 | 7908,6 | 6941,7 | 7294,5 | 2285,7 | 220,4 | 4068,6 |
| Parsley | 238,8 | 6551,7 | 30,4 | 48,4 | 2,0 | | 33,0 | 117,1 | 2299,4 | 1165,1 |
| Radish | 48,5 | 303,8 | 108,0 | 62,4 | 63,0 | 109,3 | 75,6 | 227,8 | 283,4 | 142,4 |
| Others | 121,7 | 23,1 | 372,0 | 556,1 | 505,8 | 948,0 | 2103,3 | 2273,4 | 555,8 | 828,8 |

| Total Production in the Middle Ghors -Jordan Valley- Tons | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Production in Tons | **Production 1994** | **Production 1995** | **Production 1996** | **Production 1997** | **Production 1998** | **Production 1999** | **Production 2000** | **Production 2001** | **Production 2002** | **Average production** |
| Lemons | 1461,2 | 1170,2 | 1751,7 | 1074,5 | 1651,6 | 2409,9 | 1872,8 | 639,2 | 1138,8 | 1463,3 |
| Oranges, local | 347,4 | 175,1 | 265,7 | 207,8 | 199,0 | 114,9 | 382,9 | 116,2 | 85,3 | 210,5 |
| Oranges, navel | 423,6 | 565,1 | 705,9 | 301,6 | 706,3 | 1068,7 | 2343,7 | 600,5 | 624,5 | 815,5 |
| Oranges, red | 8,6 | 9,5 | 9,5 | 13,8 | 11,7 | 11,5 | 11,5 | 13,4 | 34,4 | 13,8 |
| Oranges, valencia | 339,5 | 300,1 | 285,4 | 244,5 | 196,7 | 203,2 | 203,2 | 185,5 | 63,2 | 224,6 |
| Oranges, french | 119,6 | 128,3 | 141,3 | 100,3 | 104,1 | 107,6 | 33,9 | 51,8 | 189,3 | 108,5 |
| Oranges, shamouti | 421,6 | 289,5 | 93,8 | 175,6 | 510,5 | 1568,3 | 1877,5 | 2048,2 | 695,5 | 853,4 |
| Clementines | 1212,4 | 1454,7 | 2435,2 | 2428,9 | 2125,8 | 3181,7 | 3574,0 | 1320,8 | 1699,3 | 2159,2 |
| Mandarins | 981,5 | 935,3 | 2650,5 | 1478,8 | 1875,3 | 1379,7 | 2625,7 | 1718,6 | 725,6 | 1596,8 |
| Grapefruits | 123,4 | 159,9 | 102,1 | 515,2 | 246,2 | 597,3 | 500,9 | 475,9 | 1252,3 | 441,5 |
| Medn. mandarins | 64,9 | 63,5 | 56,4 | 14,4 | 35,3 | 83,3 | 99,1 | 77,5 | 176,6 | 74,6 |
| Pummelors | 272,1 | 238,4 | 98,0 | 1476,6 | 643,7 | 1381,7 | 780,6 | 433,7 | 355,6 | 631,2 |
| Sour oranges | 0,0 | 0,0 | 0,0 | 0,0 | 0,0 | 0,0 | 0,0 | 0,0 | 0,0 | 0,0 |
| Olives | 197,5 | 41,3 | 134,6 | 359,5 | 215,8 | 287,6 | 205,0 | 409,9 | 1008,4 | 317,7 |
| Grapes | 1887,1 | 4693,3 | 1408,9 | 1001,1 | 1323,0 | 3711,4 | 1826,3 | 2422,4 | 2124,9 | 2266,5 |
| Figs | 13,6 | 20,0 | 32,3 | 34,2 | 26,6 | 9,2 | 18,5 | 13,8 | 9,2 | 19,7 |
| Almonds | | | | 0,1 | 0,1 | 0,1 | 0,2 | 0,2 | 0,2 | 0,2 |
| Peaches | 607,4 | 1050,7 | 310,8 | 134,3 | 213,4 | 217,2 | 442,7 | 338,0 | 383,3 | 410,9 |
| Plums, prunes | | | | 2,1 | 2,2 | 1,8 | 5,4 | 2,7 | 3,3 | 2,9 |
| Apricots | | | | 14,8 | 22,7 | 31,5 | 66,1 | 54,8 | 60,4 | 41,7 |
| Apples | 51,9 | 21,4 | 7,6 | 561,5 | 430,3 | 733,0 | 1570,5 | 1323,4 | 1759,8 | 717,7 |
| Pomegrantes | 41,7 | 31,0 | 33,5 | 49,8 | 51,7 | 101,7 | 153,8 | 113,6 | 52,5 | 69,9 |
| Pears | | | | 0,1 | 0,3 | 0,3 | 0,3 | 0,2 | 0,2 | 0,2 |
| Guava | 160,4 | 546,0 | 231,5 | 845,3 | 606,6 | 732,1 | 719,8 | 745,5 | 814,1 | 600,1 |
| Dates | 109,2 | 248,8 | 238,0 | 418,9 | 264,0 | 151,9 | 224,5 | 188,5 | 520,5 | 262,7 |
| Bananas | 7640,0 | 4374,3 | 4550,0 | 535,9 | 736,6 | 645,9 | 813,8 | 922,7 | 968,9 | 2354,2 |
| Others | 185,0 | 83,3 | 83,3 | 75,2 | 135,0 | 166,8 | 183,2 | 188,2 | 536,7 | 181,9 |

## *Appendix XI: Average agricultural prices in the Amman's central market*

| Average Prices in the Amman's central market in 2002 (according to the central market registrations excepted for lettuce - Tessier du Cros & Vallin, 2001-) | | |
|---|---|---|
| | JD/T | $/T |
| Tomatoes | 133 | 188 |
| Squash | 213 | 300 |
| Eggplants | 132 | 186 |
| Cucumber | 200 | 282 |
| Potato | 194 | 274 |
| Cabbage | 70 | 99 |
| Cauliflower | 192 | 271 |
| Hot pepper | 192 | 271 |
| Sweet pepper | 236 | 333 |
| Broad beans | 396 | 559 |
| String beans | 404 | 570 |
| Cow-peas | 305 | 430 |
| Jew's mallow | 99 | 140 |
| Okra | 472 | 666 |
| Lettuce | 215 | 303 |
| Sweet melon | 197 | 278 |
| Water melon | 130 | 183 |
| Spinach | 110 | 155 |
| Onion green | 118 | 166 |
| Onion dry | 118 | 166 |
| Turnip | ?? | ?? |
| Carrot | 136 | 192 |
| Parsley | ?? | ?? |
| Radish | ?? | ?? |
| Others | ?? | ?? |

| Average Prices in the Amman's central market in 2002 (according to the central market registration if no other indications) | | |
|---|---|---|
| | JD/T | $/T |
| Lemons | 213 | 300 |
| Oranges shamouti | 213 | 300 |
| Oranges navel | 213 | 300 |
| Oranges red | 213 | 300 |
| Oranges valencia | 213 | 300 |
| Oranges french | 213 | 300 |
| Oranges | 286 | 404 |
| Clementines | 165 | 233 |
| Mandarins | 116 | 164 |
| Grapefruits | 150 | 212 |
| Medn, mandarins | 116 | 164 |
| Pummelors | 136 | 192 |
| Sour oranges | 213 | 300 |
| Olives | ?? | ?? |
| Grapes | 150 | 212 |
| Figs | ?? | ?? |
| Peaches | 444 | 626 |
| Apples | 415 | 585 |
| Pomegrantes | ?? | ?? |
| Guava | ?? | ?? |
| Dates | ?? | ?? |
| Bananas | 764 | 1078 |
| Others | ?? | ?? |
| Almonds | ?? | ?? |
| Plums | 400 | 564 |
| Apricots | 300 | 423 |
| Pears | ?? | ?? |

Price of plums and Apricot according to *Venot (2003)*

Prices of Orange have been harmonized on the shamouti variety since that is the only price the central market presents.