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Agriculture in the Zayandeh Rud Catchment



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Institute for Social-Ecological Research

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Preface

This report presents and justifies data regarding agriculture in the Zayandeh Rud Basin in Iran used in the German-Iranian Research Project "Integrated Water Resource Management (IWRM) in Isfahan", funded by the German Ministry of Education and Research. The report is composed by ISOE – Institute for Social-Ecological Research GmbH in order to describe the current status of scientific knowledge on agriculture and to serve as a database for the Water Management Tool (WMT) developed by DHI-WASY. Hence, the primary goal of the report at hand is neither to develop a comprehensive understanding of all agricultural activities in the basin or develop future trends of the agricultural sector nor to elaborate on available water resources or overall water demand of agriculture, but to deliver comprehensible basic data (cultivated area, crops and orchards) for the WMT and its future application. Both institutions and activities are part of the German-Iranian Research Project "Integrated Water Resource Management (IWRM) in Isfahan" (www.iwrm-isfahan.com), coordinated by inter3. The report, its contents and its validations are accounted solely by its authors.

The study is based on data received by close collaboration with (1) local institutions like Isfahan Regional Water Company and Agriculture Organization Isfahan – AOI, as well as (2) Interviews with farmers from the Western and Eastern part of the catchment and local experts of water management and agriculture and (3) a continuously literature review of articles and reports concerning the Zayandeh Rud catchment in Iran.

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Content

| 1 | Introduction |
|-----|--|
| 2 | Study area1 |
| 3 | Data basis |
| 4 | Status quo of agriculture in the Iranian year 1385 |
| 4.1 | Cultivated areas and crop rotation7 |
| 4.2 | Development of cultivated areas for farmland and orchards 10 |
| 4.3 | Irrigation technology |
| 4.4 | Livestock |
| 4.5 | Water consumption |
| 5 | Future developments |
| 6 | Socio-economic aspects |
| 7 | Problem perception and requirements to future water management |
| 8 | Adaption strategies to water scarcity |
| 9 | Proposals for the second project phase |
| 10 | References |
| 11 | Appendix |



1 Introduction

The use of water resources in the Zayandeh Rud catchment is characterized by water use of different socioeconomic groups. Main consumer of the surface and ground water resources with over 90 % is the sector agriculture followed by the urban and the industry sector.

This report focuses on the agricultural sector, which still plays an important role in the Iranian economy. It comprises a considerably high percentage of production and employment: In earlier years about 25% of the Gross National Product (GNP), 33% of employment, 25% of non-oil exports and 80% of food requirements have been provided by the agricultural sector in Iran (cf. Karbasioun et al. 2008).

The Iranian year 1385 (2006) is the reference or base year of the above mentioned project. In this year the agriculture accounted for 14 percent of Iran's Gross Domestic Product (GDP) and 21 percent of the economically active population. According to Stads et al (2008) the agricultural sector was the fastest growing economic sector in Iran over much of the 1370s due to the construction of extensive irrigation schemes and the expanded production of export-based agricultural commodities such as dates, flowers and pistachios. Nevertheless, successive years of severe drought have substantially held back agricultural output growth. As a result, agriculture's share of GDP has fallen from one-quarter in the early 1370s to the aforementioned 14 percent in 1385.

2 Study area

In the Center of Iran the Zayandeh Rud is the highest-volume river which originates in the Zagros Mountains at an altitude of about 2,300 m and closes after a length of about 350 km in the Gav Khuni swamp at an altitude of about 1,500 m. The Gav Khuni swamp is an important wetland recognized by the Convention of Ramsar in 1975.

The closed Zayandeh Rud Basin covers an area of about 41,500 km² whereof the province of Isfahan contributes more than 90 % completed by the province of Chahar Mahaal & Bakhtiari (Figure 1).

While annually rainfall in the upper catchment area reaches an average of 1,700 mm the city of Isfahan (at an altitude of about 1,800 m) receives only 130 mm a year concentrated in the period of November to April. Temperatures in summer time are reaching 30 °C in July and are dropping down to an average minimum of 3 °C in January. The potential evapotranspiration is about 1,500 mm/y (Molle et al. 2004).

Agriculture is the main water consumer using more than 90 % of the available water resources in the basin followed by domestic and industrial sectors. Due to the low precipitation in the central part of the basin agricultural irrigation is dominant consisting of six main irrigation networks (Abshar, Nekouabad, Borkhar, Rudasht, Mahyar and Lenjanat) in the lower sub-basins along the Zayandeh Rud (Figure 2). Together with the northwestern Karvan network (Morghab spring, Khamiran dam) a net irrigation area of about 180,000 ha is supplied by surface water and groundwater.





Figure 1: Map of the Zayandeh Rud Basin and hydrological sub catchments (source: DHI-WASY)

Regarding field scale the irrigation efficiency is approximately 40 % if percolation and run-off of irrigation water is considered as a loss (Madani and Mariño 2009). Against the background of a closed basin these water losses return to surface and ground water sources and can be used again. Due to this multiplier effect of water recycling the irrigation efficiency on basin scale can be assumed much higher up to 70 % (Zayandab 2008).





Figure 2: Main irrigation networks along the Zayandeh Rud (Droogers and Miranzadeh 2000)

3 Data basis

Existing studies regarding the Zayandeh Rud catchment respectively the Gaw Khuni catchment are mostly based on different hydrological sub-units (Zayandab 2008, Yekom 2010) and the appropriate agricultural data refer to these units (see example in Table 1). Within these studies basic agricultural data are only available for one specific year and for few selected products regarding farmland and orchards. In addition, the method of adapting the original data regarding agriculture to the hydrological sub-units is not clearly described.¹

¹ Furthermore, during a workshop with Yekom Consulting Engineers about the masterplan (Yekom 2010) the Agriculture Organization Isfahan was questioning the data base and appropriate results of this study, due to some data e.g. regarding water consumption in agriculture (see Appendix D) and scenarios of cropping patterns are not confirmed by AOI.



| | | | | - | | - | 0 | - | | | | | | | |
|-------|------------------------|----------|----------|----------|------------|-----------|-----------|----------|----------|----------|----------|---------|--|--|--|
| Hydro | logical sub-units | | | | | | | | | | | | | | |
| | | Wheat | Barley | Rice | Sugar beet | Potato | Onion | Maize | Pulse | Fodder | Others | Total | | | |
| | Area (ha) | 21,330 | 5,068 | 1,520 | 1,534 | 433 | 1,341 | 1,988 | 23 | 3,949 | 4,061 | 41,248 | | | |
| | Area (%) | 50.6 | 12.0 | 3.6 | 3.6 | 1.0 | 3.2 | 4.7 | 0.1 | 9.4 | 9.6 | 97.9 | | | |
| 4201 | Performance (kg/ha) | 4,845.00 | 4,085.00 | 5,544.00 | 36,371.00 | 23,431.00 | 40,000.00 | 6,423.00 | 1,654.00 | 9,500.00 | 4,000.00 | | | | |
| | Yield (t) | 103,343 | 2,070 | 8,425 | 55,793 | 10,143 | 53,635 | 12,769 | 39 | 37,519 | 16,246 | 318,615 | | | |
| | Area (ha) | 8,527 | 3,038 | 140 | 562 | 7 | 144 | 1,332 | 2 | 1,178 | 4,345 | 19,274 | | | |
| | Area (%) | 42.3 | 15.1 | 0.7 | 2.8 | 0.0 | 0.7 | 6.6 | 0.0 | 5.8 | 21.6 | 95.6 | | | |
| 4202 | Performance (kg/ha) | 4,845.00 | 4,085.00 | 5,544.00 | 36,371.00 | 23,431.00 | 40,000.00 | 6,423.00 | 1,654.00 | 9,500.00 | 4,000.00 | | | | |
| | Yield (t) | 41,313 | 12,410 | 775 | 20,428 | 156 | 5,772 | 8,555 | 4 | 11,188 | 17,378 | 117,981 | | | |
| | Area (ha) | 1,999 | 757 | 0 | 224 | 2 | 0 | 6,852 | 0 | 157 | 634 | 10,625 | | | |
| | Area (%) | 18.5 | 7.0 | 0.0 | 2.1 | 0.0 | 0.0 | 63.3 | 0.0 | 1.4 | 5.9 | 98.2 | | | |
| 4203 | Performance (kg/ha) | 4,845.00 | 4,085.00 | | 36,371.00 | 23,431.00 | | 6,423.00 | | 9,500.00 | 4,000.00 | | | | |
| | Yield (t) | 9,686 | 3,092 | 0 | 8,155 | 52 | 0 | 44,011 | 0 | 1,487 | 2,523 | 69,018 | | | |
| | | | | | | | | | | | | | | | |

Table 1: Excerpt of aggregated agricultural data at level of hydrological sub-units (Yekom 2010)

On the other hand original data regarding agriculture (area, production, yield) are aggregated and documented by the Agriculture Organisation Isfahan (AOI) based on the counties of the province of Isfahan (see Table 2). These data show figures for each year and include all cultivated products separated for farmland and orchards.

| Table 2: Excerpt of original data a | t county level re | garding agriculture, | provided by AOI (AOI 2012) |
|-------------------------------------|-------------------|----------------------|----------------------------|
|-------------------------------------|-------------------|----------------------|----------------------------|

| Year | Products | | Province | | County | County (Town ship) | | | | | | | | |
|------|----------------|--------|------------|-------|--------|--------------------|-------|-------|-------------|-------|-------|------------|-------|--|
| - | Name | | Isfahan | | | Isfahan | | | Shahin Shah | r | | Tiran | | |
| - | - | Area | Production | Yield | Area | Production | Yield | Area | Production | Yield | Area | Production | Yield | |
| - | - | ha | t | kg/ha | ha | t | kg/ha | ha | (Ton) | kg/ha | ha | t | kg/ha | |
| | Wheat | 90,000 | 439,329 | 4,881 | 28,601 | 160,166 | 5,600 | 4,200 | 20,160 | 4,800 | 2,500 | 10,500 | 4,200 | |
| /89 | Rainfed wheat | 18,010 | 18,855 | 1,047 | 0 | 0 | | 0 | 0 | | 500 | 300 | 600 | |
| 88 | Barley | 47,850 | 198,926 | 4,157 | 6,700 | 30,820 | 4,600 | 2,500 | 11,250 | 4,500 | 800 | 3,120 | 3,900 | |
| 13 | Rainfed barley | 7,006 | 5,870 | 838 | 0 | 0 | | 0 | 0 | | 75 | 53 | 700 | |
| | Rice (paddy) | 11,468 | 61,016 | 5,321 | 1,400 | 7,000 | 5,000 | 0 | 0 | | 13 | 40 | 3,100 | |
| | Corn | 2,546 | 18,230 | 7,160 | 248 | 1,637 | 6,600 | 400 | 2,720 | 6,800 | 0 | 0 | | |
| | Millet | 1,534 | 4,008 | 2,612 | 140 | 322 | 2,300 | 4 | 11 | 2,750 | 0 | 0 | | |
| | Pease | 345 | 495 | 1,434 | 0 | 0 | | 0 | 0 | | 9 | 14 | 1,500 | |
| | Fedraind pease | 718 | 201 | 280 | 0 | 0 | | 0 | 0 | | 0 | 0 | | |
| | Beans | 1,550 | 2,868 | 1,850 | 2 | 4 | 1,750 | 0 | 0 | | 50 | 115 | 2,300 | |
| | | | | | | | | | | | | | | |

The Water Management Tool (WMT) developed by our project partner DHI-WASY is not based on hydrological sub-units because of the main purpose of the model to support detailed strategic decisions on monthly bases on a river basin scale (instead of other studies based on hydrological sub-units which generate average results over several years and balancing on small scale). Against this background and in order to limit the effort of data generation for future users of the WMT an easy and reproducible method of data adaption was necessary.

In a first approximating step already existing coefficients by Sally et al. 2001 were applied to be able to use the original data from AOI (Table 2). In addition, new coefficients for the remaining counties without irrigation networks within the Zayandeh Rud Basin were generated. Regarding the province of Chahar Mahaal & Bakhtiari there were no original data regarding cultivated areas and specific crops/fruits available. Therefore assumptions made by the AOI regarding the total area for crops and orchards in the year 1385 were used (see Appendix B).

Sally et al. 2001 used the aggregated administrative district-level data to get better estimates for cropping patterns with less time and effort comparing to the use of village data. Therefore, the irrigation system and administrative district boundaries were overlaid using the available ILWIS² maps to determine the proportion of area of each system that belonged to each of the administrative districts in the Zayandeh Rud basin. This enabled to determine a weighting factor for each irrigation system belonging to a particular district. Applying this factor to the recorded crop area of that district will give an estimation of how this cropped area are distributed among

² Integrated Land and Water Information System (ILWIS)



the irrigation systems that fall within that district (see Appendix B, figures with grey background). The appropriate map with the county borders and the catchment area of the Zayandeh Rud Basin is shown in Figure 3. The assumptions for the coefficients by Sally et al. 2001 are that (a) all the crop area in a given district can be attributed to one or more of the irrigation systems, and (b) the crop areas are distributed among the irrigation systems in a particular district in the same proportion as their overall boundary areas.

After applying these coefficients the Agriculture Organisation Isfahan stated that the results regarding the cultivated areas of farmland and orchards for the base year 1385 show excessive deviation compared to their real data. As a solution, new data regarding cultivated areas for the Iranian agricultural year 1385-86 were gathered and delivered by AOI at the end of the project.

With regard to this new data parts of the cultivated areas regarding farmland and orchards in five counties (Isfahan, Mobarakeh, Tiran&Karvan, Flavarjan, Lenjan) could not be allocated completely by AOI to specific irrigation networks within the Zayandeh Rud Basin. Based on the proposal of inter 3 these remaining areas were allocated to specific irrigation networks in the same portion as already existing parts within these five counties have been allocated. According to this assumption about 16% of cultivated areas of farmland and 29 % of orchards were completed.

Based on this data of the Iranian agricultural year 1385-86 (see Appendix F) new overall coefficients regarding the allocation of cultivated farmland and orchards for irrigation networks and remaining counties could be generated and were applied to the county data base. These differentiated coefficients for farmland and orchards are shown in Table 3.

For future application the above described method of allocating county data within the Zayandeh Rud Basin should be extended in a way that e.g. specific coefficients regarding farmland and orchards are not only available for a normal year (like the Iranian year 1385 which was determined by all project partners as the base year) but also for a dry and wet year. This would further improve the results of the allocation of county data of different years due to the fact that the cultivated areas and appropriate cropping patterns are changing depending on the availability of irrigation water.



| Province | | County | Irrigation network | Coeff | cients |
|---------------------------|------|-------------------------------|-----------------------------------|-----------|----------|
| | no. | name | | (based or | 1385-86) |
| | | | | farmland | orchards |
| | | | | (-) | (-) |
| | 1001 | Ardestan ¹⁾ | - | - | |
| | 1002 | Isfahan | Borkhar | 0.001 | 0.00 |
| | | | Abshar left | 0.17 | 0.01 |
| | | | Abshar right | 0.20 | 0.57 |
| | | | Rudasht north | 0.17 | - |
| | | | Rudasht south | 0.19 | - |
| | | | Mahyar | 0.003 | - |
| | 1003 | Khomeinishahr | Nekouabad left | 0.99 | 0.95 |
| | 1004 | Khansar ¹⁾ | - | - | - |
| | 1005 | Samirom ¹⁾ | - | - | - |
| | 1006 | Faridan | - | 0.80 | 0.59 |
| | 1007 | Fereydoonshahr | - | 0.75 | 0.69 |
| | 1008 | Falavarjan | Nekouabad right | 0.36 | 0.37 |
| | | | Nekouabad left | 0.64 | 0.63 |
| | 1009 | Shahreza | Mahyar | 0.51 | 0.07 |
| | 1010 | Kashan ¹⁾ | - | - | - |
| Isfahan | 1011 | Golpaygan ¹⁾ | - | - | - |
| | 1012 | Lenjan | Lenjanat up | 0.16 | 0.76 |
| | | | Lenjanat down | 0.84 | 0.24 |
| | 1013 | Nain ¹⁾ | - | - | - |
| | 1014 | Najafabad | Nekouabad left | 0.94 | 0.99 |
| | 1015 | Natanz ¹⁾ | - | - | - |
| | 1016 | Shahinshahr | - | - | - |
| | 1017 | Mobarakeh | Nekouabad right | 0.69 | 0.80 |
| | | | Mahyar | 0.30 | - |
| | 1018 | Aran & Bidgol ¹⁾ | - | | |
| | 1019 | Tiran & Korun | Askaran /Karvan up Morghab spring | 0.18 | 0.03 |
| | | | Karvan upstream Khamiran | 0.47 | 0.35 |
| | | | Karvan downstream Khamiran | 0.32 | 0.62 |
| | 1020 | Chadegan | - | 1.00 | 1.00 |
| | 1021 | Dehaghan | - | 1.00 | 1.00 |
| | 1022 | Borkhar | Borkhar | 0.93 | 0.60 |
| | 1023 | Khor & Biabanak ¹⁾ | - | - | - |
| Chahar Mahaal | | | | _ | _ |
| & Bakhtiari ²⁾ | 1 | Ē | | - | - |

Table 3: Allocation of counties to irrigation networks within the Zayandeh Rud Basin and appropriate coefficients

¹⁾ Counties outside of Zayandeh Rud Basin

 $^{\rm 2)}$ No coefficients available, but assumptions for cultivated area in 1384-85 by AOI





Figure 3: Counties of the province of Isfahan (no. 1001-1023) and border of the Zayahndeh Rud Basin (bold black line) (source: DHI-WASY)

4 Status quo of agriculture in the Iranian year 1385

4.1 Cultivated areas and crop rotation

The overall coefficients for cultivated areas (Table 3) were applied to the original data of farmland and orchards on county level for the Iranian year 1385 resulting in appropriate cultivated areas within the Zayaendeh Rud Basin (see Appendix E). The Iranian year 1385 was defined by all project partners as a "normal" year regarding agriculture and water availability and therefore chosen as the base year for the project. Regarding agriculture the base year lasts from October 2005 to October 2006.

The cultivated areas of different farmland products according to the irrigation areas in the base year 1385 are shown in Figure 4. In order to give a better overview only products with a sum > 1,000 ha in the Zayandeh Rud Basin are considered.





Figure 4: Cultivated areas of farmland in the Iranian year 1385 within the Zayandeh Rood Basin (supplied by surface water and other resources, only products with sum > 1,000 ha)

In total 46 products (or products groups)³ were listed in the statistics from the Ministry of Agriculture with a sum of 206,347 ha (see Appendix G, table 21) out of which 23 show a total cultivated area > 1,000 ha. With over 73,000 ha wheat is the most cultivated product by far. Barley, rice, alfalfa, potato, maize (forage) and sainfoin show cultivated areas between 26,000 and 10,000 ha followed by clover, beans and other commodities with less than 4,000 ha down to 1,000 ha. Wheat, barley, alfalfa, potato, maize and canola were grown in all the 17 irrigation areas (13 irrigation networks and 4 counties).

Regarding the irrigation areas Faridan (24,896 ha), Nekouabad left (23,692 ha) and Borkhar (23,044 ha) show the largest sum of cultivated farmland out of which Faridan is not belonging to an irrigation network supplied by surface water of the Zayandeh Rud.

According to the statistics about 57,539 ha of irrigated farmland was fallow land out of which Faridan (10,488 ha), Borkhar (10,365 ha) and Nekouabad right (8,117 ha) have the largest areas.

Figure 5 shows the cultivated areas of different products regarding orchards according to the irrigation areas in the base year 1385. In order to give a better overview only products with a sum >100 ha in the Zayandeh Rud Basin are considered.

³ In addition to these products supplied by irrigation, six products are poduced by rainfed agriculture (wheat, barley, lentils, alfalfa, pease, sainfoin) with a total area of 20,138 ha located in the North of the Basin within the three Karvan networks and the counties Faridan, Fereydoonshahr and Chadegan. About 12,036 ha of rainfed land was fallow land.





Figure 5: Cultivated areas of orchards in the Iranian year 1385 within the Zayandeh Rood Basin (supplied by surface water and other resources, only products with a total > 100 ha)

In total 25 products (or products groups)⁴ were listed in the statistics from the Ministry of Agriculture with a sum of 18,871 ha (see Appendix H, table 30) out of which 16 show a total cultivated area > 100 ha. Grapes and almonds each with over 4,000 ha and walnuts with over 2,000 ha are the most cultivated products by far.

Regarding the irrigation areas Nekouabad left (5,789 ha) and Karvan downstream Khamiran (2,310 ha) show the largest sum of cultivated orchards. These are followed by Nekouabad right (1,459 ha), Dehaghan (1,378 ha), Lenjanat up (1,370 ha), Karvan upstream Khamiran (1,304 ha), Abshar right (1,302 ha) and Borkhar (1,146 ha) each with over 1,000 ha cultivated areas.

In the irrigation networks Roodasht North and Roodasht South no cultivated areas are situated that have orchard functions.

The applied crop rotations in several counties and appropriate irrigation areas are shown in Table 4. The farmers in the remaining counties within the Zayandeh Rud Basin do not practice crop rotation.

⁴ In addition to these products supplied by irrigation, almonds are also grown by rainfed with a total area of 1,352 ha located in the North of the Basin within the irrigation networks of Karvan and Lenjanat and the four counties Faridan, Fereydoonshahr, Chadegan and Dehaghan.



| County | Existing area | Total cultivated area, including crop rotation | Cultivated area with 2 rotations | Cultivated area without rotation | Crop rotation |
|------------------|------------------|--|--|--|----------------------------|
| | (ha) | (ha) | (ha) | (ha) | |
| Falavarjan | 11,300 | 15,452 | 8,304 | 7,148 | Barley-Rice, Wheat-Cabbage |
| Khomeinishahr | 3,500 | 4,338 | 1,676 | 2,662 | Hay-Rice, Barley-Maize |
| Isfahan | 61,000 | 86,877 | 51,754 | 35,123 | Melon-Cotton, Barley-Rice |
| Mobarakeh | 10,500 | 17,286 | 13,572 | 3,714 | Barley-Rice, Barley-Maize |
| Lenjan | 4,000 | 4,767 | 1,534 | 3,233 | Hay-Rice, Barley-Maize |
| Borkhar o Meymeh | 18,734 | 24,653 | 11,838 | 12,815 | Barley-Maize |
| Najafabad | 7,250 | 10,113 | 5,726 | 4,387 | Barley-Maize, Hay-Rice |
| Shahinshahr | 0 | 0 | 0 | 0 | Barley-Maize |
| Sum | 116,284 | 163,486 | 94,404 | 69,082 | - |

Table 4: Crop rotation at county level (AOI, 2012)

4.2 Development of cultivated areas for farmland and orchards

Based on the Iranian year 1385 the statistical data for farmland and orchards of four years before and after that base year were adapted by the method described in chapter two.⁵ Figure 6 shows the appropriate development of total cultivated areas for the period of nine years within the Zayandeh Rud Basin (without the province of Chahar Mahaal & Bakhtiari).

After the three-years drought from 1999-2001 (Molle et al. 2008) the cultivated areas of farmland in the year 2002 ammounted to 148,822 ha (see Appendix G) which are about 30 % less compared to the "normal" year 2006. In the years between the cultivated areas steadily increased up to the base year 2006 with a sum of 206,347 ha. The development of the cultivated area regarding orchards before 2006 was qualitatively similar to the farmland.

By contrast, after the base year 2006 the cultivated areas of farmland and orchards developed differently. Farmland areas decreased again up to 40 % less compared to 2006 whereas the cultivated areas of orchards increased to over 40% more compared to the base year although another dry period after 2007 can be observed (Faramarzi et al. 2010). Referring to this, the increase took place in every single irrigation area except Borkhar which shows a decline for cultivated area of about 70 %. The positive extreme can be identified for the county Faridan with an increase of about 217 % compared to the base year 2006 (see Appendix H).

⁵ Regarding cultivated areas of orchards only 8 years of agricultural data up to the Iranian year 1388 (10/2008-10/2009) were considered.





Figure 6: Development of cultivated areas for farmland and orchards for Iranian years 1380-89 (2001-2010)

4.3 Irrigation technology

Most of the irrigated agricultural area within the Zayandeh Rud cathement is irrigated by flood irrigation (e.g. furrow irrigation). In the Iranian year 1385 about 92 % of the cultivated areas were supplied with water by flood irrigation. About 8 % of the cultivated area belong to pressurized irrigation systems consisting of about 80 % of sprinklers regarding farmland and 20 % of drip irrigation regarding orchards (see Table 5). The data shown are based on bank loans granted to the farmers for funding pressure irrigation projects until 1385. There were no data available for the part of the province of Chahar Mahaal & Bakhtiari belonging to the Zayandeh Rud catchment.



| Until 1385 | Spri | inkler | Dr | rip | With low | pressure | Su | m |
|----------------------|------|-----------|--------|-----------|----------|-----------|--------|-----------|
| County Amount | | Area (ha) | Amount | Area (ha) | Amount | Area (ha) | Amount | Area (ha) |
| Isfahan | 58 | 1,766 | 39 | 403 | 0 | 0 | 99 | 2,168 |
| Borkhar | 65 | 2,440 | 10 | 306 | 2 | 20 | 77 | 2,765 |
| Tiran o Karun | 20 | 490 | 9 | 59 | 0 | 0 | 29 | 549 |
| Chadegan | 106 | 1,845 | 14 | 196 | 0 | 0 | 120 | 2,041 |
| Khomeinishahr | 3 | 14 | 4 | 26 | 0 | 0 | 7 | 40 |
| Shahinshahr o Meymeh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Shahreza | 14 | 286 | 50 | 473 | 0 | 0 | 64 | 759 |
| Fereydun | 382 | 7,083 | 34 | 379 | 0 | 0 | 416 | 7,461 |
| Fereydunshahr | 28 | 812 | 12 | 170 | 0 | 0 | 40 | 982 |
| Falavarjan | 6 | 50 | 23 | 76 | 0 | 0 | 29 | 124 |
| Lenjan | 9 | 224 | 17 | 244 | 0 | 0 | 26 | 468 |
| Mobarakeh | 18 | 385 | 11 | 68 | 0 | 0 | 29 | 453 |
| Najafabad | 26 | 687 | 69 | 1,791 | 0 | 0 | 95 | 2,478 |
| Sum | 735 | 16,082 | 292 | 4,191 | 2 | 20 | 1,031 | 20,288 |

Table 5: Implemented irrigation technology (AOI 2012)

4.4 Livestock

The livestock in the Zayandeh Rud catchment is dominated by poultry and sheep farming by approximately ten million respectively one million animals. Livestock data regarding the counties within the Zayandeh Rud catchment are shown in Table 6.

Table 6: Livestock in the year 1385 (AOI 2012)

| | | | | Popul | ation: head | / piece | | |
|----------------|-----------------|------------------------------|---------|-----------------|----------------------------|---------------------------------|---|--|
| County | Sheep (head) | Goat Cow & c (head) (head | | Camel (head) | Poultry (1000 piece) | New born Fish(1000 Piece) | Decorating fish (tank fish) (1000 piece) | Honey bee colony (1000 piece) |
| Isfahan | 190,606 | 47,625 | 70,313 | 73 | 2,268 | 0 | 3,000 | 25 |
| Borkhar | 126,842 | 52,610 | 36,530 | 265 | 2,134 | 0 | 100 | 18 |
| Tiran & Karvan | 28,591 | 7,757 | 12,567 | 0 | 975 | 116 | 0 | 3 |
| Chadegan | 133,226 | 35,784 | 14,373 | 0 | 71 | 0 | 0 | 2 |
| Khomeynishahr | 44,224 | 28,712 | 25,667 | 0 | 436 | 1,150 | 200 | 13 |
| Dehaghan | 25,748 | 22,498 | 5,027 | 0 | 274 | 2,080 | 0 | 5 |
| Shahinshahr | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Shahreza | 50,700 | 44,398 | 14,464 | 0 | 179 | 0 | 0 | 33 |
| Feridan | 169,724 | 45,569 | 27,411 | 0 | 352 | 1,080 | 0 | 4 |
| Falavarjan | 44,566 | 23,927 | 16,338 | 0 | 939 | 6,242 | 0 | 0 |
| Lenjan | 45,595 | 16,649 | 29,980 | 30 | 300 | 0 | 0 | 1 |
| Mobarakeh | 68,855 | 9,571 | 24,400 | 0 | 619 | 300 | 0 | 1 |
| Najafabad | 60,610 | 20,943 | 23,615 | 305 | 1,523 | 0 | 1,500 | 176 |
| Sum | 989,287 | 356,043 | 300,685 | 673 | 10,070 | 10,968 | 4,800 | 279 |



4.5 Water consumption

The agricultural water consumption⁶ of surface water within the Zayandeh Rud Basin is measured and documented by Mirhab.⁷ For the year 1385 about 726 million m³ of surface water was extracted from the Zayandeh Rud and supplied to agriculture by canals within the new irrigation networks (Mirhab 2012). Table 7 shows the monthly water consumption of each irrigation network differentiated into the total water extracted from the Zayandeh Rud (canal, inlet) and the water supplied to farmland and orchards (canal, agriculture).

| Year | Irrigation network | Canal | Oct | Nov | Dec | Jan | Feb | Mar | Apr | May | Jun | lut | Aug | Sep | Sum |
|------|-----------------------|-------------|---------------------|------|------|-----|-----|-----|-------|-------|-------|-------|-------|-------|-------|
| | | | mio. m ³ | | | | | | | | | | | | |
| | Mahyar and | Inlet | 8.5 | 8.0 | 0.0 | 0.0 | 0.0 | 0.0 | 13.4 | 15.5 | 9.6 | 7.6 | 7.5 | 6.4 | 76.5 |
| | Jarghoyeh | Agriculture | 5.0 | 6.9 | 0.0 | 0.0 | 0.0 | 0.0 | 11.2 | 13.1 | 8.0 | 6.4 | 6.5 | 5.4 | 62.5 |
| | | Inlet | 3.5 | 0.0 | 2.7 | 0.0 | 0.0 | 0.0 | 13.5 | 27.9 | 40.1 | 50.4 | 48.3 | 40.8 | 227.2 |
| | Nekoabad Left | Agriculture | 2.3 | 0.0 | 2.0 | 0.0 | 0.0 | 0.0 | 10.8 | 23.8 | 33.0 | 43.0 | 39.4 | 32.6 | 186.9 |
| | Nekoabad | Inlet | 3.5 | 0.0 | 2.7 | 0.0 | 0.0 | 0.0 | 1.2 | 8.0 | 14.8 | 21.1 | 21.1 | 18.2 | 90.6 |
| | Right | Agriculture | 2.3 | 0.0 | 2.0 | 0.0 | 0.0 | 0.0 | 0.9 | 0.6 | 10.1 | 17.2 | 17.9 | 15.2 | 66.2 |
| | Porkhar | Inlet | 3.9 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 5.3 | 12.3 | 13.1 | 13.9 | 14.7 | 14.2 | 77.4 |
| | borknar | Agriculture | 3.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 4.0 | 10.4 | 11.6 | 12.0 | 12.4 | 11.3 | 65.2 |
| 8 | Karvan | Inlet | 0.5 | 1.7 | 0.3 | 0.0 | 0.0 | 0.0 | 0.0 | 1.6 | 2.8 | 3.9 | 3.7 | 4.1 | 18.6 |
| -50 | | Agriculture | 0.4 | 1.4 | 0.2 | 0.0 | 0.0 | 0.0 | 0.0 | 1.4 | 2.2 | 3.3 | 3.0 | 3.2 | 15.2 |
| 30 | Abshar Loft | Inlet | 3.3 | 8.5 | 7.9 | 0.0 | 0.0 | 0.0 | 19.5 | 20.6 | 14.0 | 12.5 | 13.4 | 13.4 | 113.0 |
| 5 | Absilar Leit | Agriculture | 2.7 | 6.6 | 6.2 | 0.0 | 0.0 | 0.0 | 14.7 | 15.1 | 10.5 | 9.1 | 10.0 | 9.8 | 84.7 |
| | Abshar Pight | Inlet | 3.3 | 8.5 | 7.9 | 0.0 | 0.0 | 0.0 | 18.0 | 19.3 | 12.1 | 12.5 | 13.4 | 13.4 | 108.3 |
| | | Agriculture | 2.7 | 6.6 | 6.2 | 0.0 | 0.0 | 0.0 | 12.5 | 13.2 | 9.0 | 9.2 | 9.3 | 9.6 | 78.3 |
| | Roudasht | Inlet | 0.0 | 2.1 | 23.8 | 0.0 | 0.0 | 0.0 | 20.5 | 23.6 | 13.3 | 8.1 | 10.7 | 11.0 | 113.1 |
| | North | Agriculture | 0.0 | 1.8 | 19.0 | 0.0 | 0.0 | 0.0 | 15.4 | 17.7 | 10.0 | 6.1 | 8.0 | 8.3 | 86.3 |
| | Roudasht | Inlet | 0.0 | 2.5 | 21.0 | 0.0 | 0.0 | 0.0 | 15.3 | 20.9 | 13.2 | 7.9 | 9.6 | 11.1 | 101.5 |
| | South | Agriculture | 0.0 | 1.9 | 17.2 | 0.0 | 0.0 | 0.0 | 12.2 | 16.0 | 10.5 | 6.3 | 7.7 | 8.9 | 80.7 |
| | Sum | Inlet | 26.4 | 31.2 | 66.1 | 0.0 | 0.0 | 0.0 | 106.7 | 149.7 | 133.0 | 137.9 | 142.4 | 132.6 | 926.0 |
| | Jun | Agriculture | 18.8 | 25.2 | 52.8 | 0.0 | 0.0 | 0.0 | 81.7 | 111.3 | 104.9 | 112.6 | 114.2 | 104.3 | 725.8 |

 Table 7: Water consumption of irrigation networks for the Iranian year 1385 (Mirhab 2012)

Considering traditional networks and pumps in total about 1.2 billion m³ of surface water is assumed for water consumption in agriculture (Yekom 2010).

Regarding groundwater consumption only rough estimations of the groundwater extraction are existing. Based on the potential capacity of the installed pumps and their operating hours about 3.2 million m³ of groundwater are supplied to agriculture by wells. Considering also springs and qanats, each about 350 million m³, in total about 3.9 million m³ of groundwater is assumed to be used in agriculture⁸ in the year 1385 (Yekom 2010).

Appropriate data for surface water and groundwater consumption is summarized in Appendix D.

5 Future developments

Based on figures of the Iranian year 1389-90 the Agriculture Organisation Isfahan assumes that an increase of the cultivated area of about 68 % for agriculture and 23 % of orchards can be possible until 1404. At the same time the production is expected to increase of about 73 % for crops and 67 % for fruits, which indicates an improvement of the specific yield in addition to the expansion of the cultivated land (see Table 8). For this intensification of production greenhouses are taken into consideration by the Agricultural Organization of Isfahan. Also interviewed experts of the Agricultural Research Centre such as A.R. Mamanpoush emphasized

⁶ Statistical data regarding the use of fertilizers and pesticides are not available because these products are not sold by government anymore but by private companies which do not collect and provide data.

⁷ Mirhab is an independent semi-governmental institution responsible for the operation and maintenance of the irrigation networks within the Zayandeh Rud Basin, established in 1993.

⁸ Even though the water consumption regarding livestock might be negligible compared to total the water consumption in agriculture it is not clear if and how much water for livestock is included.



greenhouses besides improved plant protection and bio-engineering. The production regarding livestock is expected to increase of about 73 %.

| Scenarios | | | | | | | | |
|-------------|-----------------------------|-----------------------------------|--------------------------|-----------------------------|--|--|--|--|
| | Area in the year 1389-90 | Production in the year 1389-90 | Area in the year 1404 | Production in the year 1404 | | | | |
| | [ha] | [t] | [ha] | [t] | | | | |
| Agriculture | 159,747 | 2,214,000 | 268,181 | 3,834,000 | | | | |
| Orchards | 40,917 | 144,273 | 50,500 | 240,225 | | | | |
| Livestock | - | 1,243,094 | - | 2,152,636 | | | | |
| Sum | 200,664 | 3,601,367 | 318,681 | 6,226,861 | | | | |

Table 8: Expected developments in the sector agriculture (AOI 2012)

6 Socio-economic aspects

Within the Zayandeh Rud catchment only few data regarding socio-economic aspects are available respectively documented.⁹ Nevertheless, three main types of farming (1) agriculture, (2) livestock and (3) orchards and different combination of these types can be observed. Agriculture farms (arable farming)¹⁰ are the largest single farming type with about 19 % and agriculture & orchards is the largest combination with about 38 % of all farms. 22 % of all farms are located within the county Isfahan (see Table 9).

Besides a few cooperatives and industrial farms most of the farms are family enterprises (about 94 %, Yekom 2011). Most of the farms are relatively small farms between 0.1 ha and 10 ha and show low financial capacity e.g. for implementing new technologies. Therefore, the government is funding new irrigation technologies by 85 %. There are different reasons why only about 20,000 ha of the cultivated area is supplied by new irrigation technologies¹¹:

- 1. In reality the funding is not 85 % but about 50 %, due to necessary additional equipment e.g. storage tanks etc. is not included in the funding.
- 2. The funding amount is limited but in every year there are more proposals of farmers than funding capacity.
- 3. In the Western part of the Zayandeh Rud catchment there are more innovations funded due to higher water quality of the Zayandeh Rud (compared to the Eastern part) which is needed for new irrigation techniques such as drip irrigation. Therefore in the Eastern part mostly extensions of canals have been applied.

⁹ More detailed socio-economic data regarding the county Faridan exist, but are not available up to now. The acquisition of additional funding in order to conduct empirical investigation and to fill these data gaps by the German project team was not successful.

¹⁰ For more information on farmland characteristics see Nikouei and Ward (2012).

¹¹ Only private investments in new technologies are negligible, there are estimations about 100 ha to 200 ha (information by Zayandab Consulting Engineers Co. in 2012)



| | Typ of farm (amount of farms, without year) | | | | | | | | | | |
|-----|---|---------|-----------|----------|-------------|-------------|-------------|--------------|---------|--|--|
| | | | | | | | | Agriculture, | | | |
| | | Agri- | | | Livestock & | Livestock & | Orchards & | Livstock & | | | |
| Row | County | culture | Livestock | Orchards | Orchards | Agriculture | Agriculture | Orchards | Sum | | |
| 1 | Isfahan | 2,100 | 2,900 | 600 | 400 | 4,000 | 18,137 | 1,000 | 29,137 | | |
| 2 | Borkhar | 1,000 | 800 | 200 | 100 | 1,405 | 1,650 | 50 | 5,205 | | |
| 3 | Tiran o Karun | 100 | 287 | 300 | 800 | 1,500 | 5,000 | 950 | 8,937 | | |
| 4 | Chadegan | 1,800 | 500 | 400 | 300 | 900 | 1,250 | 100 | 5,250 | | |
| 5 | Khomeinishahr | 50 | 100 | 2,000 | 500 | 1,000 | 4,000 | 278 | 7,928 | | |
| 6 | Dehaghan | 380 | 200 | 500 | 115 | 700 | 1,500 | 280 | 3,675 | | |
| 7 | Shahinshahr | 800 | 900 | 150 | 200 | 1,300 | 1,770 | 180 | 5,300 | | |
| 8 | Shahreza | 1,100 | 400 | 700 | 140 | 1,600 | 1,360 | 300 | 5,600 | | |
| 9 | Fereydun | 4,500 | 1,000 | 100 | 200 | 3,500 | 800 | 401 | 10,501 | | |
| 10 | Falavarjan | 8,603 | 750 | 400 | 300 | 2,000 | 6,000 | 800 | 18,853 | | |
| 11 | Lenjan | 932 | 1,200 | 2,800 | 1,600 | 1,100 | 1,550 | 500 | 9,682 | | |
| 12 | Mobarakeh | 3,000 | 875 | 100 | 350 | 3,500 | 1,800 | 145 | 9,770 | | |
| 13 | Najafabad | 850 | 725 | 2,000 | 800 | 2,500 | 6,500 | 400 | 13,775 | | |
| | Sum | 25,215 | 10,637 | 10,250 | 5,805 | 25,005 | 51,317 | 5,384 | 133,613 | | |

Table 9: Type of farms, without year (AOI 2012)

According to Fred Pearce there are winners and losers in the agricultural process of adapting the farms to less water availability and of water allocation during the last 15 years: "Bigger, politically better connected farmers won. Small farmers and the old-age water distribution arrangements lost." (Pearce 2012: 281) We are not sure that this abrasively perspective is adequate, especially in regard to the old-age water distribution, but see need for research regarding an establishment of new inequalities inside the agricultural sector due the changed water availabilities in the basin.

7 Problem perception and requirements to future water management

In November 2011 two workshops with farmers and representatives of agriculture from the Western and Eastern part of the Zayandeh Rud catchment were conducted. Most of the participants were farmers and smallholders being concerned because of having economic losses caused by water shortage during the last years. Besides basic information about their farms and regions these participants were also asked about their specific problem perception in terms of agriculture and water management. The following main aspects can be summarized:

- The way of water distribution during drought condition is not clear to farmers respectively it seems to them that their farming requirements (e.g. irrigation demand and water rights) are not taken into consideration accordingly.
- The accessible water in the province is obviously not enough for all sectors (especially under drought conditions) but there are water transfers to cities or provinces outside the catchment area which are not understood by the invited farmers.
- The payment of compensation (in terms of drought) by the government does in the view of the concerned not reflect their basic needs. According to the participating smallholders and farmers from the eastern part it is "not enough to live" and thus the peasant feel like not been respected. In this regard the total losses in agriculture (estimated 400 billion Tuman in the Eastern part of the basin) are much higher than compensation paid (only 12 billion Tuman according to the farmers).
- Land cultivation and grassland is reduced due to drought and puts pressure on livestock. In addition, there are water losses due to allocating agricultural lands into to smaller parcels (due to inheritance law).
- The quality of water from the Zayandeh Rud is also polluted by industry and gets decreased in terms of drought which puts additional pressure to agriculture.



- The (steel) industry is a major cause of concern. According to the farmers' opinion it is affecting the farmers in three ways: (a) it uses water which "belongs to agriculture", (b) increasing population due to immigrants from other parts of the country and (c) the pollution of water, soil and air.
- In the perception of the participating farmers the large dams (e.g. Khamiran) are one of the main reasons for the existing pressure on water resources in the catchment and for dry wells and qanats. The hydrological connection between groundwater and surface water was not considered accordingly.
- Many farmers have built houses and invested in their farms. Loans have to be paid back and future is uncertain to farmers. For the farmers participating in the workshops, it seems to be difficult to decide if their farms could be managed in the future. In addition for the older farmers it is hard to switch to other business than farming. According to the concerned participants of the workshop many people in the region have existential fears.

Based on the above summarized problem perception the following main requirements regarding future water management were named by the participants of the workshops:

- 1. The water management of the Zayandeh Rud should be organized according to its catchment area by one superior institution, independent of the political borders and integrating the provinces and sectors with their stakeholders belonging to the river basin.
- 2. Water transfers to other river basins/cities should be adjusted according to the water demand within the Zayandeh Rud catchment. Inter basin transfer and management of water is needed in order to optimize the distribution of water along the river. In this regard the existing water laws and rights to water by farmers should be considered and integrated. In addition, the shortage of water should be distributed to all sectors and the development of the different sectors to be adjusted accordingly.
- 3. The hydrological control of the Zayandeh Rud by dams and weirs should be minimized and optimized in order to reconstruct natural river bed and return flows.
- 4. The land use respectively the landscape architecture within the Zayandeh Rud catchment especially in the cities should be changed and adapted to the water shortages, e.g. plants with less water consumption should be considered and agricultural gardens around Isfahan should be supported instead of implementing new urban green (and also green around the factories which is unproductive in the view of the participating peasants).
- 5. The quality of water from the Zayandeh Rud should be improved according to agricultural purposes. With this regard a polluter-pays-principle should be implemented in order to minimize pollution (e.g. by industry) and co-financing the agriculture sector.
- 6. In order to optimize the agricultural water management a regrouping of rural land (larger parcels of land managed by one farmer) is needed. The modernization of the irrigation networks should be fulfilled, e.g. continuing the construction of 2nd and 3rd canal category in the eastern part of the catchment.
- 7. The water consumption in all sectors should be optimized by water substitution and recycling, e.g. reusing more water within the industry sector and implementation of wastewater treatment and reuse for agriculture irrigation.

It is obvious that at least in part these perceptions and validations are interest driven; nevertheless they contain "kernels of truth" which should be identified and carefully reflected. Organizational ideas and proposals might be worked out precisely during specific meetings in Phase II of the project (cf. part 9 of the report). Some essentials of water management in the province seem not to be understood by the broad mass of peasants (especially in regard to the water allocation during shortages and the water transfer to Yaszd and other cities; there is also a somewhat overvalued idea of a specific water right of agriculture as the traditional water user). It is possible that better communication might minimize such misunderstandings and wrong interpretation of the possibilities of the Isfahan Regional Water Company. Rural sociologists might support the company and the governor of the province in their decisions if specific PR or awareness rising methods are suitable for closing these knowledge gaps and bringing the peasants to an improved acceptance of Isfahan's water policy.



8 Adaption strategies to water scarcity

Drought can be considered as a meteorological phenomenon of precipitation below average conditions in areas where the regional water resources used by a specific society originate. Scarcity which is induced by drought refers to situations where the socio-economic activities of that society are reduced or at risk and become limiting factors. The Zayandeh Rud Basin and its society have faced drought induced water scarcity in the past years which has led to several adaptation strategies at different management levels (Hoogesteger 2005).

Regarding water scarcity Molle (2003) defined the following three kinds of general responses by a society: (1) supply – augmenting water supply from existing resources, (2) conservation – efficiency of use and (3) allocation – reallocation of water (Figure 7).



Figure 7: Types of responses to water scarcity (Molle 2003)

Against this theoretical background Hoogesteger (2005) observed different adaptation strategies at following three management levels:

- Basin scale: primarily spreading the scarce water among as many users as possible mainly by reducing agriculture water supply (allocation response).
- Irrigation system scale: distribution of water to all outlets according to the status of different kinds of water rights, the amount of water present in the area and several social and political motivations (allocation response).
- Field scale: first of all increasing the availability of water (supply response) by increasing groundwater supply e.g. due to longer pumping ours or deeper or new wells. After this possibility is exhausted strategies such as selling land, water sharing within outlets, reducing cultivated area, changing cropping patterns (conservation response), water stealing or renting land elsewhere or moving to activities outside of agriculture were developed.

The increased groundwater use and missing recharge of aquifers by return flows of surface water irrigation have led to overexploitations of groundwater resources in the basin. Focusing on the already practiced conjunctive use of surface and groundwater a conjunctive water management could be one possible measure to ensure a more equitable water distribution although several e.g. institutional obstacles have to overcome (Hoogesteger 2005).



9 Proposals for the second project phase

As basin water resources become tighter, there is a need for better accounting of water flows and a better understanding of the complex flow network and its dependencies. The Water Management Tool allows a development of such a better understanding. Adequate water accounting is essential to backup negotiations. Especially the data base for the agricultural groundwater extraction needs to be improved because there are only rough estimations of the extraction (using the pumping potential instead of the observable extraction).

For a qualitatively and quantitatively more sustainable management of water resources future strategies in the catchment area should be as well widely accepted but also realizable. To identify such strategies affected farmers have to participate actively in the realization of IWRM measures. For this purpose it is not sufficient to include solely the Board of Agriculture, as these cannot represent all the specific features of the extremely diverse agriculture in the catchment area during the IWRM process.

In order to identify needs and requirements on the part of agriculture, for project phase II four intensive participatory techniques are planned with the involvement of affected farmers and their representatives. Five events of 2 to 3 days' duration (each with two parallel meetings) should be carried out and as far as possible embrace the different cultivation circumstances in the catchment area (upper and lower reaches, river remote sites, greenhouse cultivation). As suitable method, the in Germany developed procedure called "Planning Cell" ("Planungszelle") is considered. This procedure combines local and expert knowledge and is aligned to the creation of concrete concepts, that serve as recommendations for action in the form of "Citizen Report". An alternative to this, which is also developed in Central Europe, is the "Future Workshop" ("Zukunftswerkstatt"), which is usually carried out in one day. With this method and the same budget it might be possible to involve two to three times more farmers and thus to consider more accurate the different social and physical base of agriculture in the Zayandeh rud basin.

In both cases, selected experts will be given the opportunity to present current challenges in terms of available water resources. In the Planning Cell the single proposed solutions and actions are presented and commented in each case by one proponent and one opponent. This finally gives a comprehensive picture of the desired land management, its water needs and the necessary measures. The land management states, their water dependence and the therefore necessary measures are evaluated and prioritized by individual participants after the discussion. The weighted and prioritized proposals for action are summarized in a "Citizen Report". They could be pictured in the WMT and handed over to the political authorities for implementation. Similarly in the possible alternative Future Workshop: The needs are obtained more precisely on the spot. They are the base for a bottom-up policy proposal which will be established for the consideration of the farmers in the IWRM process. It maps more accurate the farmers needs and for example focuses on the question, which field and garden fruits with particularly high added value can be grown in the different parts of the catchment area with high added value without having to give up certain agricultural production structures (small scale family farms for example).

Up to now the land use in the catchment area is mainly determined by the agricultural sector. Virtually as a byproduct of the cultivation of field and garden fruits, the farmers contribute significantly to the environmental protection of the basin. With the agricultural vegetation cover they protect the soil from water and wind erosion and maintain its filter and buffer capacity for groundwater recharge. They also contribute potentially to a carbon sequestration in the soil humus. The ecosystem services rendered by agriculture are not only depending on the farmers' knowledge about these relations as well as on labour, machinery and capital, but also on an adequate supply of water. Until now this contribution of agriculture to environmental protection in the area was not addressed in the debate about the solution of the water distribution conflict in the catchment area. Also related to the development of measures for environmental protection in particularly vulnerable sub-areas a further participation process can be useful in phase II.



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11 Appendix

Appendix A: Chronology of data collection, discussion and adaption

The following table shows the main steps regarding the collection, discussion and adaption of data regarding the sector agriculture.

| Time | Activity |
|---------------------|--|
| Continuously | Study of literature. |
| 2011-01-14 | First enquiry regarding agricultural data. |
| 2011-02-17 | Second inquiry regarding agricultural data; concretized after kick-off workshop in Isfahan. |
| until 2011-11-22 | Delivered data were translated into English and analyzed by ISOE (e.g. powerpoints regarding irrigation networks, Zayandab 2008 and Yekom 2010). |
| 2011-11-22 | Meeting with Agriculture Organisation Isfahan, department of planning and development and ESRW: |
| | Link from AOI to agricultural data on county-level since 1991; were downloaded afterwards and translated into English by ISOE. |
| 2012-07-14/16 | Meeting with ESRW and Mr. Mamanpoush: |
| | Mr. Mamanpoush introduced and explained existing coefficients to adapt county data to irrigation networks (Sally et al. 2001). |
| | Agreement: preparing adaption of county data to irrigation networks using "Mamanpoush-coefficients" by ISOE in order to discuss results at next visit. |
| 2012-12-02 | Presentation of Water Management Tool (WMT) and adaption of agricultural data to Iranian partners (ERSW, AOI, Mr. Mamanpoush): |
| | Participants realized that WMT is not based on sub-units due to other purpose of the model (WMT= detailed strategic decision on monthly bases; other studies based on sub-units are good for generating average over several years and balancing on small scale, but not on river basin scale). |
| | Adaptation of agricultural data (county level) was explained in two sessions (with managers of different departments and AOI only) and participants confirmed adaption method by Sally et al. 2001 and new coefficients for remaining counties by ISOE. |
| | During an additional meeting Mr. Ziai, Mr. Mamanpoush and Mr. Asadi confirmed that (a) coefficients of Sally et al. 2001 are still ok and should be used to adapt data from county level to irrigation networks and (b) no adjustment of existing coefficients by Mr. Mamanpoush is necessary due to areas of irrigation networks have not changed since 2001. |
| 2012-12-05 | Meeting with Yekom Consultant (Mr. Doroudian) at ERWB regarding the Masterplan (Yekom 2010) and appropriate agricultural data (basic data and scenarios): |
| | AOI did not accept some of the presented data in the Masterplan, e.g. data regarding water consumption in agriculture and scenarios of cropping patterns. |
| 2013-07-10 | Meeting with Iranian Partners (ESRW) in Dresden: |
| | Again explanation of coefficients and their inexactness which results for the different cultivated areas (irrigation networks and remaining counties) within the catchment area. |
| | Agreement: crop sequence should be sent to AOI for checking, including short description of method of coefficient and coefficients themselves. |

Table 10:Overview of main steps regarding data management



| Time | Activity |
|------------|--|
| 2013-09-26 | Visit and meeting with Iranian delegation (AOI and ESRW) in Witzenhausen: |
| | Discussion of crop sequences and hectars of cultivated areas: (a) around 90.000 ha difference between new AOI data and project data in WMT regarding total cultivated area of catchment area for base year, (b) differences regarding hectares of cultivated areas (irrigation networks) between new AOI data and project data in WM. |
| | Agreement: After visit in Germany discussion and check of differences within new AOI data and project data in WMT by ESRW and AOI. |
| 2013-10-15 | New data regarding cultivated areas of irrigation networks and remaining areas were sent by AOI: |
| | Total cultivated area for crops and orchards within the Zayandeh Rud catchment (without Chahar Mahaal & Bakhtiari) for normal year by AOI (about 248,000 ha) is comparable to project data for base year (about 246,000 ha). |
| | Some specific data for some irrigation networks fit (e.g. Nekouabad left and right, Abhar right, Roudasht West and East), others do not fit and show high differences (e.g. Abshar left, Borkhar). |
| 2014-09 | After clarification of contradictions regarding the agricultural data from 2013-10-15 new specific data for the Iranian year 1385-86 were sent by AOI in order to generate new coefficients for the allocation of county data to the Zayandeh Rud Basin |
| 2014-10 | Generating new coefficients based on AOI data and final revision of agricultural report |



Appendix B: First data set for the Water Management Tool (WMT)

| Province | County | County | Irrigation network | Coefficient | Comments |
|-----------|--------|---------------|----------------------------|-------------|---|
| | no. | name | | (-) | |
| Isfahan | 1001 | Ardestan | - | - | outside of catchment area |
| | 1002 | Esfahan | Nekouabad right | 0,001 | Sally et al. 2001 |
| | | | Borkhar | 0,12 | Sally et al. 2001 |
| | | | Abshar left | 0,32 | Sally et al. 2001 |
| | | | Abshar right | 0,14 | Sally et al. 2001 |
| | | | Rudasht west | 0,15 | Sally et al. 2001 |
| | | | Rudasht east | 0,14 | Sally et al. 2001 |
| | | | Mahyar | 0,14 | Sally et al. 2001 |
| | 1003 | Khomeinishahr | Nekouabad right | 0,03 | Sally et al. 2001 |
| | | | Nekouabad left | 0,46 | Sally et al. 2001 |
| | | | Borkhar | 0,51 | Sally et al. 2001 |
| | 1004 | Khansar | - | - | outside of catchment area |
| | 1005 | Samirom | - | - | outside of catchment area |
| | 1006 | Faridan | - | 1,00 | confirmed by Iranian partners 12/2012 |
| | 1007 | Fereydoonshah | - | 1,00 | confirmed by Iranian partners 12/2012 |
| | 1008 | Falavarjan | Nekouabad right | 0,44 | Sally et al. 2001 |
| | | | Nekouabad left | 0,56 | Sally et al. 2001 |
| | 1009 | Shahreza | Mahyar | 1,00 | Sally et al. 2001 |
| | 1010 | Kashan | - | - | outside of catchment area |
| | 1011 | Golpaygan | - | - | outside of catchment area |
| | 1012 | Lenjan | Lenjanat | 0,98 | Sally et al. 2001 |
| | | | Nekouabad left | 0,02 | Sally et al. 2001 |
| | 1013 | Nain | - | - | outside of catchment area |
| | 1014 | Najafabad | Nekouabad left | 1,00 | Sally et al. 2001 |
| | 1015 | Natanz | - | - | outside of catchment area |
| | 1016 | Shahinshahr | - | 1,00 | confirmed by Iranian partners 12/2012 |
| | 1017 | Mobarakeh | Lenjanat | 0,65 | Sally et al. 2001 |
| | | | Nekouabad right | 0,29 | Sally et al. 2001 |
| | | | Nekouabad left | 0,02 | Sally et al. 2001 |
| | | | Mahyar | 0,05 | Sally et al. 2001 |
| | 1018 | Aran & Bidgol | - | - | outside of catchment area |
| | 1019 | Tiran & Korun | Askaran /Karvan up Morghab | 0,25 | defined by cultivated area (google earth) |
| | | | Karvan upstream Khamiran | 0,65 | defined by cultivated area (google earth) |
| | | | Karvan downstream Khamiran | 0,10 | defined by cultivated area (google earth) |
| | 1020 | Chadegan | - | 1,00 | confirmed by Iranian partners 12/2012 |
| | 1021 | Dehaghan | - | 1,00 | confirmed by Iranian partners 12/2012 |
| | 1022 | Borkhar | Borkhar | 1,00 | Sally et al. 2001 |
| | 1023 | Khor & | - | - | outside of catchment area |
| Chahar | - | - | - | - | Assumptions for total area by AOI |
| Mahaal & | | | | | |
| Bakhtiari | | | | | |

 Table 11:
 Former allocation of county data to Zayandeh Rud Basin and appropriate coefficients

As an example the allocation of county data to irrigation networks is described for the irrigation network Borkahr regarding the crop wheat as follows:

1. Irrigation network Borkhar belongs to 11.77 % of the area of the county Esfahan, 51.13 % of Khomeinishar and 100 % of Borkhar

2. In the year 1385 about 42,600 ha of wheat were cultivated in the county Esfahan, 700 ha in Khomeinishar and 11,900 ha in Borkhar



3. Multiplying the factors under 1. with the appropriate area for wheat under 2. equals a total area of 17,272 ha of wheat cultivated in 1385 within the irrigation network Borkhar (17,272 ha = 42,600 ha * 0.1177 + 700 ha * 0.5113 + 11,900 ha *1.00)

In order to limit the agricultural input data for the WMT to a level which is easy to handle but reflects the main agricultural information specific crops and fruits were selected. Therefore, all adapted figures regarding the irrigated area of crops and orchards within the Zayandeh Rud catchment were arranged in descending order to their size. Beginning with the largest areas only those products were chosen which in total cover 90 % of the entire cultivated area¹² each for crops and orchards in 1385. As a result 13 out of 46 crops and 11 out of 25 fruits were selected which in total cover 266,493 ha including the assumptions for the part of the province of Chahar Mahaal & Bakthtiari belonging to the Zayandeh Rud catchment (see Table 12 and Table 13).

| | | | | | | Maize | | | | | | | Corn | |
|-----------------------------------|--------|--------|--------|---------|--------|--------|--------|-------|-------|--------|-------|--------|--------|---------|
| Irrigation networks and counties | | | | | | (fo- | Sain- | Sugar | | | | | (Maize | |
| (all figures in ha) | Wheat | Barley | Rice | Alfalfa | Potato | rage) | foin | beet | Beans | Clover | Onion | Cotton | sweet) | Sum |
| Lenjanat | 3,124 | 3,475 | 4,946 | 794 | 117 | 208 | 0 | 97 | 166 | 473 | 238 | 13 | 5 | 13,658 |
| Mahyar | 14,228 | 5,884 | 658 | 1,750 | 159 | 2,345 | 30 | 344 | 317 | 89 | 292 | 432 | 296 | 26,824 |
| Nekouabad left | 3,888 | 1,811 | 5,995 | 1,866 | 1,765 | 1,196 | 100 | 105 | 19 | 1,059 | 910 | 0 | 0 | 18,714 |
| Nekouabad right | 1,926 | 1,625 | 3,762 | 692 | 824 | 273 | 0 | 42 | 22 | 819 | 488 | 7 | 3 | 10,483 |
| Borkhar | 17,272 | 3,903 | 711 | 2,660 | 768 | 3,704 | 0 | 1,717 | 3 | 175 | 240 | 383 | 942 | 32,478 |
| Abshar left | 13,449 | 2,557 | 947 | 2,557 | 268 | 2,810 | 0 | 474 | 8 | 126 | 521 | 947 | 650 | 25,314 |
| Abshar right | 5,785 | 1,100 | 407 | 1,100 | 115 | 1,209 | 0 | 204 | 3 | 54 | 224 | 407 | 279 | 10,889 |
| Roodasht West | 6,369 | 1,211 | 449 | 1,211 | 127 | 1,331 | 0 | 224 | 4 | 60 | 247 | 449 | 308 | 11,987 |
| Roodasht East | 5,836 | 1,110 | 411 | 1,110 | 116 | 1,219 | 0 | 206 | 3 | 55 | 226 | 411 | 282 | 10,985 |
| Askaran/ Karvan up Morghab spring | 621 | 226 | 12 | 170 | 169 | 35 | 137 | 5 | 47 | 48 | 5 | 0 | 0 | 1,477 |
| Karvan upstream Khamiran | 1,617 | 589 | 32 | 443 | 440 | 91 | 356 | 12 | 123 | 126 | 14 | 0 | 0 | 3,844 |
| Karvan downstream Khamiran | 261 | 95 | 5 | 72 | 71 | 15 | 57 | 2 | 20 | 20 | 2 | 0 | 0 | 621 |
| Faridan | 8,550 | 2,480 | 0 | 1,850 | 7,950 | 85 | 7,300 | 662 | 478 | 500 | 0 | 0 | 0 | 29,855 |
| Fereydoonshahr | 2,420 | 980 | 0 | 525 | 2,000 | 5 | 1,300 | 0 | 273 | 160 | 0 | 0 | 0 | 7,663 |
| Shahinshahr & meymeh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Chadegan | 3,000 | 1,380 | 0 | 1,200 | 2,619 | 14 | 2,600 | 12 | 300 | 158 | 0 | 0 | 0 | 11,283 |
| Dehaghan | 3,500 | 2,160 | 0 | 280 | 20 | 400 | 8 | 0 | 2,200 | 30 | 0 | 42 | 0 | 8,640 |
| Chahar Mahaal & Bakhtiari | - | - | - | - | - | - | - | - | - | - | - | - | - | 5,000 |
| Sum | 91,846 | 30,586 | 18,336 | 18,280 | 17,529 | 14,939 | 11,888 | 4,105 | 3,986 | 3,953 | 3,408 | 3,092 | 2,766 | 229,715 |

Table 12: Area of main irrigated crops in 1385 as first data base for WMT

¹² Regarding detailed soil characteristics within the Zayandeh Rud catchment no original data were available. Therefore, existing data concerning land use and several single soil profiles were overlaid and a specific soil map was produced by Isfahan University of Technology (see Appendix C)



| | | | | Pome- | | | | | | | | |
|-----------------------------------|--------|-------|-------|-------|-------|-------|--------|-------|---------|-------|-------|--------|
| Irrigation networks and counties | | Al- | Wal- | gra- | | | | | | Pis- | | |
| (all figures in ha) | Grapes | mond | nut | nates | Apple | Olive | Cherry | Pears | Apricot | tacho | Peach | Sum |
| Lenjanat | 1,105 | 543 | 365 | 20 | 31 | 152 | 25 | 6 | 69 | 23 | 57 | 2,397 |
| Mahyar | 710 | 110 | 243 | 949 | 502 | 83 | 18 | 16 | 41 | 103 | 50 | 2,824 |
| Nekouabad left | 332 | 1,211 | 225 | 154 | 117 | 251 | 607 | 477 | 301 | 56 | 297 | 4,028 |
| Nekouabad right | 190 | 2 | 79 | 6 | 27 | 58 | 214 | 63 | 118 | 10 | 142 | 909 |
| Borkhar | 950 | 127 | 66 | 243 | 142 | 150 | 68 | 350 | 82 | 408 | 20 | 2,607 |
| Abshar left | 38 | 97 | 36 | 105 | 23 | 157 | 32 | 21 | 20 | 101 | 3 | 634 |
| Abshar right | 16 | 42 | 15 | 45 | 10 | 67 | 14 | 9 | 9 | 43 | 1 | 273 |
| Roodasht West | 18 | 46 | 17 | 50 | 11 | 74 | 15 | 10 | 10 | 48 | 1 | 300 |
| Roodasht East | 16 | 42 | 16 | 46 | 10 | 68 | 14 | 9 | 9 | 44 | 1 | 275 |
| Askaran/ Karvan up Morghab spring | 302 | 339 | 123 | 10 | 54 | 3 | 8 | 4 | 35 | 1 | 12 | 891 |
| Karvan upstream Khamiran | 785 | 883 | 320 | 27 | 140 | 9 | 20 | 10 | 91 | 3 | 31 | 2,320 |
| Karvan downstream Khamiran | 127 | 143 | 52 | 4 | 23 | 1 | 3 | 2 | 15 | 1 | 5 | 375 |
| Faridan | 402 | 226 | 119 | 0 | 31 | 0 | 8 | 3 | 45 | 0 | 9 | 843 |
| Fereydoonshahr | 150 | 350 | 635 | 0 | 36 | 0 | 5 | 2 | 60 | 0 | 5 | 1,243 |
| Shahinshahr & meymeh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Chadegan | 37 | 252 | 113 | 0 | 31 | 0 | 1 | 1 | 19 | 0 | 32 | 486 |
| Dehaghan | 610 | 35 | 185 | 75 | 335 | 0 | 10 | 15 | 45 | 44 | 20 | 1,374 |
| Chahar Mahaal & Bakhtiari | - | - | - | - | - | - | - | - | - | - | - | 15,000 |
| Sum | 5,788 | 4.449 | 2.610 | 1,735 | 1.523 | 1.074 | 1.060 | 998 | 968 | 885 | 688 | 36.779 |

Table 13:Area of irrigated orchards and main products in 1385 as first data base for WMT





Appendix C: Soil map for the Zayandeh Rud catchment (Faramarzi 2013)



Appendix D: Surface water and groundwater extraction

Table 14: Surface water and groundwater extraction within the Zayandeh Rud/Gaw Khuni catchment in the Iranian year 1385 (Yekom 2010)

| Hydrolo | ogical sub-unit | s | urface wat | er (mio. m | ³) | G | Groundwate | er (mio. m ³ |) |
|---------|------------------|---------|------------|------------|----------------|--------|------------|-------------------------|---------|
| | | New | Old | | | | | | |
| Nr. | Name | network | network | Pump | Sum | Spring | Qanat | Well | Sum |
| 4201 | Koh'payeh- Sagzi | 281.4 | - | - | 281.4 | 1.4 | 8.4 | 1,130.9 | 1,140.4 |
| 4202 | Barkhar- Isfahan | 64.8 | - | - | 64.8 | - | 0.4 | 330.3 | 331.1 |
| 4203 | Mourche'khort | - | 0.1 | - | 0.1 | 5.8 | 13.4 | 77.2 | 96.3 |
| 4204 | Alviche-dah'agh | - | - | - | - | 5.1 | 24.6 | 26.6 | 56.3 |
| 4205 | Meymeh | - | - | - | - | 15.2 | 22.4 | 26.4 | 64.1 |
| 4206 | Nadjafabad | 306.5 | 40.5 | 0.0 | 347.0 | - | 21.2 | 810.3 | 831.5 |
| 4207 | Karvan | 8.6 | 36.0 | 0.0 | 44.6 | 13.0 | 57.2 | 87.9 | 158.1 |
| 4208 | Mahyar-Nord | 67.5 | 42.0 | - | 109.5 | - | - | 88.4 | 88.4 |
| 4209 | Landjanat | - | 89.4 | 1.1 | 90.5 | 9.6 | 83.9 | 121.0 | 214.5 |
| 4210 | Bon-Saman | - | 86.4 | 0.1 | 86.5 | 12.0 | 19.9 | 8.4 | 40.4 |
| 4211 | Chadogan | - | 1.8 | - | 1.8 | 5.5 | 11.3 | 39.8 | 56.6 |
| 4212 | Bou'in-Daraán | - | 56.1 | 0.7 | 56.8 | 86.9 | 32.3 | 214.4 | 324.2 |
| 4213 | Chehel'khaneh | - | - | - | - | 4.4 | 10.1 | 18.8 | 33.3 |
| 4214 | Damaneh | - | - | - | - | 2.3 | 2.7 | 111.3 | 126.4 |
| 4215 | Yancheshmeh | - | 0.1 | 0.0 | 0.1 | 8.2 | 5.3 | 10.9 | 23.5 |
| | Chelgard- | | | | | | | | |
| 4216 | Ghale'shahrokh | - | 128.3 | 0.6 | 128.8 | 180.2 | 27.8 | 4.8 | 213.1 |
| | Mehyar-Süd | | | | | | | | |
| 4217 | Dashte Aseman | - | - | - | - | 2.8 | 6.2 | 86.6 | 95.7 |
| 4218 | Ghamshe | - | - | - | - | 35.2 | 66.5 | 39.9 | 141.5 |
| 4219 | Esfandaran | - | - | - | - | 5.4 | 13.0 | 8.7 | 27.0 |
| 4220 | Izadkhast | - | - | - | - | 22.7 | 7.6 | 7.1 | 37.4 |
| 4221 | Gaw'khoni | - | - | - | - | - | - | - | - |
| Sum Ga | w Khuni Basin | 728.8 | 480.5 | 2.5 | 1,211.8 | 415.8 | 434.3 | 3,249.7 | 4,099.8 |
| Sum Za | yandeh Rud Basin | 728.8 | 480.5 | 2.5 | 1,211.8 | 352.5 | 347.2 | 3,194.1 | 3,893.9 |



Appendix E: Basic agriculture data for the Iranian year 1385 (Oct. 2005–Oct. 2006)

Table 15: Cultivated areas of farmland within the province of Isfahan, 1385 (AOI 2012)

| Year | Products | | | | | | | | | | | County | (Town | ship) | | | | | | | | | | |
|------|----------------------------|---------|-------------|----------|-----------|--------------|-------|---------|----------------|---------|---------|----------|---|---------|---------------|-----------|--------|-------------|--------|-----------|------------|--------|----------------|--------|
| - | Name | Isfahan | Aran&Bidgol | Ardestan | Barkhovar | Shahin Shahr | Tiran | Chadgan | Khomeini Shahr | Khansar | Samirom | Dehaghan | Shah'reza | Feridan | Freydon'shahr | Flaverjan | Kashan | Golpaygan | Lanjan | Mobarakeh | Najaf'abad | Na'ein | Khor & Biabank | Natanz |
| - | - | Area | Area | Area | Area | Area | Area | Area | Area | Area | Area | Area | Area | Area | Area | Area | Area | Area | Area | Area | Area | Area | Area | Area |
| - | - | ha | ha | ha | ha | ha | ha | ha | ha | ha | ha | ha | ha | ha | ha | ha | ha | ha | ha | ha | ha | ha | ha | ha |
| | Wheat | 42,600 | 1,450 | 4,960 | 11,900 | | 2,500 | 3,000 | 700 | 1,350 | 4,510 | 3,500 | 7,925 | 8,550 | 2,420 | 1,962 | 1,510 | 4,500 | 875 | 3,514 | 2,400 | 600 | | 1,600 |
| | Rainfed wheat | | | | | | 550 | 5,000 | | 69 | 7,300 | | | 4,400 | 2,545 | | | | 70 | | | | | |
| | Barley | 8,100 | 3,850 | 4,490 | 2,750 | | 910 | 1,380 | 390 | 600 | 810 | 2,160 | 4,500 | 2,480 | 980 | 800 | 1,650 | 3,950 | 676 | 4,360 | 1,100 | 750 | | 1,950 |
| | Rainfed barley | 2 000 | | | | | 600 | 3,600 | 700 | | 544 | | | 2,410 | 1,250 | 5 500 | | | 2.005 | 4 5 00 | 2 500 | | | 40 |
| | Com | 2,000 | 162 | 1 000 | 700 | | 50 | | 700 | | 70 | | | | | 5,500 | 10 | | 2,065 | 4,500 | 2,500 | 10 | | 250 |
| | Millet | 300 | 217 | 1,000 | 700 | | 22 | | 10 | | | 3 | 220 | | | 100 | 10 | | 50 | 600 | | 13 | | 250 |
| | Pease | 10 | 217 | 60 | | | 70 | 18 | 10 | 16 | 350 | 150 | 70 | 220 | 60 | 100 | 120 | 22 | 18 | 35 | | 24 | | 5 |
| | Rainfed pease | 10 | | 00 | | | 50 | 10 | | 4 | 750 | 100 | ,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,, | 88 | 200 | | 120 | | 10 | 55 | | ~ . | | |
| | Beans | 25 | | 120 | | | 190 | 300 | | 56 | 200 | 2,200 | 310 | 478 | 273 | | 120 | 125 | 120 | 75 | 15 | 60 | | 3 |
| | Lentil | 10 | | 130 | | | 36 | 32 | | 7 | 300 | 100 | 56 | 370 | 118 | | | 21 | 3 | 4 | | 25 | | |
| | Rainfed lentils | | | | | | 10 | 300 | | | 70 | | | 650 | 550 | | | | | | | | | |
| | Vetch | | | 22 | | | 20 | | | | 10 | 30 | | | | | | | 60 | 150 | | 30 | | 5 |
| | Watermelon | 15 | 78 | 150 | 450 | | 25 | | | | | 10 | 10 | | | | 125 | 10 | 80 | 50 | 60 | 10 | | 18 |
| | Melon | 60 | 234 | 320 | 820 | | 10 | | | | | 20 | 25 | | | | 50 | 8 | 2 | 5 | | 25 | | 30 |
| | Curcumbor | 1,200 | 1,205 | 60 | 20 | | 20 | 276 | 10 | 4 | 10 | 20 | 200 | 50 | 65 | 250 | 420 | 15 | 2 | 10 | 20 | 10 | | 200 |
| | Cucumber Squash variety | 400 | | 45 | 20 | | 50 | 570 | 10 | 4 | 10 | 50 | 15 | 50 | 05 | 250 | 1/0 | 10 | 2 | 19 | 20 | 10 | | 500 |
| | Potato | 850 | | 120 | 310 | | 680 | 2.619 | 700 | 383 | 2.200 | 20 | 35 | 7.950 | 2.000 | 1.780 | 144 | 400 | 100 | 30 | 455 | 64 | | 12 |
| | Onion | 1,650 | 178 | 150 | 35 | | 22 | _, | 22 | 1 | _, | | 40 | ., | _, | 900 | 120 | 50 | 45 | 300 | 394 | 16 | | 90 |
| | Tomatoes | 700 | 31 | 100 | 71 | | 90 | 50 | 80 | 5 | | 10 | 15 | 20 | | 70 | 203 | 350 | | 9 | 250 | 10 | | 80 |
| | Eggplant | 100 | 137 | 100 | | | 6 | 3 | 27 | | | | 5 | | | | 200 | 14 | | | | 10 | | 50 |
| | Bean | | 25 | 2 | | | | | | | | | | | | | 160 | | | | | | | 2 |
| 35) | Green beans | 10 | | 3 | | | 20 | 29 | | | | | | | 5 | | 4 | | | 5 | | | | |
| 34/8 | Garlic | | | | | | | | | 6 | | 2 | | | | | 4 | 38 | | 1 | 30 | 32 | | |
| 135 | Other vegetables | 1,200 | 210 | 255 | | | 450 | 5 | 46 | | 2 | 3 | 8 | 22 | | 600 | 670 | 10 | 3 | 25 | 250 | 10 | | 55 |
| 90 | tuber vegetables | 300 | 25 | 100 | 1 400 | | 330 | 1 200 | 520 | F 20 | 2 200 | 200 | 5 | 1 950 | 525 | 1 050 | 40 | 25 E 200 | 2 250 | 25 | 50 | 200 | | 200 |
| 0/20 | rainfed Alfalfa | 8,100 | 720 | 1,050 | 1,400 | | 000 | 1,200 | 600 | 320 | 2,200 | 260 | 550 | 1,650 | 120 | 1,050 | 575 | 5,500 | 550 | 700 | 990 | 200 | | 500 |
| - 10 | Clover | 400 | | | | | 195 | 158 | 250 | 35 | 70 | 30 | 6 | 500 | 160 | 1.500 | 65 | 1.000 | 154 | 500 | 100 | | | 5 |
| 005 | Sainfoin | | | 2 | | | 550 | 2,600 | | 650 | 1,000 | 8 | 30 | 7,300 | 1,300 | , | | 1,000 | | | 100 | | | |
| 0/2 | Rainfed sainfoin | | | | | | | 180 | | 120 | 485 | | | | 104 | | | | | | | | | |
| a | Forage sorghum | | | | 80 | | 1 | | 1 | | | | 30 | | | | | 40 | 5 | | 5 | 25 | | 30 |
| | Grain sorghum | 20 | | 250 | | | | | | | | 10 | | | | | | | | | | | | |
| | Maize forage | 8,900 | 640 | 1,500 | 2,580 | | 140 | 14 | 150 | 20 | | 400 | 1,050 | 85 | 5 | 400 | 60 | 980 | 15 | 300 | 900 | | | 300 |
| | Turnip and fodder beet | 325 | 224 | 500 | 240 | | 125 | 400 | | 3 | | 20 | 40 | 10 | 220 | | 100 | 70 | 2 | | 205 | 140 | | 10 |
| | Sunflower | 210 | | 100 | 202 | | 125 | 400 | | 80 | | 20 | 620 | 10 | 550 | | 00 | 70 | 10 | 110 | 295 | 40 | | ° |
| | Sesame | 30 | | 150 | 202 | | | | 5 | | | 4 | 3 | | | | | | 2 | 15 | | 6 | | 35 |
| | Safflower | 933 | 14 | 250 | 40 | | | | 8 | | | 15 | 40 | | | | 3 | | - | 300 | | 15 | | |
| | Canola | 276 | 255 | 74 | 75 | | 102 | 150 | 8 | 22 | 171 | 27 | 55 | 650 | 120 | 40 | 12 | 228 | 40 | 70 | 55 | 7 | | 65 |
| | Sugar beet | 1,500 | | 6 | 1,540 | | 19 | 12 | | 10 | 3,300 | | 121 | 662 | | | | 455 | 4 | 145 | 102 | | | |
| | Tobacco | 20 | 22 | | | | | | 50 | 31 | | | | | | | 12 | 237 | | | | | | |
| | Cotton | 3,000 | 1,033 | 100 | 30 | | | | | | | 42 | | | | | 760 | | | 20 | | 50 | | 12 |
| | Madder | 400 | 100 | 170 | 1 200 | | 20 | | 10 | 2 | | 75 | | | | | 45 | 20 | | 100 | 10 | 55 | | 20 |
| | Sunflower nuts | 400 | 100 | 1/0 | 1,200 | | 30 | 22 | 10 | 2 | 2 | /5 | 550 | 15 | | | 15 | 20 | 55 | 100 | 10 | 70 | | 20 |
| | Cumin | 35 | | 20 | 40 | | 1/ | د | | 2 | 2 | 150 | 7 | 15 | | | 30 | 5 | | 700 | 24 | 12 | | 05 |
| | black cumin | | | 2 | | | | | | | 4 | 100 | , | | | | 50 | | | , | | | | |
| | Cannabis | | | 20 | | | | 2 | | | | | | | | | | | | 500 | | | | |
| | Seed products | 30 | | 15 | 20 | | 130 | 2 | 15 | | | | | [| | | 10 | | | 100 | | | | 20 |
| | Other products | 10 | | 5 | | | 8 | 2 | 28 | | | 35 | 68 | | | | 5 | 20 | | | | | | |
| | sum of irrigated | 86,877 | 10,923 | 17,344 | 24,653 | | 7,465 | 12,381 | 4,338 | 3,802 | 15,209 | 9,351 | 16,607 | 31,262 | 8,361 | 15,452 | 7,455 | 19,056 | 4,767 | 17,286 | 10,113 | 2,385 | | 6,360 |
| | sum of rainfed | | | | | | 1,210 | 9,205 | | 228 | 9,669 | | | 7,698 | 4,769 | | | | 70 | | | | | |
| | area of fallow irrigation | 2,625 | 1,471 | 3,344 | 11,127 | | 3,858 | 5,670 | 921 | 1,464 | 12,095 | 3,363 | 6,439 | 13,170 | 2,347 | 2,734 | 4,292 | 9,154 | 2,287 | 10,413 | 777 | 2,524 | | 1,792 |
| | area of fallow rainfed | | | | 1 | 1 | 1 | 9 165 | | 1 422 | 12 251 | | | / 487 | 1 711 | | | | ⊢ 360 | | | | | 1 |



| Year | Products | | | | | | | | | | | Count | ty (Town | ship) | _ | | | | | | | _ | | |
|------|-------------------|---------|-------------|----------|-----------|--------|---------|----------------|---------|---------|----------|-----------|----------|---------------|-----------|--------|-----------|--------|-----------|--------|------------|--------|--------------|----------------|
| - | Name | Isfahan | Aran&Bidgol | Ardestan | Barkhovar | Tiran | Chadgan | Khomeini Shahr | Khansar | Samirom | Dehaghan | Shah'reza | Feridan | Freydon'shahr | Flaverjan | Kashan | Golpaygan | Lanjan | Mobarakeh | Na'ein | Najaf'abad | Natanz | Shahin Shahr | Khor & Biabank |
| | - | Area | Area | Area | Area | Area | Area | Area | Area | Area | Area | Area | Area | Area | Area | Area | Area | Area | Area | Area | Area | Area | Area | Area |
| | | (ha) | (ha) | (ha) | (ha) | (ha) | (ha) | (ha) | (ha) | (ha) | (ha) | (ha) | (ha) | (ha) | (ha) | (ha) | (ha) | (ha) | (ha) | (ha) | (ha) | (ha) | (ha) | (ha) |
| | Sour Cherry | 53.0 | | 2.0 | 4.0 | 29.0 | 3.0 | 230.0 | 6.3 | 125.0 | | 87.0 | 9.0 | 4.0 | 32.0 | 30.0 | 15.0 | 7.0 | 2.0 | | 210.0 | 8.0 | | |
| | Cherry | 100.0 | | 1.0 | 10.0 | 31.0 | 1.0 | 90.0 | 5.3 | 40.0 | 10.0 | 2.0 | 8.0 | 5.0 | 460.0 | 58.0 | 8.0 | 10.0 | 23.0 | | 310.0 | 15.0 | | |
| | Tomato | 35.0 | | 3.0 | 4.0 | 34.0 | 6.0 | 150.0 | 11.0 | 4.0 | 2.0 | 4.0 | 5.0 | 2.0 | | 456.0 | 5.0 | 3.0 | | 11.0 | 30.0 | 60.0 | | |
| | Plum | 47.0 | | 5.0 | 10.0 | 35.0 | 4.0 | 124.0 | 157.0 | 65.0 | 2.0 | 6.0 | 3.0 | 5.0 | | 37.0 | 20.0 | 3.0 | 3.0 | | 27.0 | 95.0 | | |
| | Peach | 9.0 | | 10.0 | 4.0 | 48.0 | 32.0 | 30.0 | 0.4 | 250.0 | 20.0 | 45.0 | 9.0 | 5.0 | 264.0 | 16.6 | 27.0 | 4.0 | 83.0 | | 135.0 | 400.0 | | |
| | Nectarine 1 | | | | | | | | | | | | | | | | | | | | | | | |
| | Apricots 1 | 64.0 | | 8.0 | 28.0 | 141.0 | 19.0 | 90.0 | 94.5 | 90.0 | 45.0 | 31.0 | 45.0 | 60.0 | 250.0 | 169.0 | 36.0 | 63.0 | 12.0 | 33.0 | 120.0 | 117.0 | | |
| | Apricots 2 | | | | | | | | | | | 4.0 | | | | 206.0 | 3.0 | | | | | 65.0 | | |
| | Nectarine 2 | | | | | | | | | | | 2.0 | | | | | 2.0 | | | | | 60.0 | | |
| 85) | Apples | 74.0 | | 9.0 | 91.0 | 217.0 | 31.0 | 83.0 | 63.0 | ###### | 335.0 | 490.0 | 31.0 | 36.0 | 42.0 | 125.3 | 58.0 | 20.0 | 18.0 | | 55.0 | 200.0 | | |
| -13 | Pears | 68.0 | | | 10.0 | 15.0 | 1.0 | 650.0 | 8.0 | 10.0 | 15.0 | 6.0 | 3.0 | 2.0 | 92.0 | 18.0 | 10.0 | 5.0 | 1.0 | | 130.0 | 110.0 | | |
| 384 | Quince | 51.0 | | 20.0 | 8.0 | 57.0 | 1.0 | 5.0 | 2.0 | 57.0 | | 28.0 | 1.0 | | 265.0 | 107.0 | 14.0 | 20.0 | 7.0 | | 28.0 | 650.0 | | |
| (1) | Pomegranates | 334.0 | 15.0 | 2052.0 | 200.0 | 42.0 | | 7.0 | | | 75.0 | 900.0 | | | | 2599.8 | | 8.0 | 19.0 | 250.0 | 150.0 | 1300.0 | | |
| 900 | Grapes | 120.0 | 55.0 | 426.0 | 890.0 | 1214.0 | 37.0 | 90.0 | 680.0 | 120.0 | 610.0 | 660.0 | 402.0 | 150.0 | | 380.5 | 365.0 | 700.0 | 650.0 | 21.0 | 265.0 | 310.0 | | |
| 0/2 | Grapes (rainfed) | | | | | | | | | 40.0 | | | | | | | | | | | | | | |
| - 10 | Fig | | | | 10.0 | | | | | | | 4.0 | | | | 73.0 | | | 10.0 | 15.0 | | 30.0 | | |
| S | Walnuts | 114.0 | | 146.0 | 28.0 | 495.0 | 113.0 | 49.0 | 768.3 | 1050.0 | 185.0 | 225.0 | 119.0 | 635.0 | 152.0 | 424.0 | 85.0 | 350.0 | 35.0 | 110.0 | 110.0 | 530.0 | | |
| /20 | Hazelnut | | | | | | | | 0.6 | | | | 20.0 | 4.0 | | | | | | | | | | |
| 10 | Almonds | 308.0 | | 180.0 | 91.0 | 1365.0 | 252.0 | | 420.1 | 45.0 | 35.0 | 65.0 | 226.0 | 350.0 | | 520.9 | 173.0 | 550.0 | 7.0 | 225.0 | 1200.0 | 165.0 | | |
| | Almonds (rainfed) | | | | | 10.0 | 655.0 | | 71.5 | 2700.0 | 10.0 | | 480.0 | 279.0 | | | | 200.0 | | | | | | |
| | Pistachio | 320.0 | 1150.0 | 1020.0 | 370.0 | 5.0 | | 1.0 | | | 44.0 | 55.0 | | | | 942.0 | 10.0 | | 35.0 | 490.0 | 55.0 | 155.0 | | |
| | Date | | | | | | | | | | | | | | | | | | | 780.0 | | | | |
| | Flowers | 10.0 | | | 15.0 | | 2.0 | | | 2.0 | | | 4.0 | | | 1110.0 | 12.0 | | | | 2.0 | 30.0 | | |
| | Others | 75.0 | | 678.0 | 67.0 | | 85.0 | 218.0 | | | | 120.0 | 42.0 | 19.0 | | | 10.0 | 18.0 | 25.0 | 60.0 | 15.0 | 100.0 | | |
| | Persimmon | | | | | | | | | | | | | | | 5.0 | | | | | 7.0 | 22.0 | | |
| | Olive | 496.6 | 102.9 | 55.3 | 63.2 | 13.6 | | 55.3 | | | | 4.0 | | | 23.9 | 400.0 | 11.7 | 52.2 | 156.7 | 90.2 | 208.9 | 75.0 | | |
| | Jujube | 3.0 | | | | | | | | | | | | | | | | | | | | | | |
| | Total | 2281.6 | 1322.9 | 4615.3 | 1903.2 | 3741.6 | 587.0 | 1872.3 | 2216.5 | ####### | 1378.0 | 2738.0 | 927.0 | 1277.0 | 1580.9 | 7678.0 | 864.7 | 1813.2 | 1086.7 | 2085.2 | 3057.9 | 4497.0 | | |

Table 16: Cultivated areas of orchards (seedlings and fertile) within the province of Isfahan, 1385 (AOI 2012)



Appendix F: New basic data from Agriculture Organization Isfahan for the Iranian year 1385-86, farmland and orchards

| | واحد: علتا . | , Co 2007, | اج ازحرجت محد | شرائد و | 61 4 17- | اير ساج آب | لی ویا مرجری د- | with Erinow | المنات فيلا |
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| 2 | زراعت | 14 | تداين | { ¹ | زراء: | ٤٢ | زراعت | ن ایرانی ا | USA |
| 941 | 1666 | ITANIS | FUTD9 | TTDIA | NISELA | STUDY | . 976 | في بدت | فريرت |
| 975 | T-VI | 7055 | NICI | 000 | 63 | 900 | LAF | | 44 |
| 0 | 0 | 1188 | 1.54 | 15911 | V998 | 1005,5 | TE al | 13430 | ener a |
| 0 | 555 | 011012 | 1195 | TVTT | P017 | Tr. 45.9 | 1201 | this charges in a | 036 |
| P | ۵ | 109/11 | 1994 | FEVIA | purpung 1 | VEEL | 2AEV | (E v s aldis | تبران-رون |
| 0 | 0 | T9991,1 | SANAM | 1918,0 | TITE | 1541 | arap | 12 | دماكان |
| 1.9915 | NIEV | TLIVIE | 1929V | 145 | EASS | 11/10 | 1-481- | التي ومدران | مناف |
| TAA 19 | 129 | 1891,5 | 19810 | ELDIF | 9.VV | VAVIA | 1-00. | 140 | ((a), Ly |
| 0 | IFIT | IAEI | 12959 | 25F | FSVAN | 1510 | 1-95-15 | 125757-7-75 | مبارکم |
| 110 | 213 | AVI-112 | 9-12 | 0 | 10/0 | TTint | VERA | كلوابار (موجع | 19/10 |
| 10/19 | ETIA | T.dE, F | ETIS | 19.18 | 11572 | 19951 | 71010 | كلوا الريب | in lis |
| VEIJA | 10.1 | 115410 | F1985 | MARIN | SVED | VII | 1897 | برخوار | ~~ |
| 911,1 | 70 | TRAVIV | 98-11 | 11.9/1 | 19310 | FVV/d | STETS | 10,000,000 | U Siel |
| 249.4 | EMLOLY | TV99A,V | TE9 F | AEQV,F | V9.25~ | ITAT.IV | 154955 | - 04 0 5 1 1 0 5 1 1 C | 8 |



Appendix G: Cultivated areas of farmland for agricultural Iranian years 1380-81 to 1388-89

Table 17: Cultivated areas of farmland (ha) and appropriate products of irrigation networks and counties within the Zayandeh Rud Basin, agricultural Iranian year 1380-81

| | Cultivated areas | | | | Ę | | | | | | | | A | | E | | | | |
|-------|----------------------------|------------------------|----------|-------------|----------------|------------|-------------|-------------|------------|------------|------------|------------|--------------|-----------|----------------|----------------|----------------|-----|------|
| | | area | | | rguye | | | | | | | | orgha | iran | amir | | | | |
| | | her | | | ır-Jaı | | | | | | | | Ň I | ham | ч К | | | | |
| Year | | + of | | | ahya | ÷ | Ħ | | | | ء | ч | in (e | Ĕ | rean | | F | | |
| | | ater | ۵. | uwo | :M-r otal) | d lef | d rig | | | ¥ | Vort | sout | arva doli | itrea | vnst | | shar | | |
| | | iside ce wa ces) | lat u | iat d | rakel yar t | aba | abai | r | rlefi | r rigl | sht I | sht (| (Koi | ŝdn u | opu | 5 | noo | gan | han |
| | | im ir urfac sour | njar | njar | Vah | skon | ekon | orkh | osha | osha | oda | oda | kara | irvar | Irvar | rida | rey c | ade | shag |
| | Products | Su Su | <u>و</u> | E CTO | Σ <u></u> | ž | ž | E | ¥ | T | 2 2 6 2 | 2000 | As sp | ¥ | <u><u></u></u> | <u>.</u> | 문 1.700 | 5 | ă |
| | Rainfed wheat | 48,042 | 131 | 13 | 5,032 | 3,894 0 | 2,807 | 9,518 | 3,358 | 3,842 | 3,263 | 3,806 | 66 | 1,416 | 947 114 | 7,008 8,481 | 1,790 | 0 | 0 |
| | Barley | 18,655 | 61 | 319 | 3,160 | 1,729 | 1,488 | 2,522 | 1,253 | 1,434 | 1,218 | 1,421 | 157 | 403 | 270 | 2,548 | 671 | 0 | 0 |
| | Rainfed barley | 4,345 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 82 | 210 | 141 | 3,106 | 806 | 0 | 0 |
| | Rice (paddy) | 13,266 | 299 | 1,551 | 1,375 | 4,574 | 4,620 | 1 | 189 | 216 | 184 | 214 | 8 | 21 | 14 | 0 | 0 | 0 | 0 |
| | Millet | 1,468 | 5 | 25 | 7 198 | 0 | 343 | 2 | 343 17 | 393 | 334 17 | 389 | 4 | 9 | 6 | 0 | 0 | 0 | 0 |
| | Pease | 430 | 5 | 25 | 82 | 0 | 14 | 0 | 3 | 3 | 3 | 3 | 8 | 20 | 13 | 223 | 30 | 0 | 0 |
| | Rainfed pease | 543 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 9 | 24 | 16 | 271 | 224 | 0 | 0 |
| | Beans | 2,235 | 5 | 25 | 1,558 | 1 | 18 | 0 | 3 | 4 | 3 | 4 | 19 | 50 | 33 | 329 | 184 | 0 | 0 |
| | Rainfed lentils | 452 | 0 | 2 | 0 | 0 | 0 | 0 | 2 | 2 | 2 | 2 | 2 | 14 | 3 | 263 | 373 | 0 | 0 |
| | Vetch | 134 | 2 | 8 | 30 | 6 | 72 | 0 | 0 | 0 | 0 | 0 | 3 | 7 | 5 | 0 | 0 | 0 | 0 |
| | Watermelon | 117 | 2 | 13 | 2 | 42 | 3 | 14 | 7 | 8 | 7 | 8 | 2 | 5 | 3 | 0 | 0 | 0 | 0 |
| | Melon | 905 | 0 | 0 | 21 | 0 | 0 | 764 | 28 | 32 | 28 | 32 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Cucumber | 947 | 0 | 0 | 20 | 330 | 85 | 47 | 100 | 79 | 67 | 78 | 6 | 14 | 9 | 119 | 52 | 0 | 0 |
| | Squash variety | 104 | 0 | 0 | 0 | 51 | 9 | 0 | 10 | 12 | 10 | 12 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Potato | 14,685 | 8 | 42 | 58 | 1,924 | 712 | 309 | 94 | 108 | 92 | 107 | 147 | 378 | 253 | 8,739 | 1,716 | 0 | 0 |
| | Onion | 2,852 | 12 | 63 | 135 | 875 | 565 | 34 | 266 | 304 | 258 | 301 | 7 | 19 | 13 | 0 | 0 | 0 | 0 |
| | Eggplant | 57 | 0 | 0 | 19 | 236 | 0 | 47 | 45 | 49 | 42 | 49 | 0 | 20 | 19 | 0 | 0 | 0 | 0 |
| | Bean | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ē | Green beans | 32 | 0 | 0 | 0 | 15 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 7 | 5 | 0 | 3 | 0 | 0 |
| 80/8 | Garlic Other vegetables | 17 | 0 | 0 | 0 | 9 505 | 228 | 0 | 0 | 108 | 0 92 | 107 | 0 79 | 203 | 0 136 | 0 | 7 | 0 | 0 |
| : (13 | tuber vegetables | 1,394 | 0 | 0 | 10 | 621 | 235 | 36 | 42 | 48 | 41 | 48 | 59 | 153 | 102 | 0 | 0 | 0 | 0 |
| 2002 | Alfalfa | 11,406 | 23 | 117 | 666 | 1,533 | 748 | 1,217 | 1,099 | 1,257 | 1,068 | 1,246 | 119 | 307 | 205 | 1,354 | 448 | 0 | 0 |
| 10/ | rainfed Alfalfa | 488 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 398 | 90 | 0 | 0 |
| 01- | Sainfoin | 2,745 | 32 | 0 168 | 153 40 | 1,047 | //1 | 0 | 41 | 47 | 40 | 47 | 28 138 | 71 354 | 47 237 | 6.451 | 134 895 | 0 | 0 |
| 0/20 | Rainfed sainfoin | 75 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 75 | 0 | 0 |
| Ħ | Forage sorghum | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Grain sorghum | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Turnip and fodder beet | 432 | 2 | 15 | 409 | 041 | 200 | 224 | 46 | 53 | 45 | 53 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Other forage | 317 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 18 | 45 | 30 | 0 | 224 | 0 | 0 |
| | Sunflower | 660 | 0 | 0 | 462 | 0 | 27 | 3 | 39 | 45 | 38 | 45 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Sesame | 92 1 705 | 0 | 0 | 28 | 0 | 34 | 23 | 333 | 2 | 324 | 2 | 0 | 0 | 0 | 12 | 0 | 0 | 0 |
| | Canola | 66 | 0 | 2 | 10 | 23 | 10 | 1 | 1 | 1 | 1 | 1 | 1 | 3 | 2 | 9 | 1 | 0 | 0 |
| | Sugar beet | 4,050 | 9 | 46 | 74 | 56 | 69 | 941 | 644 | 737 | 626 | 730 | 0 | 0 | 0 | 119 | 0 | 0 | 0 |
| | Tobacco | 108 | 0 | 0 | 0 | 99 | 0 | 0 | 2 | 2 | 2 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Cotton Madder | 1,172 | 0 | 0 | 59 | 0 | 14 | /8 | 240 | 2/5 | 234 | 2/2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Sunflower nuts | 1,814 | 12 | 63 | 219 | 20 | 21 | 1,346 | 26 | 29 | 25 | 29 | 5 | 12 | 8 | 0 | 0 | 0 | 0 |
| | Saffron | 93 | 0 | 0 | 2 | 33 | 5 | 20 | 4 | 5 | 4 | 5 | 3 | 7 | 5 | 0 | 1 | 0 | 0 |
| | Cumin | 51 | 0 | 0 | 51 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Cannabis | 0 495 | 0 | 0 | 0 152 | 0 | 343 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Seed products | 259 | 0 | 0 | 30 | 36 | 69 | 0 | 2 | 2 | 2 | 2 | 22 | 57 | 38 | 0 | 0 | 0 | 0 |
| | Other products | 86 | 0 | 0 | 0 | 25 | 0 | 0 | 14 | 16 | 14 | 16 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Sum of irrigated | 148,822 | 610 | 3,168 | 14,360 | 18,432 | 13,643 | 18,668 | 9,119 | 10,432 | 8,861 | 10,336 | 1,408 | 3,621 | 2,423 | 27,493 | 6,248 | 0 | 0 |
| | Area of fallow irrigation | 16,567 99.309 | 2 529 | 13 2.745 | 0 12.488 | 0 8.786 | 0 11.785 | 0 14.448 | 0 4,938 | 0 5,650 | 0 4,799 | 0 5.598 | 159 | 409 | 2/3 1.144 | 12,503 | 3,208 1,792 | 0 | 0 |
| | Area of fallow rainfed | 10,850 | 67 | 348 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | _,, 10 | _,1.1 | 9,763 | 671 | 0 | 0 |



| Year | Cultivated areas | Sum inside catchment area (surface water + other resources) | Lenjanat up | Lenjanat down | Mobarakeh-Mahyar-Jarguyeh (Mahyar total) | Nekouabad left | Nekouabad right | Borkhar | Abshar left | Abshar right | Roodasht North | Roodasht South | Askaran/ Karvan up Morghab spring (Kordolia) | Karvan upstream Khamiran | Karvan downstream Khamiran | Faridan | Fereydoonshahr | Chadegan | Dehaghan |
|-------|----------------------------|---|-------------|---------------|--|----------------|-----------------|-------------|-------------|--------------|----------------|----------------|---|--------------------------|----------------------------|-----------------|----------------|----------------|----------|
| | Wheat Rainfed wheat | 62,908 10,469 | 166 48 | 864 252 | 5,909 0 | 4,628 0 | 3,292 0 | 9,615 0 | 5,666 0 | 6,482 0 | 5,506 0 | 6,423 0 | 529 92 | 1,359 236 | 909 158 | 6,769 2,684 | 1,790 0 | 3,000 7,000 | 0 0 |
| | Barley Deinford bandou | 20,893 | 81 | 419 | 3,912 | 1,808 | 3,029 | 2,018 | 1,118 | 1,279 | 1,086 | 1,267 | 180 | 462 | 309 | 2,239 | 726 | 960 | 0 |
| | Rainted barley | 7,148 | 307 | 1 593 | 1 376 | 0 5 891 | 5 0/9 | 0 | 258 | 295 | 250 | 292 | /3 | 189 | 126 | 2,230 | 0 | 4,500 | 0 |
| | Corn | 2,013 | 0 | 1,555 | 58 | 0 | 5,045 | 393 | 367 | 420 | 357 | 416 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Millet | 803 | 6 | 34 | 254 | 0 | 343 | 0 | 34 | 39 | 33 | 39 | 4 | 9 | 6 | 0 | 0 | 0 | 0 |
| | Pease | 385 | 2 | 13 | 21 | 0 | 14 | 0 | 3 | 4 | 3 | 4 | 13 | 33 | 22 | 179 | 34 | 40 | 0 |
| | Rainfed pease | 633 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 9 | 24 | 16 | 255 | 0 | 330 | 0 |
| | Lentil | 2,388 | 10 | 50 | 1,377 | 0 | 24 | 0 | 5 | 5 | 5 | 5 | 24 | 29 | 41 20 | 351 411 | 179 | 250 | 0 |
| | Rainfed lentils | 392 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 6 | 4 | 131 | 0 | 250 | 0 |
| | Vetch | 150 | 2 | 8 | 37 | 0 | 84 | 0 | 0 | 0 | 0 | 0 | 4 | 9 | 6 | 0 | 0 | 0 | 0 |
| | Watermelon | 127 | 3 | 17 | 6 | 47 | 14 | 14 | 5 | 6 | 5 | 6 | 1 | 2 | 2 | 0 | 0 | 0 | 0 |
| | Cantaloune | 894 605 | 0 | 0 | 7 80 | 0 | 3 | /52 | 31 112 | 35 128 | 30 108 | 35 127 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Cucumber | 980 | 0 | 0 | 14 | 199 | 85 | 19 | 60 | 69 | 58 | 68 | 6 | 15 | 10 | 16 | 60 | 300 | 0 |
| | Squash variety | 50 | 0 | 0 | 0 | 41 | 9 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Potato | 15,583 | 27 | 143 | 26 | 2,169 | 682 | 289 | 132 | 151 | 128 | 150 | 162 | 415 | 278 | 7,190 | 1,641 | 2,000 | 0 |
| | Union | 2,929 | 17 | 89 | 132 | 889 | 561 64 | 34 48 | 275 | 314 | 267 | 311 | 11 | 19 28 | 13 | 5 | 0 | 51 | 0 |
| | Eggplant | 126 | 0 | 0 | 10 | 39 | 5 | 16 | 13 | 15 | 13 | 15 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Bean | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 82) | Green beans | 37 | 0 | 0 | 0 | 15 | 0 | 0 | 1 | 1 | 1 | 1 | 3 | 7 | 5 | 0 | 3 | 0 | 0 |
| 81/ | Garlic Other vegetables | 1480 | 0 | 0 | 1 | 9 460 | 2 185 | 0 | 94 | 108 | 92 | 107 | 79 | 203 | 136 | 2 | 4 | 0 | 0 |
| 3 (13 | tuber vegetables | 1,325 | 0 | 0 | 10 | 580 | 217 | 38 | 47 | 54 | 46 | 54 | 51 | 132 | 88 | 0 | 7 | 0 | 0 |
| 200 | Alfalfa | 12,938 | 23 | 117 | 673 | 1,762 | 776 | 1,218 | 1,224 | 1,401 | 1,190 | 1,388 | 128 | 330 | 221 | 995 | 492 | 1,000 | 0 |
| 10/ | rainfed Alfalfa | 276 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 96 | 0 | 180 | 0 |
| 02 - | Sainfoin | 3,205 | 46 | 239 | 40 | 1,113 | /00 | 0 | 34 | 39 | 33 | 39 | 110 | 80 283 | 54 189 | 5.734 | 134 970 | 2.400 | 0 |
| 0/20 | Rainfed sainfoin | 140 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 140 | 0 |
| a | Forage sorghum | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Grain sorghum | 15 | 0 | 0 | 0 | 0 | 0 | 0 | 1 0 2 0 | 4 | 3 | 1 1 6 9 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Turnip and fodder beet | 527 | 0 | 0 | 12 | 0 | 2/4 | 224 | 1,030 | 79 | 67 | 78 | 0 | 0 | 14 | 4 | 0 | 0 | 0 |
| | Other forage | 622 | 0 | 0 | 0 | 187 | 0 | 0 | 0 | 0 | 0 | 0 | 24 | 61 | 41 | 0 | 209 | 100 | 0 |
| | Sunflower | 1,338 | 0 | 0 | 615 | 2 | 69 | 178 | 112 | 128 | 108 | 127 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Sesame | 38 1 294 | 0 | 2 | 4 302 | 16 | 3 105 | 23 49 | 2 180 | 206 | 175 | 204 | 0 | 0 | 5 | 12 | 11 | 15 | 0 |
| | Canola | 350 | 5 | 25 | 36 | 71 | 40 | 21 | 11 | 13 | 11 | 13 | 1 | 2 | 1 | 79 | 7 | 14 | o |
| | Sugar beet | 3,454 | 9 | 46 | 74 | 66 | 69 | 1,399 | 394 | 451 | 383 | 447 | 0 | 0 | 0 | 117 | 0 | 0 | 0 |
| | Tobacco | 110 | 0 | 0 | 0 | 99 | 0 | 0 | 3 | 3 | 3 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Madder | 1,785 | 0 | 0 | 64 | 0 | 14 | 102 | 3/8 | 432 | 367 | 428 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Sunflower nuts | 1,333 | 6 | 34 | 250 | 15 | 0 | 931 | 17 | 20 | 17 | 19 | 5 | 12 | 8 | 0 | 0 | 0 | 0 |
| | Saffron | 96 | 0 | 0 | 2 | 19 | 5 | 23 | 4 | 5 | 4 | 5 | 3 | 8 | 5 | 8 | 1 | 3 | 0 |
| | Cumin | 530 | 0 | 0 | 248 | 0 | 274 | 0 | 2 | 2 | 2 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Cannabis | 495 | 0 | 0 | 152 | 0 | 343 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Seed products | 262 | 0 | 0 | 30 | 30 | 69 | 0 | 2 | 2 | 2 | 2 | 24 | 61 | 41 | 0 | 0 | 0 | 0 |
| | Other products | 79 | 0 | 0 | 15 | 30 | 0 | 0 | 3 | 4 | 3 | 4 | 4 | 9 | 6 | 0 | 0 | 0 | 0 |
| | Sum of irrigated | 175,288 | 719 | 3,731 | 16,390 | 21,158 | 16,405 | 18,278 | 11,734 | 13,424 | 11,403 | 13,301 | 1,432 | 3,682 | 2,464 | 24,469 | 6,326 | 10,371 | 0 |
| | Area of fallow irrigation | 75 221 | 53 421 | 2183 | 0 10 468 | 5,930 | 0 080 0 | 0 14 850 | 2,033 | 2,326 | 1,976 | 2 30/ | 646 | 454 | 304 1 1 1 7 | 5,395 10 85/ | 1 662 | 7 715 | 0 |
| | Area of fallow rainfed | 8.684 | 16 | 2,103 | 10,400 | 0,550 | 0,000 | 0,050 | 2,000 | 2,320 | 1,5,5 | 2,504 | 0,40 | 1,001 | -,2 | 2.251 | 374 | 5,960 | 0 |

Table 18: Cultivated areas of farmland (ha) and appropriate products of irrigation networks and counties within the Zayandeh Rud Basin, agricultural Iranian year 1381-82



| Year | Cultivated areas | Sum inside catchment area (surface water + other resources) | Lenjanat up | Lenjanat down | Mobarakeh-Mahyar-Jarguyeh (Mahyar total) | Nekouabad left | Nekouabad right | Borkhar | Abshar left | Abshar right | Roodasht North | Roodasht South | Askaran/ Karvan up Morghab spring (Kordolia) | Karvan upstream Khamiran | Karvan downstream Khamiran | Faridan | Fereydoonshahr | Chadegan | Dehaghan |
|------|---------------------------|---|-------------|---------------|--|----------------|-----------------|-------------|-------------|--------------|----------------|----------------|---|--------------------------|----------------------------|----------|----------------|------------------|------------|
| | Wheat | 69,402 | 113 | 587 | 5,095 | 4,434 | 3,114 | 10,281 | 6,425 | 7,350 | 6,244 | 7,283 | 514 | 1,321 | 884 | 7,167 | 1,790 | 3,000 | 3,800 |
| | Rainfed wheat Barley | 12,909 | 16 73 | 84 377 | 0 3 124 | 0 1 796 | 0 3 166 | 0 2 148 | 0 1 107 | 0 1 267 | 0 1 076 | 0 1 255 | 83 | 212 425 | 142 284 | 3,185 | 1,937 746 | 7,250 | 0 1 800 |
| | Rainfed barley | 5,579 | 2 | 8 | 0 | 1,, 50 | 0 | 0 | 0 | 0 | 0 | 1,200 | 92 | 236 | 158 | 1,833 | 746 | 2,504 | 1,000 |
| | Rice (paddy) | 14,467 | 307 | 1,593 | 1,345 | 5,466 | 4,730 | 1 | 232 | 265 | 225 | 263 | 7 | 19 | 13 | 0 | 0 | 0 | 0 |
| | Corn | 1,866 | 0 | 0 | 32 | 0 | 0 | 374 | 343 | 393 | 334 | 389 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Millet | 723 | 10 | 52 | 224 | 0 | 309 | 0 | 26 | 29 | 25 | 29 | 4 | 9 24 | 6 16 | 0 101 | 0 | 0 | 100 |
| | Fedraind pease | 257 | 2 | 13 | 0 | 0 | 14 | 0 | 0 | 4 | 0 | 4 | 7 | 19 | 10 | 64 | 115 | 20 | 100 |
| | Beans | 3,231 | 8 | 42 | 194 | 0 | 48 | 0 | 5 | 5 | 5 | 5 | 24 | 62 | 42 | 365 | 196 | 231 | 2,000 |
| | Lentil | 551 | 0 | 2 | 18 | 0 | 3 | 0 | 3 | 4 | 3 | 4 | 6 | 17 | 11 | 239 | 90 | 50 | 100 |
| | Rainfed lentils | 697 | 0 | 0 | 0 | 0 | 103 | 0 | 0 | 0 | 0 | 0 | 3 | 7 | 5 | 64 | 373 | 246 | 0 |
| | Watermelon | 201 | 15 | 73 25 | 40 | 47 | 27 | 70 | 5 | 6 | 5 | 6 | 4 | 2 | 1 | 0 | 0 | 0 | 20 |
| | Melon | 929 | 2 | 9 | 12 | 0 | 7 | 717 | 43 | 49 | 42 | 49 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Cantaloupe | 950 | 0 | 0 | 93 | 0 | 7 | 48 | 189 | 216 | 184 | 214 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Cucumber | 1,235 | 0 | 0 | 16 | 193 | 92 | 19 | 103 | 118 | 100 | 117 | 6 | 16 | 10 | 16 | 60 | 350 | 20 |
| | Squash variety | 16 302 | 30 | 155 | 21 | 2 147 | 659 | 299 | 137 | 157 | 133 | 156 | 156 | 401 | 4 268 | 7 155 | 1 656 | 2 700 | 70 |
| | Onion | 3,291 | 19 | 96 | 147 | 1,132 | 703 | 37 | 263 | 301 | 255 | 298 | 6 | 14 | 9 | 0 | 0 | 2,700 | 12 |
| | Tomatoes | 760 | 0 | 0 | 11 | 207 | 46 | 45 | 78 | 89 | 76 | 88 | 11 | 29 | 20 | 0 | 0 | 50 | 10 |
| | Eggplant | 127 | 0 | 0 | 3 | 16 | 0 | 9 | 22 | 26 | 22 | 25 | 1 | 2 | 1 | 0 | 0 | 0 | 0 |
| _ | Bean Green heans | 70 | 0 | 0 | 0 | 15 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 9 | 0 | 0 | 1 | 20 | 0 |
| (83 | Garlic | 13 | 0 | 0 | 0 | 9 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 2 |
| 1382 | Other vegetables | 1,691 | 0 | 0 | 15 | 602 | 230 | 1 | 94 | 108 | 92 | 107 | 83 | 212 | 142 | 2 | 0 | 2 | 2 |
| 5 | tuber vegetables | 1,272 | 0 | 0 | 9 | 547 | 189 | 33 | 46 | 53 | 45 | 53 | 53 | 137 | 92 | 12 | 0 | 2 | 2 |
| /20 | Alfalfa | 13,321 | 23 | 117 | 540 | 2,189 | 837 | 1,403 | 1,120 | 1,282 | 1,089 | 1,270 | 136 | 349 | 234 | 1,035 | 449 | 998 81 | 250 |
| - 10 | Clover | 3,413 | 16 | 84 | 158 | 1,268 | 878 | 0 | 37 | 42 | 36 | 42 | 33 | 85 | 57 | 382 | 134 | 150 | 10 |
| 003 | Sainfoin | 9,657 | 0 | 0 | 20 | 70 | 0 | 0 | 0 | 0 | 0 | 0 | 110 | 283 | 189 | 5,688 | 895 | 2,400 | 0 |
| 10/2 | Rainfed sainfoin | 76 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 76 | 0 |
| | Grain sorghum | 8 15 | 0 | 0 | 8 | 0 | 0 | 0 | 3 | 4 | 3 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Maize forage | 11,242 | 12 | 63 | 428 | 836 | 310 | 3,454 | 1,382 | 1,581 | 1,343 | 1,567 | 12 | 32 | 21 | 0 | 0 | 0 | 200 |
| | Turnip and fodder beet | 546 | 0 | 0 | 14 | 0 | 0 | 252 | 64 | 73 | 62 | 72 | 0 | 0 | 0 | 0 | 0 | 0 | 10 |
| | Other forage | 686 | 0 | 0 | 0 | 187 | 0 | 0 | 17 | 20 | 17 | 19 | 22 | 57 | 38 | 0 | 224 | 85 | 0 |
| | Sesame | 799 | 3 | 13 | 522 | 0 | 34 | 28 | 49 | 50 | 47 | 55 | 0 | 0 | 0 | 0 | 0 | 0 | 3 |
| | Safflower | 907 | 0 | 0 | 122 | 15 | 167 | 57 | 112 | 128 | 108 | 127 | 0 | 0 | 0 | 0 | 0 | 0 | 72 |
| | Canola | 946 | 10 | 50 | 68 | 156 | 140 | 71 | 34 | 39 | 33 | 39 | 7 | 19 | 13 | 183 | 26 | 32 | 24 |
| | Sugar beet | 2,082 | 5 | 25 | 60 | 66 | 69 | 979 | 197 | 226 | 192 | 224 | 0 | 0 | 0 | 40 | 0 | 0 | 0 |
| | Cotton | 2,706 | 0 | 0 | 28 | 52 | 24 | 31 | 589 | 4 674 | 572 | 4 668 | 0 | 0 | 0 | 0 | 0 | 0 | 120 |
| | Madder | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Sunflower nuts | 1,317 | 10 | 50 | 269 | 0 | 34 | 664 | 53 | 60 | 51 | 60 | 3 | 7 | 5 | 0 | 0 | 0 | 50 |
| | Saffron | 104 | 0 | 0 | 2 | 23 | 5 | 23 | 5 | 5 | 5 | 5 | 3 | 8 | 5 | 8 | 1 | 3 | 2 |
| | black cumin | 603 | 0 | 0 | 152 | 0 | 343 | 0 | 2 | 2 | 2 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 100 |
| | Cannabis | 498 | 0 | 0 | 152 | 0 | 343 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0 |
| | Seed products | 284 | 0 | 0 | 31 | 36 | 69 | 0 | 4 | 5 | 4 | 5 | 25 | 64 | 43 | 0 | 0 | 0 | 0 |
| | Other products | 140 | 0 | 0 | 26 | 30 | 0 | 0 | 12 01- | 13 | 11 | 13 | 1 | 4 | 3 | 0 | 0 | 5 | 25 |
| | Sum of irrigated | 189,269 | 661 21 | 3,430 109 | 13,042 n | 21,539 | 16,707 n | 21,064 0 | 12,817 0 | 14,663 0 | 12,455 0 | 14,528 n | 1,409 184 | 3,623 474 | 2,424 | 24,713 | 6,292 3,260 | 11,097 10 177 | 8,804 n |
| | Area of fallow irrigation | 63.068 | 479 | 2,484 | 7.341 | 4.717 | 8.778 | 12.064 | 950 | 1,087 | 923 | 1.077 | 104 | 4/4 | 0 | 10.610 | 1,696 | 6.953 | 3.910 |
| | Area of fallow rainfed | 15,232 | 48 | 252 | , | ,, | 0 | ,1 | 0 | 0 | 0 | ,, | 669 | 1,720 | 1,151 | 2,380 | 828 | 8,183 | 0 |

Table 19: Cultivated areas of farmland (ha) and appropriate products of irrigation networks and counties within the Zayandeh Rud Basin, agricultural Iranian year 1382-83



| Yea | Cultivated areas | Sum inside catchment area (surface water + other resources) | Lenjanat up | Lenjanat down | Mobarakeh-Mahyar-Jarguyeh (Mahyar total) | Nekouabad left | Nekouabad right | Borkhar | Abshar left | Abshar right | Roodasht North | Roodasht South | Askaran/ Karvan up Morghab spring (Kordolia) | Karvan upstream Khamiran | Karvan downstream Khamiran | Faridan | Fereydoonshahr | Chadegan | Dehaghan |
|------|----------------------------|---|-------------|---------------|--|----------------|-----------------|-------------|-------------|--------------|----------------|----------------|---|--------------------------|----------------------------|-----------------|----------------|----------|------------|
| | Wheat | 70,376 | 153 | 797 | 5,164 | 4,172 | 3,047 | 10,701 | 6,698 | 7,663 | 6,509 | 7,593 | 514 | 1,321 | 884 | 6,861 | 1,753 | 2,844 | 3,700 |
| | Barley | 23,788 | 121 | 629 | 3,356 | 1,866 | 3,035 | 2,336 | 1,301 | 1,488 | 1,264 | 1,474 | 147 | 378 | 253 | 2,007 | 735 | 1,200 | 2,200 |
| | Rainfed barley | 5,825 | 1 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 110 | 282 | 189 | 1,895 | 895 | 2,450 | 0 |
| | Rice (paddy) | 17,116 | 339 | 1,761 | 1,391 | 6,506 | 5,000 | 3 | 488 | 558 | 474 | 553 | 8 | 21 | 14 | 0 | 0 | 0 | 0 |
| | Corn | 1,930 | 0 | 25 | 229 | 0 | 3/13 | 563 | 318 | 363 | 309 | 360 | 0 | U Q | 0 | 0 | 0 | 0 | 2 |
| | Pease | 421 | 2 | 10 | 223 | 0 | 26 | 0 | 2 | 2 | 2 | 2 | 11 | 29 | 20 | 167 | 19 | 20 | 85 |
| | Fedraind pease | 300 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 11 | 28 | 19 | 70 | 142 | 30 | 0 |
| | Beans | 3,141 | 7 | 37 | 167 | 0 | 55 | 0 | 4 | 5 | 4 | 5 | 26 | 66 | 44 | 341 | 189 | 236 | 1,955 |
| | Lentil Rainfed lentils | 450 | 0 | 2 | 17 | 0 | 3 | 0 | 2 | 2 | 2 | 2 | 6 | 17 | 11 | 227 | 90 522 | 30 | 40 |
| | Vetch | 302 | 19 | 100 | 41 | 0 | 93 | 0 | 0 | 0 | 0 | 0 | 5 | 12 | 8 | 0 | 0 | 0 | 25 |
| | Watermelon | 836 | 24 | 126 | 24 | 37 | 55 | 553 | 3 | 3 | 3 | 3 | 1 | 2 | 2 | 0 | 0 | 0 | 0 |
| | Melon | 971 | 0 | 2 | 10 | 0 | 4 | 837 | 27 | 31 | 27 | 31 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Cantaloupe Cucumber | 1.074 | 0 | 0 | 91 | 211 | 3 104 | 21 | 146 | 167 | 142 | 165 | 6 | 15 | 10 | 21 | 58 | 400 | 15 |
| | Squash variety | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Potato | 16,302 | 21 | 109 | 15 | 2,199 | 637 | 290 | 146 | 167 | 142 | 165 | 155 | 399 | 267 | 7,201 | 1,716 | 2,600 | 75 |
| | Onion | 3,125 | 16 | 84 | 130 | 1,080 | 621 | 34 | 267 | 306 | 260 | 303 | 5 | 12 | 8 | 0 | 0 | 0 | 0 |
| | Eggplant | 183 | 0 | 0 | 4 | 290 | 54 | 40 | 34 | 39 | 33 | 39 | 12 | 2 | 21 | 0 | 0 | 45 | 15 |
| | Bean | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 34) | Green beans | 67 | 0 | 0 | 1 | 0 | 1 | 0 | 2 | 2 | 2 | 2 | 5 | 13 | 9 | 0 | 1 | 30 | 0 |
| 83/1 | Garlic Other vegetables | 22 | 0 | 0 | 17 | 19 770 | 277 | 0 | 0 170 | 195 | 0 166 | 193 | 0 | 217 | 145 | 0 16 | 1 | 0 | 2 |
| (13 | tuber vegetables | 1,932 | 0 | 0 | 8 | 965 | 248 | 75 | 43 | 49 | 42 | 49 | 79 | 203 | 136 | 33 | 0 | 3 | 0 |
| 2005 | Alfalfa | 14,083 | 57 | 293 | 442 | 2,277 | 836 | 1,348 | 1,249 | 1,429 | 1,214 | 1,416 | 128 | 330 | 221 | 1,087 | 410 | 1,100 | 245 |
| 10/ | rainfed Alfalfa | 332 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 115 | 97 | 120 | 0 |
| - 40 | Sainfoin | 10.106 | 24 | 126 | 22 | 1,299 | 8/8 | 0 | 52 | 59 | 50 | 58 | 37 103 | 94 264 | 177 | 6.052 | 904 | 2.500 | 20 |
| 0/20 | Rainfed sainfoin | 193 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 75 | 118 | 0 |
| a | Forage sorghum | 63 | 0 | 0 | 9 | 0 | 0 | 37 | 3 | 4 | 3 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 2 |
| | Grain sorghum | 12 906 | 0 | 0 147 | 0 520 | 1 214 | 245 | 0 | 1 6 2 2 | 1 956 | 0 1577 | 1 920 | 0 | 0 | 0 | 0 | 0 | 0 | 225 |
| | Turnip and fodder beet | 720 | 20 | 147 | 22 | 1,214 | 0 | 224 | 1,022 | 1,850 | 1,577 | 1,833 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Other forage | 782 | 0 | 0 | 0 | 281 | 0 | 0 | 12 | 14 | 12 | 14 | 24 | 61 | 41 | 0 | 221 | 103 | 0 |
| | Sunflower | 460 | 2 | 13 | 158 | 0 | 36 | 29 | 52 | 60 | 51 | 59 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Sesame | 1 133 | 1 | 0 | 4 134 | 10 | 266 | 26 | 3 135 | 3 155 | 3 131 | 3 153 | 0 | 0 | 0 | 0 | 0 | 0 | 6 105 |
| | Canola | 967 | 4 | 19 | 98 | 127 | 104 | 51 | 48 | 54 | 46 | 54 | 7 | 18 | 12 | 175 | 52 | 70 | 27 |
| | Sugar beet | 1,666 | 2 | 13 | 91 | 0 | 67 | 839 | 137 | 157 | 133 | 156 | 0 | 0 | 0 | 72 | 0 | 0 | 0 |
| | Tobacco | 49 | 0 | 0 | 0 | 49 | 10 | 0 | 0 618 | 0 | 0 | 701 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Madder | 2,850 | 0 | 0 | 0 | 0 | 10 | 0 | 010 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 140 |
| | Sunflower nuts | 2,289 | 10 | 49 | 629 | 30 | 67 | 1,114 | 70 | 80 | 68 | 79 | 3 | 7 | 5 | 0 | 0 | 0 | 80 |
| | Saffron | 119 | 0 | 0 | 2 | 23 | 5 | 37 | 5 | 6 | 5 | 6 | 3 | 8 | 5 | 8 | 0 | 3 | 2 |
| | black cumin | 99 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 95 |
| | Cannabis | 484 | 0 | 0 | 149 | 0 | 335 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| | Seed products | 254 | 0 | 0 | 29 | 14 | 66 | 19 | 3 | 4 | 3 | 4 | 21 | 54 | 36 | 0 | 0 | 0 | 0 |
| | Other products | 112 | 0 | 0 | 35 | 30 | 16 (22) | 0 | 12 01 1 | 2 | 12 5 10 | 15 770 | 2 | 5 | 3 | 0 | 0 | 11 22 | 30 |
| | Sum of irrigated | 21.360 | 837 | 4,346 81 | 13,258 N | 23,577 0 | 16,623 N | 22,598 0 | 13,911 N | 15,915 N | 13,519 N | 15,770 N | 1,419 220 | 3,647 565 | 2,441 378 | 24,678 5.449 | 6,289 3.685 | 11,337 | 9,214 N |
| | Area of fallow irrigation | 62,041 | 302 | 1,569 | 7,147 | 3,511 | 8,862 | 10,808 | 893 | 1,021 | 868 | 1,012 | 660 | 1,696 | 1,135 | 10,645 | 1,699 | 6,713 | 3,500 |
| | Area of fallow rainfed | 10,335 | 54 | 279 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2,196 | 403 | 7,404 | 0 |

Table 20: Cultivated areas of farmland (ha) and appropriate products of irrigation networks and counties within the Zayandeh Rud Basin, agricultural Iranian year 1383-84



| Year | Cuttwated areas | Sum inside catchment area (surface water + other resources) | Lenjanat up | Lenjanat down | Mobarakeh-Mahyar-Jarguyeh (Mahyar total) | Nekouabad left | Nekouabad right | Borkhar | Abshar left | Abshar right | Roodasht North | Roodasht South | Askaran/ Karvan up Morghab spring (Kordolia) | Karvan upstream Khamiran | Karvan downstream Khamiran | Faridan | Fereydoonshahr | Chadegan | Dehaghan |
|-------|------------------------------|---|-------------|---------------|--|----------------|-----------------|-------------|-------------|--------------|----------------|----------------|---|--------------------------|----------------------------|-----------------|----------------|----------------|------------|
| | Wheat | 73,164 | 141 | 734 | 5,231 | 4,201 | 3,110 | 11,124 | 7,314 | 8,368 | 7,108 | 8,291 | 459 | 1,180 | 789 | 6,809 | 1,805 | 3,000 | 3,500 |
| | Rainfed wheat Barley | 11,007 | 11 109 | 59 567 | 3 634 | 0 1 930 | 3 276 | 2 569 | 0 1 391 | 0 1 591 | 0 1 352 | 0 1 576 | 101 167 | 260 429 | 1/4 287 | 3,504 | 1,899 731 | 5,000 | 0 2 160 |
| | Rainfed barley | 7,034 | 0 | 0 | 5,054 | 1,550 | 5,270 | 2,505 | 1,551 | 1,551 | 1,552 | 1,570 | 110 | 283 | 189 | 1,919 | 932 | 3,600 | 2,100 |
| | Rice (paddy) | 17,323 | 337 | 1,748 | 1,381 | 6,567 | 5,049 | 3 | 515 | 589 | 501 | 584 | 9 | 24 | 16 | 0 | 0 | 0 | 0 |
| | Corn | 2,171 | 0 | 0 | 10 | 0 | 5 | 654 | 353 | 404 | 343 | 401 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Millet | 1,110 | 8 | 42 | 295 | 74 | 447 | 0 | 52 | 59 | 50 | 58 | 4 | 10 | 7 | 175 | 0 | 0 | 150 |
| | Fedraind pease | 278 | 0 | 15 | 40 | 0 | 24 | 0 | 0 | 0 | 0 | 0 | 9 | 24 | 16 | 70 | 149 | 10 | 150 |
| | Beans | 3,652 | 19 | 101 | 180 | 14 | 51 | 0 | 4 | 5 | 4 | 5 | 35 | 90 | 60 | 381 | 204 | 300 | 2,200 |
| | Lentil | 592 | 0 | 2 | 30 | 0 | 3 | 0 | 2 | 2 | 2 | 2 | 7 | 17 | 11 | 295 | 88 | 32 | 100 |
| | Rainfed lentils | 1,238 | 0 | 0 | 0 | 0 | 102 | 0 | 0 | 0 | 0 | 0 | 2 | 5 | 3 | 518 | 410 | 300 | 0 |
| | Watermelon | 655 | 10 | 67 | 20 | 56 | 34 | 419 | 3 | 3 | 3 | 3 | 4 | 9 12 | 8 | 0 | 0 | 0 | 50 10 |
| | Melon | 857 | 0 | 1 | 14 | 0 | 3 | 764 | 10 | 12 | 10 | 12 | 2 | 5 | 3 | 0 | 0 | 0 | 20 |
| | Cantaloupe | 1,050 | 0 | 0 | 107 | 0 | 3 | 48 | 206 | 236 | 200 | 234 | 0 | 1 | 1 | 0 | 0 | 0 | 15 |
| | Cucumber Squash variety | 1,158 | 0 | 2 | 15 | 205 | 102 | 19 | 69 | 79 | 67 | 78 | 6 | 14 | 9 | 40 | 48 | 376 | 30 |
| | Potato | 15,080 | 16 | 84 | 30 | 2,262 | 656 | 290 | 146 | 167 | 142 | 165 | 125 | 321 | 215 | 6,331 | 1,492 | 2,619 | 20 |
| | Onion | 2,918 | 7 | 38 | 117 | 969 | 527 | 34 | 283 | 324 | 275 | 321 | 4 | 10 | 7 | 0 | 0 | 0 | 0 |
| | Tomatoes | 1,143 | 0 | 0 | 13 | 358 | 31 | 67 | 120 | 137 | 117 | 136 | 17 | 42 | 28 | 16 | 0 | 50 | 10 |
| | Eggplant | 111 | 0 | 0 | 3 | 27 | 0 | 0 | 1/ | 20 | 1/ | 19 | 1 | 3 | 2 | 0 | 0 | 3 | 0 |
| | Green beans | 64 | 0 | 0 | 2 | 0 | 3 | 0 | 2 | 2 | 2 | 2 | 4 | 9 | 6 | 0 | 4 | 29 | 0 |
| 4/85 | Garlic | 31 | 0 | 0 | 0 | 28 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 |
| 138 | Other vegetables | 2,254 | 0 | 3 | 16 | 665 | 231 | 1 | 206 | 236 | 200 | 234 | 83 | 212 | 142 | 18 | 0 | 5 | 3 |
| 900 | tuber vegetables | 1,748 | 57 | 203 | 10 520 | 2 196 | 196 | 1312 | 1 391 | 1 591 | 1 352 | 58 1 5 7 6 | 61 126 | 156 | 104 216 | 40 | 392 | 4 | 280 |
| 0/2(| rainfed Alfalfa | 324 | 0 | 0 | 0 | 2,150 | 0 | 0 | 0 | 0 | 1,552 | 1,570 | 0 | 0 | 0 | 119 | 90 | 115 | 0 |
| 5 - 1 | Clover | 3,681 | 25 | 129 | 157 | 1,305 | 878 | 0 | 69 | 79 | 67 | 78 | 36 | 92 | 62 | 398 | 119 | 158 | 30 |
| 200 | Sainfoin Bainfod coinfoin | 10,034 | 0 | 0 | 15 | 94 | 0 | 0 | 0 | 0 | 0 | 0 | 101 | 260 | 174 | 5,813 | 970 | 2,600 | 8 |
| 10/ | Forage sorghum | 101 | 1 | 4 | 15 | 6 | 0 | 75 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | /8 | 180 | 0 |
| | Grain sorghum | 25 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 4 | 3 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 10 |
| | Maize forage | 11,792 | 2 | 13 | 654 | 1,248 | 348 | 2,411 | 1,528 | 1,748 | 1,485 | 1,732 | 26 | 66 | 44 | 68 | 4 | 14 | 400 |
| | Turnip and fodder beet | 484 | 0 | 2 | 21 | 276 | 0 | 224 | 56 | 64 20 | 54 | 63 19 | 23 | 0 59 | 0 39 | 0 | 246 | 400 | 20 |
| | Sunflower | 775 | 2 | 8 | 348 | 2,0 | 75 | 188 | 36 | 41 | 35 | 41 | 0 | 0 | 0 | 0 | 240 | 400 | 0 |
| | Sesame | 68 | 0 | 2 | 6 | 5 | 10 | 19 | 5 | 6 | 5 | 6 | 0 | 0 | 0 | 0 | 0 | 0 | 4 |
| | Safflower | 1,062 | 0 | 0 | 115 | 8 | 206 | 38 | 160 | 183 | 156 | 182 | 0 | 0 | 0 | 0 | 0 | 0 | 15 |
| | Canola Sugar beet | 1,392 | 6 1 | 34 | 50 111 | 85 | 62 99 | 70 1 436 | 258 | 54 295 | 46 250 | 54 292 | 19 | 48 9 | 32 | 518 | 90 | 150 | 2/ |
| | Tobacco | 64 | 0 | 0 | 0 | 49 | 0 | 1,150 | 3 | 4 | 3 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Cotton | 2,292 | 0 | 0 | 17 | 0 | 14 | 31 | 515 | 589 | 501 | 584 | 0 | 0 | 0 | 0 | 0 | 0 | 42 |
| | Madder | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Saffron | 1,989 | 9 | 46 | 310 | 22 | 5 | 1,118 | 69 | 79 | 6/ | /8 | 3 | 14 | 9 | 12 | 0 | 22 | /5 |
| | Cumin | 847 | 0 | 0 | 217 | 0 | 480 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 150 |
| | black cumin | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Cannabis | 497 | 0 | 0 | 152 | 0 | 343 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 |
| | Other products | 283 | 0 | 0 | 31 | 15 28 | 69 0 | 19 | 5 | ь 2 | 5 | 6 2 | 24 | о1 4 | 41 | 0 | 0 | 2 | 35 |
| | Sum of irrigated | 206,347 | 770 | 3,997 | 13,976 | 23,692 | 17,368 | 23,044 | 14,916 | 17,065 | 14,496 | 16,909 | 1,370 | 3,523 | 2,357 | 24,896 | 6,237 | 12,381 | 9,351 |
| | Sum of rainfed | 20,138 | 11 | 59 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 222 | 571 | 382 | 6,130 | 3,558 | 9,205 | 0 |
| | Area of fallow irrigation | 57,539 | 369 | 1,918 302 | 6,441 0 | 3,396 ი | 8,117 0 | 10,365 n | 451 0 | 516 0 | 438 0 | 511 0 | 708 | 1,820 | 1,218 0 | 10,488 1 981 | 1,751 | 5,670 9.165 | 3,363 ი |

Table 21: Cultivated areas of farmland (ha) and appropriate products of irrigation networks and counties within the Zayandeh Rud Basin, agricultural Iranian year 1384-85



| Year | Cultivated areas | um inside catchment area :urface water + other :sources) | enjanat up | enjanat down | lobarake h-Mahyar-Jarguye h Mahyar total) | ekouabad left | ekouabad right | orkhar | bshar left | bshar right | oodasht North | oodasht South | skaran/ Karvan up Morghab oring (Kordolia) | arvan upstream Khamiran | arvan downstream Khamiran | aridan | ereydoonshahr | hadegan | ehaghan |
|-------|---------------------------------|--|------------|-----------------|--|---------------|----------------|-------------------|------------|-------------|-------------------|-------------------|---|-------------------------|---------------------------|--------------|---------------|---------|-------------------|
| | Products Vheat | <u> </u> | تت 152 | <u>ت</u> 788 | ≥ <u></u> 5.038 | Ž 4.290 | 2 2.768 | <u>8</u> 9.912 | ₹ 7.125 | ₹ 8.152 | <u>~</u> 6.924 | <u>∞</u> 8.077 | ਵੱਖ 440 | <u>¥</u> 1.133 | <u>¥</u> 758 | <u>6.052</u> | <u> </u> | 2,500 | <u>م</u> 2.900 |
| | Rainfed wheat | 8,135 | 2 | 9 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 46 | 118 | 79 | 2,389 | 1,492 | 4,000 | 0 |
| | Barley | 22,828 | 128 | 666 | 3,265 | 1,862 | 2,901 | 2,428 | 1,205 | 1,379 | 1,171 | 1,366 | 182 | 467 | 313 | 1,672 | 671 | 1,100 | 2,050 |
| | Rainfed barley | 6,352 | 3 | 14 | 1 107 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 83 | 212 | 142 | 1,593 | 806 | 3,500 | 0 |
| | Corn | 2,122 | 505 | 1,987 | 35 | 0,040 | 4,602 | 654 | 326 | 370 | 484 317 | 370 | 0 | 0 | 52 | 0 | 0 | 0 | 0 |
| | Millet | 1,365 | 10 | 50 | 287 | 25 | 411 | 1 | 129 | 147 | 125 | 146 | 4 | 9 | 6 | 0 | 0 | 0 | 15 |
| | Pease | 588 | 4 | 20 | 37 | 0 | 25 | 0 | 3 | 4 | 3 | 4 | 16 | 42 | 28 | 175 | 45 | 32 | 150 |
| | Fedraind pease | 382 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 48 | 123 | 82 | 0 | 114 | 15 | 2 05 2 |
| | Lentil | 456 | 23 | 127 | 32 | 9 | 54 | 0 | 9 | 10 | 9 | 10 | 4 | 9 | 6 | 205 | 41 | 19 | 2,055 |
| | Rainfed lentils | 509 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 35 | 157 | 317 | 0 |
| | Vetch | 413 | 16 | 86 | 76 | 1 | 171 | 0 | 0 | 0 | 0 | 0 | 6 | 15 | 10 | 0 | 0 | 0 | 30 |
| | Watermelon | 796 | 5 | 29 | 109 | 47 | 211 | 300 | 5 | 6 35 | 5 30 | 6 35 | 12 | 30 21 | 20 14 | 0 | 0 | 0 | 10 20 |
| | Cantaloupe | 577 | 0 | 0 | 71 | 0 | 0 | 36 | 107 | 123 | 104 | 121 | 0 | 0 | 14 | 0 | 0 | 0 | 15 |
| | Cucumber | 1,001 | 6 | 34 | 11 | 247 | 97 | 11 | 49 | 57 | 48 | 56 | 13 | 34 | 23 | 37 | 82 | 186 | 10 |
| | Squash variety | 17 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 2 | 2 | 0 | 0 | 11 | 0 |
| | Potato | 14,543 | 10 12 | 52 | 32 | 1,763 | 553 1 076 | 617 | 131 | 150 638 | 128 542 | 149 632 | 100 | 258 | 173 | 6,697 0 | 1,367 | 2,330 | 33 |
| | Tomatoes | 1,006 | 2 | 12 | 19 | 233 | 44 | 43 | 112 | 128 | 108 | 127 | 17 | 43 | 29 | 11 | 0 | 67 | 10 |
| | Eggplant | 107 | 0 | 1 | 8 | 75 | 1 | 0 | 4 | 5 | 4 | 5 | 1 | 2 | 2 | 0 | 0 | 0 | 0 |
| () | Bean Groon boons | 12 | 0 | 0 | 0 | 8 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 5/8(| Green beans | 128 | 0 | 1 | 2 | 0 | 3 | 0 | 2 | 2 | 2 | 2 | 4 | 9 | 0 | 0 | 25 | /1 | 0 |
| (138 | Other vegetables | 2,474 | 2 | 12 | 38 | 783 | 313 | 1 | 211 | 242 | 205 | 239 | 75 | 193 | 129 | 19 | 0 | 5 | 5 |
| 007 | tuber vegetables | 2,434 | 2 | 8 | 58 | 1,021 | 430 | 75 | 120 | 137 | 117 | 136 | 55 | 142 | 95 | 32 | 0 | 5 | 0 |
| 10/2 | Alfalfa | 17,791 | 39 | 202 | 735 | 2,370 | 966 | 1,430 | 1,823 | 2,086 | 1,772 | 2,067 | 207 | 532 | 356 | 1,132 | 641 177 | 1,134 | 300 |
| 6 - 3 | Clover | 3,862 | 88 | 454 | 69 | 1,501 | 800 | 0 | 40 | 46 | 39 | 46 | 31 | 81 | 54 | 321 | 110 | 164 | 17 |
| /200 | Sainfoin | 7,226 | 1 | 7 | 10 | 94 | 0 | 0 | 0 | 0 | 0 | 0 | 93 | 238 | 159 | 3,823 | 821 | 1,973 | 8 |
| 10 | Rainfed sainfoin | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Forage sorgnum Grain sorghum | 26 | 0 | 0 | 25 | 0 | 0 | 28 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 10 |
| | Maize forage | 14,021 | 4 | 20 | 659 | 1,098 | 334 | 2,140 | 2,023 | 2,314 | 1,966 | 2,293 | 115 | 297 | 199 | 44 | 4 | 13 | 500 |
| | Turnip and fodder beet | 1,000 | 1 | 6 | 144 | 1 | 0 | 197 | 153 | 175 | 149 | 174 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Other forage | 901 | 3 | 14 | 57 | 4 | 14 | 112 | 0 | 0 | 0 | 0 | 5 | 13 | 9 | 139 | 412 | 89 | 32 |
| | Sesame | 61 | 0 | 2 | 8 | 0 | 14 | 17 | 43 | 43 | 42 | 43 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| | Safflower | 1,521 | 0 | 2 | 69 | 0 | 100 | 32 | 307 | 351 | 298 | 348 | 0 | 0 | 0 | 0 | 0 | 0 | 15 |
| | Canola | 1,810 | 5 | 26 | 138 | 114 | 98 | 138 | 34 | 39 | 33 | 39 | 22 | 57 | 38 | 717 | 90 | 195 | 27 |
| | Sugar beet | 1,983 | 0 | 0 | 39 | 0 42 | 21 | 638 | 242 | 277 | 235 | 274 | 1 | 3 | 2 | 251 | 0 | 0 | 0 |
| | Cotton | 2,822 | 0 | 0 | 19 | 0 | 14 | 48 | 638 | 730 | 620 | 723 | 0 | 0 | 0 | 0 | 0 | 0 | 30 |
| | Madder | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Sunflower nuts | 2,287 | 7 | 38 | 235 | 10 | 53 | 1,087 | 185 | 212 | 180 | 210 | 0 | 0 | 0 | 0 | 0 | 0 | 70 |
| | Sattron | 613 | 0 | 0 | 185 | 0 | 411 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 15 |
| | Cannabis | 389 | 0 | 0 | 120 | 0 | 270 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Seed products | 247 | 2 | 8 | 73 | 18 | 52 | 0 | 6 | 7 | 6 | 7 | 13 | 34 | 22 | 0 | 0 | 0 | 0 |
| | Other products | 174 | 0 | 4 75 9 | 12 680 | 30 | 16.924 | 20 5 20 | 16 141 | 19 465 | 15 696 | 19 207 | 1 504 | 2 966 | 2 5 9 7 | 21 709 | 6.092 | 10.265 | 48 8 46 9 |
| | Sum of rainfed | 15,572 | 5 | 4,758 | 15,080 | 22,721 | 10,034 | 20,530 | 10,141 | 10,400 0 | 13,080 | 10,297 | 1,504 | 454 | 2,587 | 4,017 | 2,746 | 7,846 | 0,408 0 |
| | Area of fallow irrigation | 65,429 | 339 | 1,761 | 6,640 | 4,331 | 8,389 | 12,412 | 189 | 216 | 184 | 214 | 855 | 2,198 | 1,471 | 12,423 | 1,902 | 7,670 | 4,235 |
| | Area of fallow rainfed | 14,170 | 65 | 335 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 777 | 1 1 9 4 | 9 800 | 0 |

Table 22: Cultivated areas of farmland (ha) and appropriate products of irrigation networks and counties within the Zayandeh Rud Basin, agricultural Iranian year 1385-86



| Year | Cultivated areas | Sum inside catchment area (surface water + other resources) | Lenjanat up | Lenjanat down | Mobarakeh-Mahyar-Jarguyeh (Mahyar total) | Nekouabad left | Nekouabad right | Borkhar | Abshar left | Abshar right | Roodasht North | Roodasht South | Askaran/ Karvan up Morghab spring (Kordolia) | Karvan upstream Khamiran | Karvan downstream Khamiran | Faridan | Fereydoonshahr | Chadegan | Dehaghan |
|-------|----------------------------|---|-------------|---------------|--|----------------|-----------------|------------|-------------|--------------|----------------|----------------|---|--------------------------|----------------------------|-----------------|----------------|-----------------|------------|
| | Wheat | 47,614 | 150 | 780 | 3,389 | 3,101 | 2,214 | 3,752 | 4,722 | 5,402 | 4,588 | 5,352 | 394 | 1,012 | 677 | 6,291 | 1,790 | 2,500 | 1,500 |
| | Rainfed wheat | 11,656 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3,162 | 3,323 | 5,171 | 0 |
| | Barley Rainfed barley | 20,264 | 152 | /91 | 2,967 | 1,804 | 2,/3/ | 984 | 1,128 | 1,291 | 1,096 | 1,279 | 240 | 618 | 413 | 1,752 | 841 1 347 | 1,100 | 1,070 |
| | Rice (paddy) | 12,166 | 323 | 1,677 | 768 | 4,511 | 3,499 | 2 | 326 | 373 | 317 | 370 | 0 | 0 | 0 | 0 | 0 | 1,0.15 | 0 |
| | Corn | 1,268 | 0 | 0 | 31 | 0 | 0 | 30 | 284 | 325 | 276 | 322 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Millet | 1,082 | 8 | 42 | 232 | 0 | 348 | 15 | 103 | 118 | 100 | 117 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Pease Fedraind pease | 223 | 0 | 1 | 31 | 0 | 32 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 40 | 0 172 | 15 | 60 0 |
| | Beans | 1,472 | 25 | 129 | 61 | 0 | 12 | 0 | 1 | 1 | 1 | 1 | 27 | 68 | 46 | 223 | 127 | 450 | 300 |
| | Lentil | 114 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 64 | 0 | 37 | 13 |
| | Rainfed lentils | 509 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 290 | 219 | 0 |
| | Vetch Watermelon | 126 | 6 | 29 44 | 16 | 13 | 44 174 | 77 | 2 | 2 | 2 | 2 | 2 | 4 14 | 3 | 0 | 0 | 0 | 0 |
| | Melon | 573 | 0 | 2 | 21 | 0 | 3 | 381 | 39 | 45 | 38 | 44 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Cantaloupe | 225 | 0 | 0 | 39 | 0 | 0 | 3 | 43 | 49 | 42 | 49 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Cucumber | 777 | 5 | 28 | 8 | 207 | 88 | 0 | 29 | 33 | 28 | 33 | 8 | 20 | 14 | 7 | 0 | 254 | 15 |
| | Potato | 14,749 | 13 | 69 | 10 | 1.755 | 491 | 2 | 325 | 372 | 316 | 368 | 88 | 225 | 151 | 6.554 | 1.232 | 2,760 | 19 |
| | Onion | 3,212 | 11 | 55 | 237 | 740 | 823 | 4 | 309 | 354 | 300 | 350 | 6 | 14 | 9 | 0 | 0 | 0 | 0 |
| | Tomatoes | 957 | 2 | 10 | 16 | 172 | 39 | 10 | 156 | 178 | 151 | 177 | 3 | 9 | 6 | 9 | 0 | 15 | 5 |
| | Eggplant | 88 | 0 | 1 | 4 | 46 | 0 | 0 | 9 | 10 | 9 | 10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| /87) | Green beans | 235 | 0 | 0 | 0 | 40 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 195 | 0 |
| 1386 | Garlic | 3 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 08 (1 | Other vegetables | 3,763 | 3 | 14 | 84 | 2,022 | 819 | 47 | 91 | 104 | 89 | 103 | 68 | 176 | 118 | 16 | 0 | 4 | 5 |
| /20 | Alfalfa rainfed Alfalfa | 14,575 | 38 | 199 | 520 | 1,769 | /// | 592 | 1,440 | 1,648 | 1,400 | 1,633 | 1// | 455 | 304 | 1,672 | 844 | 967 | 141 |
| - 10 | Clover | 3,067 | 48 | 249 | 36 | 1,466 | 745 | 0 | 26 | 29 | 25 | 29 | 13 | 34 | 22 | 182 | 65 | 99 | 0 |
| 001 | Sainfoin | 5,426 | 0 | 0 | 0 | 66 | 0 | 0 | 0 | 0 | 0 | 0 | 61 | 156 | 104 | 2,787 | 709 | 1,544 | 0 |
| 10/2 | Rainfed sainfoin | 107 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 7 | 100 | 0 |
| | Grain sorghum | 2/8 | 2 | 15 | 157 | 9 | 25 | 0 | 10 | 12 | 10 | 12 | 4 | 9 | 0 | 4 | 0 | 0 | 0 |
| | Maize forage | 9,023 | 15 | 80 | 827 | 1,130 | 356 | 1,868 | 889 | 1,017 | 864 | 1,008 | 88 | 227 | 152 | 64 | 4 | 57 | 378 |
| | Turnip and fodder beet | 512 | 0 | 1 | 22 | 0 | 0 | 19 | 110 | 126 | 107 | 125 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Other forage | 433 | 0 | 0 | 61 215 | 70 | 23 | 0 | 6 | 7 | 6 | 7 | 2 | 6 | 4 | 40 | 127 | 74 | 0 |
| | Sesame | 120 | 0 | 1 | 215 | 0 | 51 | 0 | 6 | 7 | 6 | 7 | 0 | 0 | 0 | 0 | 0 | 0 | 13 |
| | Safflower | 560 | 0 | 0 | 44 | 0 | 89 | 112 | 74 | 84 | 72 | 84 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| | Canola | 1,182 | 1 | 5 | 0 | 26 | 14 | 0 | 20 | 23 | 19 | 22 | 15 | 38 | 25 | 757 | 67 | 150 | 0 |
| | Sugar beet | 224 | 0 | 0 | 0 | 0 30 | 0 | 93 | 14 | 16 | 13 | 16 | 0 | 0 | 0 | 72 | 0 | 0 | 0 |
| | Cotton | 2,301 | 0 | 0 | 11 | 0 | 0 | 3 | 537 | 615 | 522 | 609 | 0 | 0 | 0 | 0 | o | 0 | 4 |
| | Madder | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Sunflower nuts | 720 | 0 | 2 | 178 | 0 | 29 | 300 | 49 | 56 | 47 | 55 | 0 | 0 | 0 | 0 | 0 | 0 | 3 |
| | Sattron | 103 | 0 | 0 | 2 30 | 42 | 5 69 | 1 | 4 | 4 | 4 | 4 | 5 | 12 | 8 0 | 8 | 0 | 2 | 2 |
| | Cannabis | 18 | 0 | 0 | 5 | 0 | 12 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Seed products | 581 | 0 | 0 | 100 | 30 | 208 | 0 | 35 | 40 | 34 | 39 | 18 | 45 | 30 | 0 | 0 | 2 | 0 |
| | Other products | 97 | 1 | 4 22 4 | 74 | 10.042 | 12 75 2 | 0 | 10.904 | 12 261 | 3 | 12.249 | 1 224 | 2 140 | 2 105 | 20.541 | 0 | 10 225 | 2 5 2 2 |
| | Sum of irrigated | 148,948 | 814 0 | 4,224 N | 10,315 N | 19,048 N | 13,/53 N | 8,301 N | 10,804 N | 12,361 N | 10,500 | 12,248 N | 1,224 0 | 3,146 N | 2,105 | 20,541 3.518 | 5,809 5.229 | 10,225 6.553 | 3,533 N |
| | Area of fallow irrigation | 98,989 | 436 | 2,264 | 9,966 | 7,908 | 11,396 | 5,247 | 5,494 | 6,286 | 5,339 | 6,228 | 1,120 | 2,878 | 1,926 | 13,538 | 2,163 | 7,700 | 9,100 |
| | Area of fallow rainfed | 14,374 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 202 | 519 | 347 | 3,106 | 0 | 10.200 | 0 |

Table 23: Cultivated areas of farmland (ha) and appropriate products of irrigation networks and counties within the Zayandeh Rud Basin, agricultural Iranian year 1386-87



| View View <th< th=""><th>Year</th><th>Cultivated areas</th><th>atchment area er + other</th><th></th><th>Ę</th><th>Mahyar-Jarguyeh I)</th><th>eft</th><th>ight</th><th></th><th></th><th></th><th>ŧ</th><th>ŧ</th><th>van up Morghab ilia)</th><th>eam Khamiran</th><th>stream Khamiran</th><th></th><th>ahr</th><th></th><th></th></th<> | Year | Cultivated areas | atchment area er + other | | Ę | Mahyar-Jarguyeh I) | eft | ight | | | | ŧ | ŧ | van up Morghab ilia) | eam Khamiran | stream Khamiran | | ahr | | |
|---|------|---------------------------|--|-------------|--------------|-----------------------------|-------------|-------------|---------|-------------|--------------|-------------|-------------|-------------------------------|--------------|-----------------|---------|-------------|----------|----------|
| Weat 99.08 145 75 3.08 2.11 4.48 2.57 2.946 2.50 2.94 2.50 2.95 1.55 5.77 1.716 2.900 2.33 Bairdy 19.551 149 775 2.905 1.715 3.064 1.900 1.31 3.86 773 1.81 3.86 2.13 3.86 713 3.66 1.33 3.86 2.13 3.86 713 3.66 7.30 80 713 1.81 3.86 71 1.71 1.000 1.77 Rainfed barky 7.799 3.07 1.93 6.37 2.31 2.28 1.31 1.37 1.57 2.30 | | Products | Sum inside ci (surface watt resources) | Lenjanat up | Lenjanat dov | Mobarakeh-l (Mahyar tot | Nekouabad I | Nekouabad ı | Borkhar | Abshar left | Abshar right | Roodasht No | Roodasht So | Askaran/ Kaı spring (Korde | Karvan upstr | Karvan dowr | Faridan | Fereydoonsh | Chadegan | Dehaghan |
| Barley 19,42 0 0 0 0 92 22.8 1.58 3.066 1.78 1.44 582 68 1.596 67.1 1.000 1.77 Barley 1.66 1.799 307 1.293 637 2.48 1.59 637 3.84 751 756 1.66 1.596 671 1.000 1.77 Milet 93 84 2.44 1.202 2.31 1.55 0 | | Wheat | 39,808 | 145 | 755 | 3,253 | 3,086 | 2,115 | 4,485 | 2,575 | 2,946 | 2,503 | 2,919 | 404 | 1,038 | 695 | 5,973 | 1,716 | 2,900 | 2,300 |
| Next of a barling 12:0:14 1:0 | | Rainfed wheat | 9,742 | 0 | 0 775 | 2 905 | 1 715 | 2 064 | 1 960 | 0 | 0 | 0 751 | 0 976 | 92 | 236 | 158 | 3,066 | 1,790 | 4,400 | 1 772 |
| Vector 7.999 307 1.593 6.37 2.314 2.02 2.211 1.957 1.933 1.503 0 | | Rainfed barley | 4,144 | 2 | 10 | 2,505 | 1,/15 | 3,004 | 1,500 | 0 | 0 | 0 | 0 | 143 | 47 | 32 | 363 | 671 | 3,000 | 1,772 |
| Com 617 0 0 31 137 137 157 133 156 0 | | Rice (paddy) | 7,999 | 307 | 1,593 | 637 | 2,314 | 2,288 | 1 | 202 | 231 | 196 | 229 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Milet 943 8 42 194 0 263 14 50 55 15 1 <th1< th=""> <th1< th=""> 1 <</th1<></th1<> | | Corn | 617 | 0 | 0 | 3 | 0 | 0 | 31 | 137 | 157 | 133 | 156 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Perse 113 0 0 1 0 0 0 0 0 0 0 3 7 4 32 7 4 33 7 4 33 7 44 | | Millet | 943 | 8 | 42 | 194 | 0 | 263 | 14 | 52 | 59 | 50 | 58 | 1 | 1 | 1 | 0 | 0 | 0 | 200 |
| Bean 1.066 0< | | Pease Fodmind poase | 115 | 0 | 0 | 21 | 0 | 24 | 0 | 0 | 0 | 0 | 0 | 3 | 7 | 4 | 32 | 0 | 20 | 5 |
| Verti 1 <th></th> <th>Beans</th> <th>1.066</th> <th>0</th> <th>0</th> <th>63</th> <th>0</th> <th>27</th> <th>0</th> <th>3</th> <th>3</th> <th>3</th> <th>3</th> <th>8</th> <th>20</th> <th>13</th> <th>21</th> <th>186</th> <th>220</th> <th>236</th> | | Beans | 1.066 | 0 | 0 | 63 | 0 | 27 | 0 | 3 | 3 | 3 | 3 | 8 | 20 | 13 | 21 | 186 | 220 | 236 |
| Vech 100 5 25 13 41 0 | | Lentil | 141 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 2 | 2 | 40 | 75 | 20 | 0 |
| Vetch 100 5 25 15 13 41 0 <th< th=""><th></th><th>Rainfed lentils</th><th>539</th><th>0</th><th>0</th><th>0</th><th>0</th><th>0</th><th>0</th><th>0</th><th>0</th><th>0</th><th>0</th><th>4</th><th>9</th><th>6</th><th>20</th><th>149</th><th>350</th><th>0</th></th<> | | Rainfed lentils | 539 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 9 | 6 | 20 | 149 | 350 | 0 |
| Vertermetion Table 10 52 13 53 62 2 2 2 2 0 | | Vetch | 100 | 5 | 25 | 15 | 13 | 41 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Network 122 0 0 12 13 <th< th=""><th></th><th>Watermelon</th><th>189</th><th>10</th><th>52</th><th>19</th><th>5</th><th>33</th><th>62</th><th>2</th><th>2</th><th>12</th><th>15</th><th>0</th><th>0</th><th>0</th><th>0</th><th>0</th><th>0</th><th>0</th></th<> | | Watermelon | 189 | 10 | 52 | 19 | 5 | 33 | 62 | 2 | 2 | 12 | 15 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Very 870 4 22 2 150 56 5 97 111 94 110 2 5 3 9 4 198 Pota 13078 6 80 0 0 11 100 121 131 1307 1317 1317 131 131 132 25 3 9 4 198 Onion 2,483 6 29 138 602 524 7 275 314 267 311 2 5 3 0 | | Cantaloupe | 200 | 0 | 0 | 20 59 | 2 | 0 | 307 | 32 | 37 | 31 | 37 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Squash variety Potato 47 0 0 28 0 0 0 4 5 4 5 0 | | Cucumber | 870 | 4 | 22 | 2 | 150 | 56 | 5 | 97 | 111 | 94 | 110 | 2 | 5 | 3 | 9 | 4 | 198 | 0 |
| Portato 13078 16 80 14 1.484 542 1 106 121 103 120 59 151 101 5.973 1,117 2,350 7 Tomatoes 1,025 2 11 13 153 28 85 166 190 161 188 3 7 4 9 0 < | | Squash variety | 47 | 0 | 0 | 28 | 0 | 0 | 0 | 4 | 5 | 4 | 5 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| Onion 2.483 b 2 3 0 | | Potato | 13,078 | 16 | 80 | 14 | 1,848 | 542 | 1 | 106 | 121 | 103 | 120 | 59 | 151 | 101 | 5,973 | 1,417 | 2,350 | 75 |
| Structure 1,20 1 <t< th=""><th></th><th>Union</th><th>2,483</th><th>6 2</th><th>29</th><th>138</th><th>602 153</th><th>524</th><th>/</th><th>275</th><th>314</th><th>267</th><th>311 188</th><th>2</th><th>5</th><th>3</th><th>0</th><th>0</th><th>0</th><th>2</th></t<> | | Union | 2,483 | 6 2 | 29 | 138 | 602 153 | 524 | / | 275 | 314 | 267 | 311 188 | 2 | 5 | 3 | 0 | 0 | 0 | 2 |
| Ben 4 0 0 3 1 0 | | Eggplant | 1,023 | 0 | 1 | 5 | 50 | 0 | 0 | 100 | 130 | 101 | 100 | 2 | 5 | 3 | 0 | 0 | 0 | 0 |
| Seed Gricen beans 106 0 0 0 2 2 2 2 2 3 8 5 0 0 62 Garic 11 0 1 0 9 0 <th>(8</th> <th>Bean</th> <th>4</th> <th>0</th> <th>0</th> <th>0</th> <th>3</th> <th>1</th> <th>0</th> | (8 | Bean | 4 | 0 | 0 | 0 | 3 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Seric 11 0 1 0 9 0 <th>7/8</th> <th>Green beans</th> <th>106</th> <th>0</th> <th>0</th> <th>0</th> <th>20</th> <th>0</th> <th>0</th> <th>2</th> <th>2</th> <th>2</th> <th>2</th> <th>3</th> <th>8</th> <th>5</th> <th>0</th> <th>0</th> <th>62</th> <th>0</th> | 7/8 | Green beans | 106 | 0 | 0 | 0 | 20 | 0 | 0 | 2 | 2 | 2 | 2 | 3 | 8 | 5 | 0 | 0 | 62 | 0 |
| Other vegetables 5,127 1 6 7.0 1.43 416 53 1.22 1.44 1.72 53 1.35 1.22 1.431 1.23 317 1.22 1.431 1.23 317 1.24 1.431 1.23 317 1.24 1.000 20 | (138 | Garlic | 2 127 | 0 | 1 | 0 | 9 | 0 | 0 | 152 | 174 | 0 | 172 | 0 | 0 | 156 | 0 | 0 | 0 | 0 |
| View Instructed Alfalfa Instruced Alfalfa Instructed Alfalfa <th>600</th> <th>Alfalfa</th> <th>13,217</th> <th>32</th> <th>168</th> <th>494</th> <th>1,455</th> <th>625</th> <th>585</th> <th>1.262</th> <th>1.444</th> <th>1.227</th> <th>1.431</th> <th>123</th> <th>255</th> <th>212</th> <th>1.870</th> <th>618</th> <th>1.000</th> <th>200</th> | 600 | Alfalfa | 13,217 | 32 | 168 | 494 | 1,455 | 625 | 585 | 1.262 | 1.444 | 1.227 | 1.431 | 123 | 255 | 212 | 1.870 | 618 | 1.000 | 200 |
| Ver 2,134 39 201 24 914 482 0 17 20 17 19 18 47 32 159 45 99 Sainfoin 5,328 1 4 3 66 0 0 0 0 55 142 95 2,787 671 1,500 85 Forage sorghum 110 1 6 61 6 0 34 0 < | 0/2(| rainfed Alfalfa | 222 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | _, | 0 | 0 | 0 | 104 | 73 | 45 | 0 |
| Šč Sainfoin 5,328 1 4 3 66 0 0 0 0 0 0 0 55 142 95 2,787 671 1,500 Forage sorghum 110 1 6 61 6 0 34 0 </th <th>8-1</th> <th>Clover</th> <th>2,134</th> <th>39</th> <th>201</th> <th>24</th> <th>914</th> <th>482</th> <th>0</th> <th>17</th> <th>20</th> <th>17</th> <th>19</th> <th>18</th> <th>47</th> <th>32</th> <th>159</th> <th>45</th> <th>99</th> <th>0</th> | 8-1 | Clover | 2,134 | 39 | 201 | 24 | 914 | 482 | 0 | 17 | 20 | 17 | 19 | 18 | 47 | 32 | 159 | 45 | 99 | 0 |
| F Rainfed samploin 229 0 | 200 | Sainfoin | 5,328 | 1 | 4 | 3 | 66 | 0 | 0 | 0 | 0 | 0 | 0 | 55 | 142 | 95 | 2,787 | 671 | 1,500 | 5 |
| Orage Sorghum 110 1 0 | 10/ | Rainted saintoin | 289 | 0 | 0 | 61 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 36 | 168 | 85 | 0 |
| Mail: Grage 7,123 5 23 716 653 233 1,587 687 786 667 779 82 210 141 19 15 70 35 Turnip and fodder beet 243 0 1 333 0 0 22 44 50 43 50 | | Grain sorghum | 0 | 0 | 0 | 01 | 0 | 0 | 0 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Turnip and fodder beet 243 0 1 33 0 0 22 44 50 43 50 0 <th< th=""><th></th><th>Maize forage</th><th>7,123</th><th>5</th><th>23</th><th>716</th><th>653</th><th>233</th><th>1,587</th><th>687</th><th>786</th><th>667</th><th>779</th><th>82</th><th>210</th><th>141</th><th>119</th><th>15</th><th>70</th><th>350</th></th<> | | Maize forage | 7,123 | 5 | 23 | 716 | 653 | 233 | 1,587 | 687 | 786 | 667 | 779 | 82 | 210 | 141 | 119 | 15 | 70 | 350 |
| Other forage 296 0 0 27 80 3 0 2 2 2 2 2 14 9 12 97 43 Sufflower 108 3 77 0 77 0 7 9 0 < | | Turnip and fodder beet | 243 | 0 | 1 | 33 | 0 | 0 | 22 | 44 | 50 | 43 | 50 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Sundwer 108 3 17 71 0 7 9 0 <th< th=""><th></th><th>Other forage</th><th>296</th><th>0</th><th>0</th><th>27</th><th>80</th><th>3</th><th>0</th><th>2</th><th>2</th><th>2</th><th>2</th><th>5</th><th>14</th><th>9</th><th>12</th><th>97</th><th>43</th><th>0</th></th<> | | Other forage | 296 | 0 | 0 | 27 | 80 | 3 | 0 | 2 | 2 | 2 | 2 | 5 | 14 | 9 | 12 | 97 | 43 | 0 |
| Safflower 337 0 0 0 6 5 0 10 52 59 50 58 0 0 0 0 0 0 Canola 397 1 4 1 3 1 9 7 8 7 8 1 3 2 207 45 90 Sugar beet 415 0 0 1 0 0 209 26 29 25 29 0 0 0 82 0 10 0 209 26 29 25 29 0 <th></th> <th>Sunflower</th> <th>108</th> <th>3</th> <th>1/</th> <th>/1</th> <th>0</th> <th>/</th> <th>9 19</th> <th>0</th> | | Sunflower | 108 | 3 | 1/ | /1 | 0 | / | 9 19 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Canola 397 1 4 1 3 1 9 7 8 7 8 1 3 2 207 45 90 Sugar beet 415 0 0 1 0 0 209 26 29 25 29 0 0 82 0 15 Tobacco 57 0 0 0 50 0 2 1 1 1 0 | | Safflower | 370 | 0 | 0 | 6 | 5 | 0 | 140 | 52 | 59 | 50 | 58 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Sugar beet 415 0 0 1 0 0 209 26 29 25 29 0 0 82 0 15 Tobacco 57 0 0 0 50 0 2 1 1 1 1 0 | | Canola | 397 | 1 | 4 | 1 | 3 | 1 | 9 | 7 | 8 | 7 | 8 | 1 | 3 | 2 | 207 | 45 | 90 | 0 |
| Tobacco 57 0 0 0 50 0 2 1 1 1 0 | | Sugar beet | 415 | 0 | 0 | 1 | 0 | 0 | 209 | 26 | 29 | 25 | 29 | 0 | 0 | 0 | 82 | 0 | 15 | 0 |
| Gottom 1,162 0 0 0 0 2 270 308 262 306 0 | | Tobacco | 57 | 0 | 0 | 0 | 50 | 0 | 2 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Sunflower nuts 625 0 0 186 0 41 296 24 27 23 27 0 <th></th> <th>Cotton</th> <th>1,102</th> <th>0</th> <th>0</th> <th>5</th> <th>0</th> <th>0</th> <th>2</th> <th>270</th> <th>308</th> <th>262</th> <th>306</th> <th>0</th> <th>0</th> <th>0</th> <th>0</th> <th>0</th> <th>0</th> <th>10</th> | | Cotton | 1,102 | 0 | 0 | 5 | 0 | 0 | 2 | 270 | 308 | 262 | 306 | 0 | 0 | 0 | 0 | 0 | 0 | 10 |
| Saffron 106 0 3 37 5 4 3 4 6 17 11 0 1 3 Cumin 120 0 0 37 0 82 0 | | Sunflower nuts | 625 | 0 | 0 | 186 | 0 | 41 | 296 | 24 | 27 | 23 | 27 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Cumin 120 0 037 0 82 0 | | Saffron | 106 | 0 | 0 | 3 | 37 | 5 | 4 | 3 | 4 | 3 | 4 | 6 | 17 | 11 | 0 | 1 | 3 | 5 |
| | | Cumin | 120 | 0 | 0 | 37 | 0 | 82 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Cannabis U 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | | Cannabis | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Seed products 202 0 | _ | Other products | 202 | 0 | 1 | ס/ א | 33 46 | 99 | 19 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 |
| Sum of irrigated 124,287 736 3,820 9,215 14,903 11,012 10,012 7,001 8,010 6,804 7,936 1,011 2,598 1,739 19,152 5,562 9,616 5,16 | | Sum of irrigated | 124,287 | 736 | 3,820 | 9,215 | 14,903 | 11,012 | 10,012 | 7,001 | 8,010 | 6,804 | 7,936 | 1,011 | 2,598 | 1,739 | 19,152 | 5,562 | 9,616 | 5,160 |
| Sum of rainfed 15,043 2 10 0 0 0 0 0 116 299 200 3,609 2,926 7,880 | | Sum of rainfed | 15,043 | 2 | 10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 116 | 299 | 200 | 3,609 | 2,926 | 7,880 | 0 |
| Area of fallow ringation 122,517 517 2,683 11,185 12,056 14,513 3,777 9,100 10,410 8,843 10,315 1,303 3,350 2,242 14,334 2,387 8,000 7,50 | | Area of fallow irrigation | 122,517 | 517 | 2,683 | 11,185 | 12,056 | 14,513 | 3,777 | 9,100 | 10,410 | 8,843 | 10,315 | 1,303 | 3,350 | 2,242 | 14,334 | 2,387 | 8,000 | 7,500 |

Table 24: Cultivated areas of farmland (ha) and appropriate products of irrigation networks and counties within the Zayandeh Rud Basin, agricultural Iranian year 1387-88



| Year | Cultivated areas | Sum inside catchment area (surface water + other resources) | Lenjanat up | Lenjanat down | Mobarakeh-Mahyar-Jarguyeh (Mahyar total) | Nekouabad left | Nekouabad right | Borkhar | Abshar left | Abshar right | Roodasht North | Roodasht South | Askaran/ Karvan up Morghab spring (Kordolia) | Karvan upstream Khamiran | Karvan downstream Khamiran | Faridan | Fereydoonsha hr | Chadegan | Dehaghan |
|-------|---|---|-------------|---------------|--|----------------|-----------------|-------------|-------------|--------------|----------------|----------------|---|--------------------------|----------------------------|----------------|-----------------|----------------|------------|
| | Wheat | 52,685 | 108 | 563 | 3,899 | 3,243 | 2,321 | 4,684 | 4,911 | 5,618 | 4,772 | 5,567 | 459 | 1,180 | 789 | 6,231 | 2,182 | 3,459 | 2,700 |
| | Rainfed wheat Barley | 9,742 21.648 | 0 106 | 0 550 | 0 3.200 | 0 2.050 | 0 2.686 | 0 1.869 | 0 1.150 | 0 1.316 | 0 1.118 | 0 1.304 | 92 147 | 236 378 | 158 253 | 3,066 1,593 | 1,790 889 | 4,400 1.000 | 0 2.040 |
| | Rainfed barley | 5,864 | 2 | 12 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 14 | 35 | 24 | 637 | 671 | 4,469 | 0 |
| | Rice (paddy) | 11,035 | 327 | 1,699 | 1,071 | 3,206 | 3,696 | 1 | 240 | 275 | 234 | 272 | 2 | 6 | 4 | 0 | 0 | 0 | 0 |
| | Millet | 1,046 | 3 | 14 | 305 | 5 | 549 | 61 | 45 24 | 27 | 23 | 40 | 0 | 0 | 0 | 0 | 0 | 0 | 8 |
| | Pease | 118 | 2 | 13 | 11 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 4 | 3 | 48 | 26 | 10 | 0 |
| | Fedraind pease | 164 | 0 | 0 17 | 0 | 0 | 0 21 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 40 100 | 112 | 12 | 200 |
| | Lentil | 137 | 1 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 24 | 0 | 40 | 75 | 19 | 200 |
| | Rainfed lentils | 803 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 80 | 373 | 350 | 0 |
| | Vetch | 81 | 8 | 39 | 2 | 17 | 13 | 0 213 | 0 10 | 0 11 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 |
| | Melon | 1,691 | 0 | 0 | 60 | 0 | 0 | 1,358 | 64 | 74 | 63 | 73 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Cantaloupe | 257 | 0 | 0 | 30 | 0 | 0 | 27 | 47 | 54 | 46 | 53 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Cucumber Cucumber (greenhous) | 873 | 1 | 5 | 2 | 146 0 | 51 | 0 | 83 | 95 | 81 | 95 | 0 | 0 | 0 | 22 | 9 | 283 | 0 62 |
| | Squash variety | 35 | 0 | 0 | 1 | 3 | 0 | 0 | 7 | 8 | 7 | 8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Potato | 10,709 | 16 | 83 | 25 | 1,437 | 397 | 1 | 120 | 137 | 117 | 136 | 37 | 96 | 64 | 4,718 | 1,211 | 2,100 | 13 |
| | Tomatoes | 2,624 | 1 | 39 5 | 23 | 172 | 520 | 5 98 | 295 | 338 108 | 287 | 335 107 | 1 | 2 | 2 | 44 | 0 | 5 | 2 |
| | Eggplant | 90 | 0 | 0 | 10 | 45 | 0 | 0 | 8 | 10 | 8 | 10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Broad bean Groon boans | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| (89) | Garlic | 3 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 4 | 0 | 0 | 0 | 0 |
| 1388 | Tomatoes (greenhouse) | 74 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 7 | 5 | 0 | 0 | 0 | 58 |
| 010 (| Eggplant (greenhouse) Bell Penner (greenhouse) | 11 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 2 | 2 | 0 | 0 | 0 | 6 |
| 0/2(| Other vegetables | 3,335 | 6 | 32 | 51 | 1,673 | 474 | 47 | 185 | 211 | 180 | 209 | 45 | 116 | 78 | 0 | 0 | 0 | 28 |
| 6 60 | Alfalfa | 13,093 | 56 | 290 | 538 | 1,770 | 716 | 566 | 1,194 | 1,366 | 1,160 | 1,354 | 110 | 283 | 189 | 1,633 | 671 | 996 | 200 |
| /200 | Clover | 1.793 | 26 | 133 | 21 | 851 | 349 | 0 | 12 | 13 | 11 | 13 | 10 | 26 | 18 | 104 | 73 | 45 134 | 0 |
| ä | Sainfoin | 4,430 | 0 | 0 | 0 | 11 | 0 | 0 | 0 | 0 | 0 | 0 | 85 | 219 | 147 | 2,071 | 597 | 1,300 | 0 |
| | Rainfed sainfoin | 289 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 36 | 168 | 85 | 0 |
| | Grain sorghum | 0 | 0 | 4 | 0 | 0 | 0 | 42 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Maize forage | 8,652 | 2 | 9 | 911 | 729 | 243 | 2,333 | 858 | 982 | 834 | 973 | 64 | 163 | 109 | 64 | 30 | 45 | 302 |
| | Turnip and fodder beet Other forage | 504 149 | 0 | 0 | 105 23 | 56 0 | 7 | 85 0 | 59 | 67 0 | 57 | 67 0 | 0 | 0 | 0 | 0 33 | 0 11 | 0 | 0 |
| | Sunflower | 209 | 4 | 21 | 141 | 1 | 10 | 9 | 5 | 6 | 5 | 6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Sesame | 115 | 0 | 0 | 7 | 2 | 10 | 75 | 5 | 6 | 5 | 6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Canola | 922 182 | 1 | 4 | 52 | 3 | 82 | 234 | 3 | 4 | 125 | 140 | 2 | 5 | 3 | 84 | 12 | 34 | 0 |
| | Sugar beet | 1,147 | 0 | 0 | 14 | 0 | 0 | 449 | 98 | 112 | 95 | 111 | 0 | 0 | 0 | 267 | 0 | 0 | 0 |
| | Tobacco | 88 1 803 | 0 | 0 | 0 | 50 | 0 | 37 | 0 422 | 0 | 0 410 | 0 178 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Madder | 1,803 | 0 | 0 | 0 | 0 | 0 | 0 | 422 | 482 | 410 | 478 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Sunflower nuts | 730 | 0 | 0 | 215 | 9 | 27 | 326 | 34 | 39 | 33 | 39 | 0 | 1 | 1 | 0 | 0 | 3 | 1 |
| | Saffron Cumin | 106 198 | 0 | 1 | 3 61 | 42 0 | 7 137 | 4 | 3 | 4 | 3 | 4 | 6 | 14 0 | 9 | 0 | 0 | 2 | 3 |
| | Cannabis | 4 | 0 | 0 | 1 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Seed products | 306 | 0 | 0 | 80 | 25 | 166 | 0 | 0 | 0 | 0 | 0 | 6 | 17 | 11 | 0 | 0 | 2 | 0 |
| | Other products Sum of irrigated | 95 143.500 | 0 679 | 0 3,526 | 54 11,190 | 36 16,231 | 2 12.550 | 3 12.583 | 0 10,113 | 0 11,569 | 0 9,828 | 0 11.463 | 0 996 | 0 2,561 | 0 1.714 | 0 17.195 | 0 5.932 | 0 9.743 | 0 5.624 |
| | Sum of rainfed | 17,083 | 2 | 12 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 106 | 271 | 182 | 3,962 | 3,188 | 9,361 | 0 |
| | Area of fallow irrigation | 103,304 | 574 | 2,977 | 9,210 | 10,729 | 12,976 | 1,206 | 5,988 | 6,851 | 5,819 | 6,788 | 1,317 | 3,387 | 2,267 | 16,291 | 2,016 | 7,873 | 7,036 |
| | Area of fallow rainted | 12,866 | U | 0 | 0 | 0 | 0 | 0 | 0 | U | 0 | 0 | 139 | 358 | 240 | 2,833 | 1,977 | 7,319 | 0 |

Table 25: Cultivated areas of farmland (ha) and appropriate products of irrigation networks and counties within the Zayandeh Rud Basin, agricultural Iranian year 1388-89



Appendix H: Cultivated areas of orchards (ha) for agricultural Iranian years 1380-81 to 1387-88

Table 26: Cultivated areas of orchards (ha) and appropriate products of irrigation networks and counties within the Zayandeh Rud Basin, agricultural Iranian year 1380-81

| Year | Cultivated areas | Sum inside catchment area (surface water + other resources) | Lenjanat up | Lenjanat down | Mobarakeh-Mahyar-Jarguyeh (Mahyar total) | Nekouabad left | Nekouabad right | Borkhar | Ab shar left | Abshar right | Roodasht No rth | Roodasht South | Askaran/ Karvan up Morghab spring (Kordolia) | Karvan upstream Khamiran | Karvan downstream Khamiran | Faridan | Ferey doonshahr | Chadegan | Dehaghan |
|------|------------------|---|-------------|---------------|--|----------------|-----------------|---------|--------------|--------------|-----------------|----------------|---|--------------------------|----------------------------|---------|-----------------|----------|----------|
| | Sour Cherry | 499 | 5 | 2 | 5 | 423 | 7 | 2 | 1 | 21 | 0 | 0 | 1 | 10 | 17 | 3 | 3 | 0 | 0 |
| | Cherry | 993 | 8 | 2 | 1 | 703 | 202 | 6 | 1 | 34 | 0 | 0 | 1 | 11 | 19 | 4 | 1 | 0 | 0 |
| | Tomato | 198 | 3 | 1 | 0 | 155 | 0 | 2 | 0 | 17 | 0 | 0 | 1 | 6 | 11 | 0 | 1 | 0 | 0 |
| | Plum | 215 | 9 | 3 | 0 | 139 | 2 | 6 | 0 | 17 | 0 | 0 | 1 | 12 | 22 | 0 | 3 | 0 | 0 |
| | Peach | 286 | 2 | 1 | 2 | 177 | 31 | 2 | 0 | 10 | 0 | 0 | 2 | 17 | 31 | 8 | 3 | 0 | 0 |
| | Nectarine 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Apricots 1 | 666 | 45 | 15 | 5 | 290 | 56 | 17 | 1 | 39 | 0 | 0 | 5 | 47 | 83 | 25 | 38 | 0 | 0 |
| ~ | Apricots 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 381 | Nectarine 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0-13 | Apples | 644 | 19 | 6 | 42 | 193 | 36 | 55 | 1 | 40 | 0 | 0 | 7 | 73 | 128 | 25 | 19 | 0 | 0 |
| 138 | Pears | 9/9 | 11 | 3 | 2 | 855 | 45 | 6 | 1 | 38 | 0 | 0 | 1 | 5 | 9 | 2 | 1 | 0 | 0 |
| 2 (1 | Quince | 357 | 26 | 9 | 1 | 156 | /8 | 4 | 1 | 26 | 0 | 0 | 2 | 19 | 34 | 1 | 0 | 0 | 0 |
| 200 | Formegranates | 4 1 2 9 | 11 | 3 | 39 | 155 | 8 402 | 13/ | 5 | 1/6 | 0 | 0 | 1 | 422 | 20 | 277 | 0 | 0 | 0 |
| 10/ | Eig | 4,120 | 000 | 202 | 。 。 | - 203 | 403 | 020 | 2 | 7 | 0 | 0 | 41 | 422 | /4/ | 2// | 50 | 0 | 0 |
| i, | Walnuts | 1 361 | 2/12 | 78 | 28 | 208 | 14 | 17 | 1 | 30 | 0 | 0 | 12 | 122 | 216 | 77 | 277 | 0 | 0 |
| 200 | Hazelnut | 1,501 | 242 | ,0 | 20 | 200 | | 0 | 0 | 0 | 0 | 0 | 0 | 122 | 210 | ,, | 2,,, | 0 | 0 |
| 10/ | Almonds | 3.357 | 298 | 97 | 7 | 937 | 4 | 55 | 4 | 172 | 0 | 0 | 49 | 504 | 892 | 137 | 201 | 0 | 0 |
| | Pistachio | 479 | 0 | 0 | 5 | 54 | 10 | 199 | 5 | 202 | 0 | 0 | 0 | 2 | 3 | 0 | 0 | 0 | 0 |
| | Date | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Flowers | 11 | 0 | 0 | 0 | 0 | 0 | 9 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Others | 413 | 5 | 2 | 26 | 223 | 6 | 40 | 1 | 29 | 0 | 0 | 0 | 0 | 0 | 70 | 11 | 0 | 0 |
| | Persimmon | 7 | 0 | 0 | 0 | 7 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Olive | 137 | 0 | 0 | 0 | 31 | 16 | 10 | 2 | 78 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Jujube | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Total | 15,314 | 1,493 | 483 | 252 | 5,088 | 949 | 1,104 | 26 | 1,010 | 0 | 0 | 123 | 1,264 | 2,239 | 629 | 653 | 0 | 0 |



| Year | Cultivated areas | cum inside catchment area (surface water + other resources) | Lenjanat up | Lenjanat down | Mobarakeh-Mahyar-Jarguyeh (Mahyar total) | Nekouabad left | Nekouabad right | Borkhar | Abshar left | Abshar right | Roodasht North | Roodasht South | Askaran/ Karvan up Morghab spring (Kordolia) | Karvan upstream Khamiran | Karvan downstream Khamiran | Faridan | Fereydoonshahr | Chadegan | Dehaghan |
|--------|-------------------|---|-------------|---------------|--|----------------|-----------------|---------|-------------|--------------|----------------|----------------|---|--------------------------|----------------------------|---------|----------------|----------|----------|
| | Sour Cherry | 493 | 5 | 2 | 5 | 404 | 7 | 2 | 1 | 30 | 0 | 0 | 1 | 10 | 18 | 2 | 3 | 3 | 0 |
| | Cherry | 1,019 | 8 | 2 | 1 | 703 | 202 | 6 | 1 | 57 | 0 | 0 | 1 | 11 | 19 | 4 | 3 | 1 | 0 |
| | Tomato | 163 | 3 | 1 | 0 | 107 | 0 | 2 | 1 | 20 | 0 | 0 | 1 | 7 | 12 | 2 | 1 | 6 | 0 |
| | Plum | 273 | 9 | 3 | 0 | 187 | 1 | 6 | 1 | 27 | 0 | 0 | 1 | 12 | 22 | 0 | 3 | 0 | C |
| | Peach | 251 | 3 | 1 | 2 | 164 | 14 | 2 | 0 | 5 | 0 | 0 | 2 | 16 | 28 | 0 | 3 | 10 | 0 |
| | Nectarine 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Apricots 1 | 656 | 45 | 15 | 5 | 276 | 56 | 17 | 1 | 37 | 0 | 0 | 5 | 48 | 85 | 24 | 40 | 4 | 0 |
| | Apricots 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| _ | Nectarine 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 382 | Apples | 666 | 19 | 6 | 44 | 193 | 36 | 55 | 1 | 42 | 0 | 0 | 7 | 74 | 132 | 14 | 22 | 21 | 0 |
| 3 | Pears | 981 | 11 | 3 | 2 | 855 | 45 | 6 | 1 | 39 | 0 | 0 | 1 | 5 | 9 | 2 | 1 | 1 | 0 |
| 38 | Quince | 350 | 23 | / | 2 | 101 | /8 | 4 | 1 | 25 | 0 | 0 | 2 | 19 | 34 | 1 | 0 | 0 | 0 |
| 3 (1 | Pomegranates | 5/9 | 10 | 3 | 40 | 159 | 8 | 120 | 5 | 191 | 0 | 0 | 1 | 15 | 26 | 226 | 0 | 0 | 0 |
| 200 | Grapes | 4,146 | 808 | 262 | 80 | 380 | 41/ | 530 | 2 | 69 | 0 | 0 | 41 | 422 | /48 | 230 | 99 | 40 | 0 |
| 10 | Grapes (raineu) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| , N | Fig Walnuts | 1 5 1 2 | 242 | 70 | 20 | 211 | 46 | 17 | 2 | 65 | 0 | 0 | 12 | 126 | 241 | 20 | 252 | 40 | 0 |
| 50 | Hazelnut | 30 | 243 | ,,, | 23 | 211 | 40 | 1/ | 2 | 05 | 0 | 0 | 13 | 130 | 241 | 12 | 12 | 40 | 0 |
| | Almonds | 3 304 | 302 | 98 | 7 | 937 | 4 | 55 | 5 | 174 | 0 | 0 | 45 | 462 | 818 | 78 | 216 | 104 | 0 |
| ••• | Almonds (rainfed) | 804 | 151 | 49 | , | 0 | 0 | 0 | 0 | 1/4 | 0 | 0 | | 3 | 610 | 284 | 10 | 300 | 0 |
| | Pistachio | 489 | 0 | 0 | 5 | 54 | 20 | 217 | 5 | 183 | 0 | 0 | 0 | 2 | 3 | 201 | 0 | 0 | 0 |
| | Date | 0 | 0 | 0 | 0 | 0 | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Flowers | 15 | 0 | 0 | 0 | 0 | 0 | 9 | 0 | 6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Others | 479 | 0 | 0 | 13 | 271 | 6 | 40 | 1 | 43 | 0 | 0 | 0 | 0 | 0 | 24 | 12 | 68 | 0 |
| | Persimmon | 7 | 0 | 0 | 0 | 7 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Olive | 140 | 8 | 2 | 0 | 23 | 16 | 10 | 2 | 79 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Jujube | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Total | 15,562 | 1,497 | 485 | 243 | 5,090 | 957 | 1,105 | 28 | 1,092 | 0 | 0 | 121 | 1,239 | 2,195 | 435 | 771 | 303 | 0 |

Table 27: Cultivated areas of orchards (ha) and appropriate products of irrigation networks and counties within the Zayandeh Rud Basin, agricultural Iranian year 1381-82

Table 28: Cultivated areas of orchards (ha) and appropriate products of irrigation networks and counties within the Zayandeh Rud Basin, agricultural Iranian year 1382-83

| Year | Cultivated areas | Sum inside catchment area (surface water + other resources) | Lenjanat up | Lenjanat down | Mobarakeh-Mahyar-Jarguyeh (Mahyar total) | Nekouabad left | Nekouabad right | Borkhar | Abshar left | Abshar right | Roodasht North | Roodasht South | Askaran/ Karvan up Morghab spring (Kordolia) | Karvan upstream Khamiran | Karvan downstream Khamiran | Faridan | Ferey doonshahr | Chadegan | Dehaghan |
|------|-------------------|---|-------------|---------------|--|----------------|-----------------|---------|-------------|--------------|----------------|----------------|---|--------------------------|----------------------------|---------|-----------------|----------|----------|
| | Sour Cherry | 547 | 5 | 2 | 6 | 456 | 9 | 2 | 1 | 30 | 0 | 0 | 1 | 10 | 18 | 2 | 3 | 3 | 0 |
| | Cherry | 957 | 8 | 2 | 0 | 672 | 167 | 6 | 1 | 57 | 0 | 0 | 1 | 11 | 19 | 4 | 3 | 1 | 5 |
| | Tomato | 230 | 2 | 1 | 0 | 154 | 9 | 2 | 1 | 20 | 0 | 0 | 1 | 10 | 19 | 2 | 1 | 6 | 2 |
| | Plum | 231 | 9 | 3 | 0 | 143 | 0 | 6 | 1 | 27 | 0 | 0 | 1 | 12 | 22 | 0 | 3 | 2 | 2 |
| | Peach | 379 | 4 | 1 | 1 | 234 | 48 | 2 | 0 | 5 | 0 | 0 | 1 | 15 | 27 | 2 | 3 | 25 | 10 |
| | Nectarine 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Apricots 1 | 780 | 45 | 15 | 2 | 324 | 104 | 17 | 1 | 37 | 0 | 0 | 5 | 48 | 86 | 26 | 42 | 8 | 20 |
| | Apricots 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| _ | Nectarine 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 383 | Apples | 896 | 19 | 6 | 29 | 185 | 30 | 55 | 1 | 42 | 0 | 0 | 1 | /4 | 132 | 15 | 25 | 25 | 250 |
| 2-10 | Pears | 946 | 8 | 2 | 0 | 823 | 3/ | 6 | 1 | 39 | 0 | 0 | 1 | 20 | 9 | 2 | 1 | 1 | 10 |
| 138 | Quince | 357 | 19 | 2 | 1 | 162 | 78 | 120 | 1 | 25 | 0 | 0 | 2 | 20 | 35 | 1 | 0 | 2 | 10 |
| 5 | granes | 4 009 | 793 | 257 | 43 | 155 | 17 | 536 | 2 | 69 | 0 | 0 | 41 | 123 | 7/9 | 238 | 100 | 31 | 610 |
| 200 | Granes (rainfed) | 4,005 | , , , , , | 257 | | 0 | 1, | 0 | 0 | 0 | 0 | 0 | -11 | 425 | ,45 | 250 | 100 | 0 | 010 |
| 10/ | Fig | 12 | 0 | 0 | 0 | 0 | 12 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 3- | Walnuts | 1,948 | 247 | 80 | 12 | 237 | 159 | 17 | 2 | 65 | 0 | 0 | 15 | 157 | 278 | 56 | 433 | 61 | 130 |
| 200 | Hazelnut | 12 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 12 | 0 | 0 |
| 10/ | Almonds | 3,540 | 310 | 100 | 3 | 937 | 177 | 55 | 5 | 174 | 0 | 0 | 44 | 453 | 803 | 108 | 231 | 116 | 25 |
| | Almonds (rainfed) | 1,144 | 151 | 49 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 6 | 284 | 120 | 530 | 0 |
| | Pistachio | 852 | 0 | 0 | 3 | 54 | 345 | 223 | 5 | 183 | 0 | 0 | 0 | 2 | 3 | 0 | 0 | 0 | 34 |
| | Date | 626 | 0 | 0 | 0 | 0 | 626 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Flowers | 27 | 0 | 0 | 0 | 0 | 0 | 9 | 0 | 6 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 10 | 0 |
| | Others | 488 | 0 | 0 | 8 | 235 | 40 | 40 | 1 | 43 | 0 | 0 | 0 | 0 | 0 | 25 | 12 | 83 | 0 |
| | Persimmon | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Olive | 221 | 14 | 4 | 0 | 44 | 33 | 16 | 2 | 96 | 0 | 0 | 0 | 4 | 7 | 0 | 0 | 0 | 0 |
| | Jujube | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Total | 18,162 | 1,490 | 482 | 162 | 5,181 | 2,145 | 1,118 | 29 | 1,109 | 0 | 0 | 123 | 1,259 | 2,230 | 482 | 869 | 374 | 1,110 |



| Year | Cultivated areas | Sum inside catchment area (surface water + other resources) | Lenjanat up | Lenjanat down | Mobarakeh-Mahyar-Jarguyeh (Mahyar total) | Nekouabad left | Nekouabad right | Borkhar | Abshar left | Abshar right | Roodasht North | Roodasht South | Askaran/ Karvan up Morghab spring (Kordolia) | Karvan upstream Khamiran | Karvan downstream Khamiran | Faridan | Fereydoonshahr | Chadegan | Dehaghan |
|------|-------------------|---|-------------|---------------|--|----------------|-----------------|---------|-------------|--------------|----------------|----------------|---|--------------------------|----------------------------|---------|----------------|----------|----------|
| | Sour Cherry | 537 | 5 | 2 | 6 | 440 | 13 | 2 | 1 | 30 | 0 | 0 | 1 | 10 | 18 | 4 | 3 | 3 | 0 |
| | Cherry | 975 | 8 | 2 | 0 | 664 | 186 | 6 | 1 | 57 | 0 | 0 | 1 | 11 | 19 | 6 | 3 | 1 | 10 |
| | Tomato | 238 | 2 | 1 | 0 | 169 | 0 | 2 | 1 | 20 | 0 | 0 | 1 | 11 | 19 | 2 | 1 | 6 | 2 |
| | Plum | 233 | 9 | 3 | 0 | 143 | 2 | 6 | 1 | 27 | 0 | 0 | 1 | 12 | 22 | 0 | 3 | 3 | 2 |
| | Peach | 528 | 2 | 1 | 2 | 296 | 126 | 2 | 0 | 5 | 0 | 0 | 2 | 16 | 28 | 2 | 3 | 27 | 15 |
| | Nectarine 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Apricots 1 | 823 | 45 | 15 | 2 | 344 | 95 | 17 | 1 | 37 | 0 | 0 | 5 | 49 | 87 | 26 | 42 | 15 | 45 |
| | Apricots 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| _ | Nectarine 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 384 | Apples | 927 | 19 | 6 | 33 | 165 | 23 | 55 | 1 | 42 | 0 | 0 | 7 | 75 | 133 | 15 | 25 | 29 | 300 |
| | Pears | 942 | 8 | 2 | 0 | 814 | 38 | 6 | 1 | 39 | 0 | 0 | 1 | 5 | 9 | 2 | 1 | 1 | 15 |
| 138 | Quince | 401 | 19 | 0 | 1 | 188 | 98 | 120 | 1 | 25 | 0 | 0 | 2 | 20 | 35 | 1 | 0 | 1 | 0 |
| 5 | pomegranates | 4 6 7 2 | 8 71 0 | 2222 | 51 | 155 | 522 | 120 | 5 | 191 | 0 | 0 | 1 | 422 | 20 | 220 | 100 | 21 | 610 |
| 200 | Granes (minfed) | 4,075 | /10 | 252 | 45 | 557 | 522 | 550 | 2 | 09 | 0 | 0 | 41 | 425 | /50 | 250 | 100 | 51 | 010 |
| 10/ | Eig | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 4 | Fig Walnute | 1 0/0 | 247 | 80 | 12 | 249 | 94 | 17 | 2 | 65 | 0 | 0 | 16 | 164 | 200 | 56 | 420 | 0 | 150 |
| 50 | Hazelnut | 2/ | 24, | 0 | 15 | 245 | 0 | 1, | 0 | 0 | 0 | 0 | 10 | 104 | 250 | 12 | 12 | 0 | 150 |
| 0 | Almonds | 3 /80 | 310 | 100 | 4 | 937 | 8 | 55 | 5 | 174 | 0 | 0 | 45 | 464 | 821 | 108 | 223 | 192 | 35 |
| | Almonds (rainfed) | 1 1 1 4 4 | 151 | 49 | | 0 | 0 | 0 | 0 | 1,1 | 0 | 0 | .5 | 3 | 6 | 284 | 120 | 530 | 0 |
| | Pistachio | 535 | 0 | 0 | 4 | 54 | 28 | 223 | 5 | 183 | 0 | 0 | 0 | 2 | 3 | 0 | 0 | 0 | 34 |
| | Date | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Flowers | 27 | 0 | 0 | 0 | 0 | 0 | 9 | 0 | 6 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 10 | 0 |
| | Others | 490 | 34 | 11 | 8 | 222 | 8 | 40 | 1 | 43 | 0 | 0 | 0 | 0 | 0 | 25 | 12 | 85 | 0 |
| | Persimmon | 7 | 0 | 0 | 0 | 7 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Olive | 256 | 14 | 5 | 0 | 60 | 108 | 23 | 1 | 45 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Jujube | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Total | 17,698 | 1,447 | 469 | 171 | 5,262 | 1,352 | 1,125 | 27 | 1,058 | 0 | 0 | 124 | 1,276 | 2,260 | 498 | 857 | 492 | 1,278 |

Table 29: Cultivated areas of orchards (ha) and appropriate products of irrigation networks and counties within the Zayandeh Rud Basin, agricultural Iranian year 1383-84

Table 30: Cultivated areas of orchards (ha) and appropriate products of irrigation networks and counties within the Zayandeh Rud Basin, agricultural Iranian year 1384-85

| Year | Cultivated areas | Sum inside catchment area (surface water + other resources) | Lenjanat up | Lenjanat down | Mobarakeh-Mahyar-Jarguyeh (Mahyar total) | Nekouabad left | Nekouabad right | Borkhar | Abshar left | Abshar right | Roodasht North | Roodasht South | Askaran/ Karvan up Morghab spring (Kordolia) | Karvan upstream Khamiran | Karvan downstream Khamiran | Faridan | Fereydoonshahr | Chadegan | Dehaghan |
|------|-------------------|---|-------------|---------------|--|----------------|-----------------|---------|-------------|--------------|----------------|----------------|---|--------------------------|----------------------------|---------|----------------|----------|----------|
| | Sour Cherry | 546 | 5 | 2 | 6 | 446 | 13 | 2 | 1 | 30 | 0 | 0 | 1 | 10 | 18 | 5 | 3 | 3 | 0 |
| | Cherry | 995 | 8 | 2 | 0 | 680 | 189 | 6 | 1 | 57 | 0 | 0 | 1 | 11 | 19 | 5 | 3 | 1 | 10 |
| | Tomato | 245 | 2 | 1 | 0 | 172 | 0 | 2 | 1 | 20 | 0 | 0 | 1 | 12 | 21 | 3 | 1 | 6 | 2 |
| | Plum | 230 | 2 | 1 | 0 | 145 | 2 | 6 | 1 | 27 | 0 | 0 | 1 | 12 | 22 | 2 | 3 | 4 | 2 |
| | Peach | 616 | 3 | 1 | 3 | 328 | 165 | 2 | 0 | 5 | 0 | 0 | 2 | 17 | 30 | 5 | 3 | 32 | 20 |
| | Nectarine 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Apricots 1 | 856 | 48 | 15 | 2 | 361 | 102 | 17 | 1 | 37 | 0 | 0 | 5 | 49 | 87 | 27 | 42 | 19 | 45 |
| | Apricots 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Nectarine 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 85) | Apples | 968 | 15 | 5 | 34 | 160 | 30 | 55 | 1 | 42 | 0 | 0 | 7 | 76 | 134 | 18 | 25 | 31 | 335 |
| -13 | Pears | 924 | 4 | 1 | 0 | 804 | 35 | 6 | 1 | 39 | 0 | 0 | 1 | 5 | 9 | 2 | 1 | 1 | 15 |
| 382 | Quince | 418 | 15 | 5 | 2 | 199 | 104 | 5 | 1 | 29 | 0 | 0 | 2 | 20 | 35 | 1 | 0 | 1 | 0 |
| 6 (1 | Pomegranates | 672 | 6 | 2 | 62 | 155 | 15 | 120 | 5 | 191 | 0 | 0 | 1 | 15 | 26 | 0 | 0 | 0 | 75 |
| 00 | Grapes | 4,422 | 529 | 171 | 45 | 347 | 522 | 536 | 2 | 69 | 0 | 0 | 41 | 423 | 750 | 238 | 104 | 37 | 610 |
| 0/3 | Grapes (rainfed) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1 | Fig | 14 | 0 | 0 | 0 | 0 | 8 | 6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 8 | Walnuts | 2,087 | 264 | 86 | 15 | 251 | 85 | 1/ | 2 | 65 | 0 | 0 | 1/ | 1/3 | 306 | /0 | 439 | 113 | 185 |
| 0/2 | Hazeinut | 1006 | 415 | 125 | 0 | 1 1 9 2 | 0 | 0 | 0 | 176 | 0 | 0 | 10 | 476 | 042 | 12 | 3 | 252 | 25 |
| - | Almonds (reinfed) | 4,000 | 415 | 100 | 4 | 1,105 | 0 | 55 | 5 | 1/0 | 0 | 0 | 40 | 4/0 | 645 | 154 | 242 | 252 | 30 |
| | Aimonus (raimeu) | 1,552 | 151 | 49 | 4 | 55 | 20 | 222 | 5 | 102 | 0 | 0 | 0 | 2 | 2 | 284 | 195 | 000 | 10 |
| | Date | 540 | 0 | 0 | 4 | 0 | 20 | 223 | 0 | 103 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | -44 |
| | Flowers | 21 | 0 | 0 | 0 | 2 | 0 | 9 | 0 | 6 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 2 | 0 |
| | Others | 476 | 14 | 4 | 8 | 222 | 20 | 40 | 1 | 43 | 0 | 0 | 0 | 0 | 0 | 25 | 13 | 85 | 0 |
| | Persimmon | 7 | 14 | 0 | 0 | 7 | 0 | | 0 | | 0 | 0 | 0 | n | 0 | 25 | 15 | 0 | 0 |
| | Olive | 803 | 39 | 13 | 0 | 274 | 135 | 38 | 7 | 283 | 0 | 0 | 0 | 5 | 8 | 0 | 0 | 0 | 0 |
| | Juiube | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 203 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Total | 18.869 | 1.370 | 444 | 188 | 5,789 | 1,459 | 1,146 | 34 | 1.302 | 0 | 0 | 127 | 1.304 | 2,310 | 548 | 884 | 587 | 1.378 |



| | Year | Cultivated areas | Sum inside catchment area (surface water + other resources) | Lenjanat up | Lenjanat down | Mobarakeh-Mahyar-Jarguyeh (Mahyar total) | Nekouabad left | Nekouabad right | Borkhar | Abshar left | Abshar right | Roodasht North | Roodasht South | Askaran/ Karvan up Morghab spring (Kordolia) | Karvan upstream Khamiran | Karvan downstream Khamiran | Faridan | Fereydoonshahr | Chadegan | Dehaghan |
|---|------|----------------------|---|-------------|---------------|--|----------------|-----------------|---------|-------------|--------------|----------------|----------------|---|--------------------------|----------------------------|---------|----------------|----------|----------|
| | | Sour Cherry | 946 | 12 | 4 | 2 | 742 | 115 | 4 | 1 | 21 | 0 | 0 | 1 | 12 | 21 | 1 | 3 | 10 | 0 |
| | | Cherry | 857 | 8 | 3 | 0 | 621 | 137 | 13 | 1 | 33 | 0 | 0 | 1 | 6 | 10 | 6 | 9 | 4 | 6 |
| | | Tomato | 476 | 23 | 7 | 0 | 269 | 7 | 7 | 0 | 19 | 0 | 0 | 2 | 21 | 37 | 0 | 68 | 12 | 2 |
| | | Plum | 264 | 15 | 5 | 0 | 148 | 7 | 15 | 0 | 18 | 0 | C | 1 | 6 | 10 | 20 | 6 | 12 | 2 |
| | | Peach | 823 | 18 | 6 | 3 | 406 | 222 | 16 | 0 | 12 | 0 | 0 | 3 | 26 | 47 | 3 | 17 | 25 | 18 |
| | | Nectarine | 4 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 1 | 0 | C | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | Apricots | 1,184 | 71 | 23 | 1 | 521 | 158 | 23 | 1 | 42 | 0 | 0 | 6 | 61 | 108 | 9 | 76 | 65 | 20 |
| | | Nectarine | 16 | 0 | 0 | 0 | 0 | 12 | 0 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | Apples | 1,346 | 52 | 1/ | 43 | 2/2 | 10 | 9/ | 1 | 58 | 0 | | 11 | 109 | 193 | 28 | 30 | 20 | 400 |
| | | Quitto | 1,124 | 50 | 16 | 1 | 395 | 125 | 54 | 1 | 40 | 0 | | 1 | 12 | 20 | 2 | 3 | 5 | 3 |
| | | Pomegranates | 560 | 36 | 10 | 56 | 1/18 | 26 | 78 | 2 | 92 | 0 | | 1 | 14 | 20 | 0 | 0 | 0 | 80 |
| | 86) | Granes | 4 4 0 6 | 560 | 181 | 21 | 502 | 386 | 367 | 1 | 28 | 0 | | 56 | 578 | 1 023 | 198 | 189 | 31 | 285 |
| | -13 | Grapes (rainfed) | -,,,00 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1,025 | 0 | 0 | 0 | 205 |
| | 385 | Berries | 116 | 21 | 7 | 0 | 11 | 15 | 6 | 1 | 48 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 3 | 0 |
| | 7 (1 | Fig | 28 | 1 | 0 | 0 | 5 | 13 | 0 | 0 | 8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 00 | Walnuts | 2,676 | 378 | 122 | 15 | 291 | 99 | 18 | 3 | 133 | 0 | C | 19 | 191 | 337 | 51 | 617 | 227 | 175 |
| | 0/3 | Hazelnut | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| | | Almonds | 4,730 | 624 | 202 | 4 | 780 | 16 | 73 | 2 | 84 | 0 | C | 71 | 732 | 1,297 | 255 | 285 | 263 | 40 |
| | 00 | Almonds (rainfed) | 1,806 | 76 | 24 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | C | 1 | 10 | 19 | 469 | 417 | 570 | 220 |
| | 0/3 | Pistachio | 554 | 3 | 1 | 4 | 20 | 18 | 244 | 5 | 211 | 0 | C | 0 | 4 | 6 | 0 | 0 | 0 | 38 |
| | - | Date | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | Flowers | 24 | 0 | 0 | 0 | 0 | 4 | 19 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | Safran | 103 | 1 | 0 | 0 | 30 | 6 | 18 | 0 | 14 | 0 | 0 | 1 | 7 | 12 | 10 | 1 | 2 | 2 |
| | | Russian olive | 42 | 8 | 2 | 0 | 6 | 10 | 2 | 0 | 11 | 0 | C | 0 | 0 | 0 | 0 | 0 | 3 | 0 |
| | | Hawthorn | 32 | 14 | 5 | 0 | 13 | 0 | 0 | 0 | 0 | 0 | C | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | Persimmon | 22 | 0 | 0 | 0 | 4 | 4 | 0 | 0 | 13 | 0 | C | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | Olive | 700 | 50 | 16 | 1 | 236 | 78 | 54 | 7 | 259 | 0 | C | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | Jujube | 4 | 0 | 0 | 0 | 0 | 1 | 3 | 0 | 0 | 0 | | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | Other Injection Dr. | 1,266 | 305 | 99 | 0 | 41 | 6 | 6 | 3 | 106 | 0 | | 0 | 0 | 0 | 1/1 | 68 | 461 | 0 |
| | | Other Irrigation Pr. | 470 | 0 | 1 | 0 | 10 | 222 | 0 | 0 | 0 | 0 | | | 0 | 0 | 0 | 20 | 0 | 0 |
| | | Total | 4/0 | 2 259 | 721 | 152 | 6 207 | 1 956 | 1 1 0 9 | 2 | 1 252 | 0 | | 172 | 1 770 | 2 1 5 1 | 762 | 1 400 | 1 1 4 2 | 1 071 |
| 1 | | TOtal | 23,200 | 2,208 | /31 | 102 | 0,297 | 1,000 | 1,108 | 35 | 1,552 | 0 | U U | 1/3 | 1,//9 | 3,131 | /02 | 1,400 | 1,142 | 1,0/1 |

Table 31: Cultivated areas of orchards (ha) and appropriate products of irrigation networks and counties within the Zayandeh Rud Basin, agricultural Iranian year 1385-86



| | Year | Cultivated areas | Sum inside catchment area (surface water + other resources) | Lenjanat up | Lenjanat down | Mobarakeh-Mahyar-Jarguyeh (Mahyar total) | Nekouabad left | Nekouabad right | Borkhar | Abshar left | Abshar right | Roodasht North | Roodasht South | Askaran/ Karvan up Morghab spring (Kordolia) | Karvan upstream Khamiran | Karvan downstream Khamiran | Faridan | Fereydoonshahr | Chadegan | Dehaghan |
|---|------|------------------------|---|-------------|---------------|--|----------------|-----------------|---------|-------------|--------------|----------------|----------------|---|--------------------------|----------------------------|---------|----------------|----------|----------|
| | | Sour Cherry | 725 | 8 | 3 | 8 | 548 | 64 | 3 | 2 | 60 | 0 | 0 | 1 | 7 | 13 | 1 | 1 | 4 | 2 |
| | | Cherry | 762 | 21 | 7 | 0 | 514 | 116 | 0 | 2 | 71 | 0 | 0 | 1 | 7 | 12 | 5 | 3 | 1 | 2 |
| | | Iomato | 359 | 18 | 6 | 0 | 211 | 6 | 0 | 1 | 19 | 0 | 0 | 1 | 10 | 19 | 1 | 62 | 1 | 3 |
| | | Plum | 332 | | 2 | 1 | 204 | 33 | 1 | 0 | 1/ | 0 | 0 | 0 | 1 | 2 | 19 | | 35 | 4 |
| | | Apricote | 1 020 | 31 112 | 27 | 2 | 456 | 112 | 1 | 2 | 20 | 0 | | 2 | 23 | 40 | 14 | ° | 23 | 30 |
| | | Nectarine | 1,050 | 115 | 5, | 0 | 3 | 9 | 0 | 0 | 0 | 0 | 0 | 0 | 15 | , 0 | 10 | 0 | 2, | 0 |
| | | Apples | 1.048 | 73 | 23 | 37 | 191 | 12 | 3 | 1 | 51 | 0 | 0 | 14 | 139 | 247 | 35 | 22 | 40 | 160 |
| | | Pears | 744 | 8 | 2 | 1 | 692 | 6 | 1 | 0 | 15 | 0 | 0 | 0 | 1 | 2 | 3 | 1 | 7 | 4 |
| | | Quince | 654 | 70 | 23 | 0 | 290 | 172 | 0 | 1 | 24 | 0 | 0 | 2 | 23 | 41 | 1 | 0 | 2 | 5 |
| | - | Pomegranates | 1,206 | 54 | 17 | 89 | 462 | 45 | 23 | 8 | 291 | 0 | 0 | 1 | 13 | 23 | 0 | 0 | 0 | 180 |
| | 387 | Grapes | 3,666 | 526 | 170 | 34 | 400 | 273 | 157 | 1 | 25 | 0 | 0 | 48 | 497 | 881 | 224 | 133 | 58 | 240 |
| | 6 -1 | Grapes (rainfed) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 138 | Berries | 130 | 20 | 6 | 0 | 26 | 10 | 1 | 1 | 54 | 0 | 0 | 0 | 0 | 1 | 3 | 2 | 4 | 2 |
| | 38 (| Fig | 32 | 2 | 1 | 0 | 4 | 17 | 0 | 0 | 7 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| | /200 | Walnuts | 2,850 | 493 | 160 | 17 | 308 | 109 | 0 | 3 | 126 | 0 | 0 | 21 | 218 | 387 | 95 | 513 | 217 | 183 |
| | 10/ | Hazelnut | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | - 10 | Almonds | 4,678 | 642 | 208 | 4 | 701 | 10 | 0 | 5 | 211 | 0 | 0 | 71 | 732 | 1,297 | 152 | 311 | 278 | 55 |
| | /20(| Almonds (rainfed) | 1,442 | /6 | 24 | 0 | 0 | 0 | 0 | 0 | 206 | 0 | 0 | 1 | 10 | 19 | 339 | 361 | 462 | 150 |
| | 10, | Pistachio | 30/ | 2 | 0 | 5 | 49 | 4 | 02 | 5 | 200 | 0 | | 0 | 3 | 5 | | | 0 | 45 |
| | | Elowers | 20 | 0 | 0 | 0 | 10 | 0 | 0 | 0 | 6 | 0 | | 0 | 0 | 0 | 4 | | 1 | 0 |
| | | Russian olive | 63 | 16 | 5 | 0 | 8 | 8 | 5 | 0 | 11 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 5 | 3 |
| | | Hawthorn | 13 | 6 | 2 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | Persimmon | 24 | 0 | 0 | 0 | 2 | 12 | 0 | 0 | 10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | Olive | 528 | 42 | 13 | 1 | 184 | 59 | 5 | 6 | 219 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | Jujube | 8 | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | Poplar and other trees | 2,459 | 171 | 55 | 1 | 112 | 23 | 14 | 36 | 1,373 | 0 | 0 | 0 | 0 | 0 | 254 | 62 | 355 | 3 |
| | | Other Irrigation Pr. | 13 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 7 | 0 | 0 | 0 | 0 | 0 | 1 | 4 | 0 | 0 |
| | | Other Rainfed Pr. | 2,745 | 676 | 219 | 1 | 192 | 1,398 | 9 | 4 | 137 | 0 | 0 | 1 | 8 | 15 | 11 | 54 | 7 | 13 |
| 1 | | Total | 26.842 | 3.095 | 1.002 | 205 | 5.994 | 2.729 | 284 | 79 | 3.062 | 0 | 0 | 167 | 1.715 | 3.037 | 1.181 | 1.641 | 1.527 | 1.124 |

Table 32: Cultivated areas of orchards (ha) and appropriate products of irrigation networks and counties within the Zayandeh Rud Basin, agricultural Iranian year 1386-87

Table 33: Cultivated areas of orchards (ha) and appropriate products of irrigation networks and counties within the Zayandeh Rud Basin, agricultural Iranian year 1387-88

| Year | Cultivated areas | Sum inside catchment area (surface water + other resources) | Lenjanat up | Lenjanat down | Mobarakeh-Mahyar-Jarguyeh (Mahyar total) | Nekouabad left | Nekouabad right | Borkhar | Abshar left | Abshar right | Roodasht North | Roodasht South | Askaran/ Karvan up Morghab spring (Kordolia) | Karvan upstream Khamiran | Karvan downstream Khamiran | Faridan | Fereydoonshahr | Chadegan | Dehaghan |
|-------------------------------|------------------------|---|-------------|---------------|--|----------------|-----------------|---------|-------------|--------------|----------------|----------------|---|--------------------------|----------------------------|---------|----------------|----------|----------|
| 10/2008 - 10/2009 (1387-1388) | Sour Cherry | 735 | 8 | 3 | 8 | 566 | 63 | 3 | 1 | 29 | 0 | 0 | 1 | 8 | 14 | 7 | 4 | 19 | 3 |
| | Cherry | 754 | 21 | 7 | 0 | 498 | 110 | 0 | 2 | 73 | 0 | 0 | 1 | 7 | 13 | 9 | 5 | 5 | 2 |
| | Tomato | 369 | 18 | 6 | 0 | 236 | 4 | 2 | 1 | 23 | 0 | 0 | 2 | 22 | 38 | 3 | 3 | 10 | 3 |
| | Plum | 293 | 7 | 2 | 1 | 201 | 34 | 1 | 0 | 17 | 0 | 0 | 0 | 1 | 2 | 1 | 4 | 16 | 5 |
| | Peach | 979 | 59 | 19 | 4 | 433 | 263 | 0 | 0 | 11 | 0 | 0 | 2 | 23 | 40 | 8 | 13 | 67 | 35 |
| | Apricots | 1,092 | 114 | 37 | 3 | 430 | 120 | 4 | 2 | 95 | 0 | 0 | 5 | 51 | 90 | 31 | 57 | 34 | 20 |
| | Nectarine | 46 | 0 | 0 | 0 | 2 | 43 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Apples | 1,057 | 63 | 20 | 38 | 174 | 3 | 3 | 1 | 31 | 0 | 0 | 10 | 105 | 185 | 27 | 23 | 73 | 300 |
| | Pears | /41 | 8 | 2 | 0 | 6/1 | 104 | 1 | 1 | 23 | 0 | 0 | 1 | 6 | 11 | 2 | 2 | 2 | 4 |
| | Quince | 1 226 | 55 | 18 | 3 | 517 | 184 | 2 | 1 | 24 | 0 | 0 | 3 | 28 | 50 | 3 | 0 | 3 | 8 260 |
| | Granoc | 2,000 | 20 | 126 | 90 | 210 | 45 | 160 | 0 | 20 | 0 | 0 | 42 | 124 | 20 | 222 | 104 | 46 | 200 |
| | Granes (rainfed) | 3,440 | 365 | 120 | 41 | 510 | 441 | 105 | 0 | 35 | 0 | 0 | 42 | 434 | /05 | 222 | 104 | 40 | 300 |
| | Berries | 124 | 20 | 6 | 0 | 20 | 4 | 1 | 1 | 51 | 0 | 0 | 1 | 6 | 10 | 0 | 2 | 0 | 2 |
| | Fig | 12 | 20 | 1 | 0 | 4 | 3 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | -0 | 0 | 0 | 0 | 0 |
| | Walnuts | 2.608 | 531 | 172 | 18 | 282 | 78 | 0 | 3 | 104 | 0 | 0 | 18 | 185 | 327 | 70 | 493 | 138 | 190 |
| | Hazelnut | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Almonds | 4,716 | 663 | 215 | 4 | 1,232 | 10 | 0 | 5 | 209 | 0 | 0 | 56 | 575 | 1,019 | 134 | 323 | 240 | 30 |
| | Almonds (rainfed) | 1,431 | 76 | 24 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 10 | 19 | 255 | 385 | 510 | 150 |
| | Pistachio | 445 | 2 | 0 | 5 | 28 | 4 | 90 | 7 | 257 | 0 | 0 | 0 | 3 | 5 | 0 | 0 | 0 | 44 |
| | Date | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Flowers | 18 | 0 | 0 | 0 | 10 | 0 | 0 | 0 | 6 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 |
| | Russian olive | 49 | 16 | 5 | 0 | 4 | 1 | 5 | 0 | 11 | 0 | 0 | 0 | 1 | 2 | 1 | 0 | 0 | 3 |
| | Hawthorn | 12 | 4 | 1 | 0 | 7 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Persimmon | 14 | 0 | 0 | 0 | 4 | 4 | 0 | 0 | 6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Olive | 447 | 45 | 14 | 0 | 178 | 31 | 7 | 4 | 168 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Jujube | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Poplar and other trees | 2,735 | 171 | 55 | 1 | 132 | 25 | 14 | 36 | 1,373 | 0 | 0 | 0 | 1 | 2 | 170 | 62 | 690 | 3 |
| | Other Irrigation Pr. | 148 | 0 | 0 | 10 | 0 | 0 | 1 | 3 | 120 | 0 | 0 | 0 | 0 | 0 | 0 | 15 | 0 | 0 |
| | Other Rainfed Pr. | 2,674 | 676 | 219 | 1 | 97 | 1,399 | 9 | 4 | 137 | 0 | 0 | 2 | 17 | 31 | 9 | 54 | 7 | 13 |
| | Total | 26,981 | 2,975 | 963 | 230 | 6,344 | 2,876 | 346 | 81 | 3,128 | 0 | 0 | 146 | 1,499 | 2,654 | 952 | 1,551 | 1,860 | 1,376 |



Appendix I: Hints for the scenario development

Since the 1990es a high pace of expansion in greenhouse cultivation can be observed in numerous countries around the world. M. Ali (2008) regards this trend as an equivalent to the so-called Green Revolution of the 1960ies and accordingly names it "the Horticulture Revolution". According to his estimation this revolution is able to benefit particular the poor, brings prosperity and by the way helps to achieve food safety – but this only in case of adequate policy measurements being taken.

Some transition countries, such as China, but also Tunisia, already intensively profited from the introduction of greenhouses and improved horticultural systems. The success of protected cultivation was perceivable through growing cultivation areas, an increasing trading quantity, as well as through augmented availability of fresh food per capita. This was mainly accompanied by an adaption of cultivation systems (Ali 2008).

In general, resource use efficiency is higher with horticulture cultivation, especially with the main inputs water, area and labour: water is used more cost-efficiently in comparison to rice cultivation; both, land area and labour, are always applied at higher gains. This resulted from the individual consideration of each single input and its resource use efficiency and also from the overall benefit-cost-ratio of four Southeast Asian countries. The benefit-cost-ratio of horticulture exceeded rice cultivation about two- to threefold and in the case of Bangladesh even about sixfold (Ali und Abedullha, 2002 quoted in Ali 2008). In addition, due to high management demands in vegetable cultivation, farmers broaden their skills and learn to perform better in general cultivation management. This circumstance becomes evident in their 20 % higher efficiency compared to the performance of pure (exclusive) rice farmers (Ali & Abedullha, 2002 quoted in Ali, 2008).

In consequence of the increase in productivity and the higher yields of greenhouse farming there is basically a smaller demand in land area. For instance, in the Netherlands greenhouses occupy merely 1 % of land area, while producing considerable 40 % of the total agricultural gains (Dutch Central Statistical Office, 2008 quoted in Stanghellini, 2011). This ratio perfectly reflects the high (enormous) land use efficiency of greenhouse farming.

In the end, the increase in productivity and profits tackled by greenhouse practises enables a reduction of cultivated area while maintaining the same output quantity. As a result, an increasing concentration on horticulture production in greenhouses can very well compensate losses in land area. However, not all areas put out of conventional cultivation simply have to be abandoned, but can be instead used for other additional agricultural purposes, such as for accommodating storage tanks or store houses for fertilizers and machinery.

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