Sectorial Economy II.

Apáti, Ferenc
Bai, Attila
Bittner, Beáta
Blaskó, Beáta
Felföldi, János
Kiss, István
Kovács, Krisztián
Madai, Hajnalka
Nábrádi, András
Szénásné Ványi, Noémi
Szöllősi, László
Szűcs, István
Szerkesztette Szűcs, István
Sectorial Economy II.
irta Apáti, Ferenc, Bai, Attila, Bittner, Beáta, Blaskó, Beáta, Felföldi, János, Kiss, István, Kovács, Krisztián, Madai, Hajnalka, Nábrádi, András, Szénásné Ványi, Noémi, Szőllősi, László, Szűcs, István, és Szűcs, István
TÁMOP-4.1.2.A/1-11/1-2011-0009
University of Debrecen, Service Sciences Methodology Centre
Debrecen, 2013.
Tartalom

1. 1. ECONOMIC IMPORTANCE OF FOOD OF PLANT ORIGIN ................................................. 1
   1. 1.1. Production and trade of cereals ................................................................. 2
      1. 1.1.1. The economic importance of maize production and trade ....................... 5
      1. 1.1.2. The economic importance of rice production and trade ......................... 7
      1. 1.1.3. The economic importance of wheat production and trade ....................... 8
   2. 1.2. The economic importance of oil crops production and trade ....................... 11
   3. 1.3. The economic importance of fruit and vegetable production ....................... 12
   4. Questions related to this Chapter ......................................................................... 12
   5. References ............................................................................................................ 13

2. 2. ECONOMIC IMPORTANCE OF FOOD OF ANIMAL ORIGIN ........................................... 14
   1. 2.1. The economic importance of meat ............................................................... 14
   2. 2.1. The economic importance of poultry meat production .................................. 17
   3. 2.2. The economic importance of pig meat production ......................................... 19
   4. 2.3. The economic importance of bovine meat production .................................. 22
   5. 2.4. The economic importance of world dairy sector ....................................... 24
   6. 2.5. The economic importance of world egg production .................................... 25
   7. 2.4. The economic importance of global fish and fishery products ..................... 25
   8. Questions related to this Chapter ......................................................................... 26
   9. References ............................................................................................................ 26

3. 3. Complex economic issues of cereal production (wheat, maize, rice, barley) .............. 28
   1. 3.1. Economic importance of global wheat production ........................................ 29
   2. 3.2. Economic importance of global rice production .......................................... 30
   3. 3.3. Economic importance of global maize production ..................................... 31
   4. 3.4. Economic importance of global barley production ..................................... 32
   5. 3.5. Hungarian cereal sector .............................................................................. 33
      5.1. 3.5.1. Competitiveness of the Hungarian COP sector on the World market .... 35
      5.2. 3.5.2. Export-import in Hungarian cereal production ................................... 36
   6. References ............................................................................................................ 37

4. 4. ECONOMIC ASPECTS OF PROTEIN AND OIL CROPS(Sunflower, Rapeseed, Soybean, Alfalfa) 39
   1. 4.1. The most commonly used arable crops for oil and protein production ............ 39
   2. 4.2. Situation of oilseed production and usage in the EU .................................... 39
   3. 4.3. The economic importance and usage of sunflower ...................................... 41
   4. 4.4. The Importance and Use of Rapeseed ......................................................... 42
   5. 4.5. Vegetable oil production and consumption ............................................... 43
   6. 4.6. Vegetable oil for biofuels .............................................................................. 44
   7. 4.7. The importance and usage of soybean ......................................................... 45
   8. 4.8. The importance and usage of alfalfa ............................................................ 47
   9. References ............................................................................................................ 48

5. 5. Economics of “Industrial Crop” Production (potato, sugar, tobacco) ......................... 49
   1. 5.1. Potato production ......................................................................................... 49
   2. 5.2. Sugar sector .................................................................................................. 51
   3. 5.3. Tobacco sector ............................................................................................. 53
   4. References ............................................................................................................ 56

6. 6. Economics figures and general attributes of fruit production .................................... 58
   1. 6.1. Basic terms .................................................................................................... 58
   2. 6.2. Fruit production need for capital ................................................................. 59
   3. 6.3. Economic issues of apple production ......................................................... 61
      3.1. 6.3.1. Costs of inputs, investment and production ......................................... 62
      3.1.1. 6.3.1.1. Investment making period of the life-cycle ................................... 62
      3.1.2. 6.3.1.2. Fruiting period of the life-cycle .................................................. 63
      3.2. 6.3.2. Yield and revenue .............................................................................. 64
      3.3. 6.3.3. Profit, profitability .............................................................................. 65
      3.4. 6.3.4. Rentability over the life-cycle of the plantation .................................. 66
   7. 7. Complex economic issues of vegetable production ............................................. 69

Created by XMLmind XSL-FO Converter.
1. 7.1. Importance of vegetable production in Hungary ................................................. 69
2. 7.2. Farm business attributes of vegetable production ........................................... 72
3. 7.3. Economic issues of sweet corn production ......................................................... 73
   3.1. 7.3.1. Inputs and cost of production ................................................................. 73
   3.2. 7.3.2. Yield, revenue, value of production ......................................................... 75
   3.3. 7.3.3. Profit, profitability, efficiency ................................................................. 76
4. 7.4. Economic issues of green peas production ......................................................... 76
   4.1. 7.4.1. Inputs and cost of production ................................................................. 77
   4.2. 7.4.2. Yield, revenue, and value of production .................................................. 78
   4.3. 7.4.3. Profit, profitability, efficiency ................................................................. 79
5. References  .................................................................................................................... 79

8. 8. ECONOMIC ASPECTS OF FEED MANAGEMENT .................................................. 81
   1. 8.1. Basic aspects of feed management ................................................................. 81
   2. 8.2. Concept of the feed management at farm level ................................................ 81
   3. 8.3. Objectives of the Feed Management in Generally ......................................... 81
   4. 8.4. Factors of global feed management ............................................................... 82
      4.1. 8.4.1. Trends of the EU compound feed production and consumption ............ 82
   5. 8.5. Feed management at farm level ................................................................... 85
      5.1. 8.5.1. Elements and system of feed supply ...................................................... 85
      5.2. 8.5.2. The Process of Feed Management ......................................................... 86
         5.2.1. 8.5.2.1. Planning of Feed Base ................................................................. 86
         5.2.2. 8.5.2.2. Feedstuff production and/or purchasing - decision on the basis of feed-
                     balance .............................................................................................. 86
         5.2.3. 8.5.2.3. Evaluation of feed supply .............................................................. 86
         5.2.4. 8.5.2.4. Planning of feed utilisation - according to farm, animal and production
                     type ...................................................................................................... 87
      5.2.5. 8.5.2.5. Feedstuff consumption (feeding–distribution: by automatized or manual
                     syst.) ...................................................................................................... 87
      5.2.6. 8.5.2.6. Analysis of feed utilisation ............................................................... 87
6. 8.6. Trends and Challenges in Agriculture ............................................................... 88
7. References:  .................................................................................................................. 89

9. 9. ECONOMICS of the MILK PRODUCTION ............................................................. 90
   1. 9.1. International and national importance of dairy sector .................................... 90
   2. 9.2. The importance of milk production at farm level .......................................... 95
   3. 9.3. The problem tree of the Hungarian dairy farms ............................................ 96
4. Questions related to this Chapter ........................................................................ 98
5. References .................................................................................................................. 98

10. 10. ECONOMICS of the CATTLE MEAT PRODUCTION ........................................... 100
   1. 10.1. Main definitions ......................................................................................... 100
   2. 10.2. World cattle production and outlooks ..................................................... 100
   3. 10.3. EU cattle production and outlooks .......................................................... 105
   4. 10.4. Cattle farming assets .............................................................................. 108
   5. 10.5. Economics of the cattle meat production on farm level ......................... 108
   6. 10.6. European beef farms performance indicators economics definitions ........ 110
7. Questions related to this chapter ....................................................................... 112
8. References .................................................................................................................. 112

11. 11. ECONOMIC OF PIG PRODUCTION ................................................................... 114
   1. 11.1. The global pig meat consumption ............................................................. 114
   2. 11.2. Global pig meat production .................................................................. 115
   3. 11.3. Pig meat production, trade and consumption in Hungary ....................... 118
   4. 11.4. Pork production phases .......................................................................... 119
      4.1. 11.4.1. Breeding-gestation ......................................................................... 119
      4.2. 11.4.2. Farrowing ..................................................................................... 120
      4.3. 11.4.3. Nursery pigs .................................................................................. 120
      4.4. 11.4.4. Grow-finishing ............................................................................. 120
   5. 11.5. Advantages and disadvantages of pig growing ....................................... 121
      5.1. 11.5.1. Advantages ..................................................................................... 121
      5.2. 11.5.2. Disadvantages ................................................................................ 121
   6. 11.6. The effectiveness of Hungarian pork production ..................................... 122
7. 11.7. Domestic pork production expenses and cost conditions ......................... 123
6.2. 15.6.2. Biogas ........................................................................................................ 184
6.3. 15.6.3. Biofuels ..................................................................................................... 184
7. References ............................................................................................................ 186
Az ábrák listája

1.1. Figure 1.1.: Production rate of the most important cereals in the world (2011) .................................. 2
1.2. Figure 1.2.: The most important cereal producers in the world in 2011 ........................................... 2
1.3. Figure 1.3.: Cereal production in the EU-27 in 2010 ................................................................. 3
1.4. Figure 1.4.: Trade of cereals in the European Union ................................................................. 4
1.5. Figure 1.5.: Evolution of cereal production in Hungary between 1990 and 2011 ......................... 4
1.6. Figure 1.6.: Change in production of crops (Percentage change 2021 relative to average 2009-2011) 5
1.7. Figure 1.7.: The most important maize producer countries in the world .................................. 6
1.8. Figure 1.8.: Maize production in the EU-27 in 2010 ................................................................. 6
1.9. Figure 1.9.: Evolution of maize production in Hungary between 1990 and 2011 ..................... 7
1.10. Figure 1.10.: The most important rice producer countries in the world in 2011 ....................... 7
1.11. Figure 1.11.: Wheat production in the European Union in 2010 ............................................ 9
1.12. Figure 1.12.: The evolution of wheat trade in the EU-27 .......................................................... 10
1.13. Figure 1.13.: The evolution of wheat production in Hungary between 1990 and 2011 .......... 10
1.14. Figure 1.14.: Distribution of oil crops production in the world in 2011 .................................... 11
1.15. Figure 1.15.: Global distribution of fruit production (2011) ....................................................... 12
2.1. Figure 2.1.: The rate of various meats in global production in 2011 ........................................ 14
2.2. Figure 2.2.: Share of various meats in world trade in 2011 ..................................................... 15
2.3. Figure 2.3.: Meat production in the EU-27 in 2010 ................................................................. 15
2.4. Figure 2.4.: The Hungarian meat production between 1990 and 2010 ..................................... 16
2.5. Figure 2.5.: Distribution of world poultry meat production in 2011 ........................................ 17
2.6. Figure 2.6.: Poultry meat production in the EU-27 in 2010 ..................................................... 18
2.7. Figure 2.7.: Outlook for the EU poultry meat market (million tonnes), 1991 – 2014 ......... 18
2.8. Figure 2.8.: Evolution of poultry meat production, export-import and consumption in Hungary between 1992 and 2010 ................................................................. 19
2.9. Figure 2.9.: Distribution of world pig meat production in 2011 ................................................. 20
2.10. Figure 2.10.: Pig meat production in the EU-27 in 2010 ...................................................... 20
2.11. Figure 2.11.: Evolution of pig meat production, export-import and consumption in Hungary between 1992 and 2010 ................................................................. 21
2.12. Figure 2.12.: Distribution of world bovine meat production in 2011 ........................................ 22
2.13. Figure 2.13.: Bovine meat production in the EU-27 in 2010 ................................................. 22
2.14. Figure 2.14.: Evolution of bovine meat production, export-import and consumption in Hungary between 1992 and 2010 ................................................................. 23
2.15. Figure 2.15.: Distribution of world milk production in 2011 ................................................... 24
2.16. Figure 2.16.: Distribution of global egg production in 2011 ................................................... 25
2.17. Figure 2.17.: Capture fisheries production in 2010 ................................................................. 25
2.18. Figure 2.18.: Aquaculture production in 2010 ................................................................. 26
3.1. Figure 3.1.: Importance of the crop sector in the world (2009) ........................................... 28
3.2. Figure 3.2.: Importance of the crop sector in the EU-27 (2009) ........................................... 28
3.3. Figure 3.3.: Top 10 cereal producers in the world (2011) ...................................................... 29
3.4. Figure 3.4.: Top 10 maize producer in the world (2011) ...................................................... 31
3.5. Figure 3.5.: The major barley producer in the world (2010) .................................................. 32
3.6. Figure 3.6.: FAO Hunger Map between 2007 and 2009 ..................................................... 32
3.7. Figure 3.7.: FAO Cereal Price Index (2002-2004=100) ....................................................... 33
3.8. Table 3.4.: Production of major crops in Hungary (2007-2011) ........................................ 34
3.9. Table 3.5.: Average yield of major crops in Hungary (2007-2011) ........................................ 35
3.10. Figure 3.8.: Carrying costs of the farm crops by modes of transport and destination .......... 35
3.11. Figure 3.9.: Quantity of the export and import of wheat and maize (2000 - 2010) ........... 36
4.1. Table 4.1.: Oil Seed and Protein Crop Production in the EU .................................................. 39
4.2. Figure 4.1.: EU-27 Dependency in Feed Proteins ................................................................. 40
4.3. Figure 4.2.: Self Sufficiency of Soybean of the Largest Users of the World ......................... 40
4.4. Figure 4.3.: Production volume of sunflower seed in major producer countries from 2000/02 to 2011/12 (in million metric tons) ....................................................... 41
4.5. Figure 4.4.: The main rapeseed products ........................................................................... 43
4.6. Figure 4.5.: World consumption of vegetable oils from 1995/1996 to 2011/2012 (million metric tons) 44
4.7. Figure 4.6.: Soybean Production of the World .......................................................... 45
4.8. Figure 4.7.: Soybean processing .................................................................................. 46
5.1. Figure 5.1.: Trends in world potato production .............................................................. 49
5.2. Figure 5.2.: Potato production share by region (1992 – 2011) ..................................... 50
5.3. Figure 5.3.: Global sugar production and consumption .............................................. 52
5.4. Figure 5.4.: World sugar prices, 1991–2007, and the price outlook, 2007–2017 (USD/ton) ... 53
5.5. Figure 5.5.: Changes in the world’s tobacco production .............................................. 54
5.6. Figure 5.6.: Trend in tobacco production in top producer countries ............................ 54
5.7. Figure 5.7.: Evaluation of tobacco production area 2004-2010 in EU ......................... 55
6.1. Table 6.2.: Fruit production need for working capital at high technology level and input use (without postharvest) .......................................................... 60
6.2. Figure 1.: Trend in average cost of a kilogram of apple taken as a function of unit yield (postharvest costs not included) .......................................................... 63
6.3. Table 6.7.: Sales revenues of apple plantations treated at high level in a standard year .... 65
6.4. Figure 6.2.: Trends in NPV reduced by interest rate counted on the tied capital over the life-cycle of the plantation (r=7%) ........................................................................... 66
6.5. Figure 6.3.: Trends in NPV of “intensive” plantations with different yields ................. 67
6.6. Figure 6.4.: Trends in NPV of “semi-intensive” plantations with different yields .......... 68
7.1. Figure 7.1.: Dynamics of fruit and vegetable production ........................................... 69
7.2. Figure 7.2.: Dynamics of fruit and vegetable area of production ............................... 69
7.3. Figure 7.3.: Export-import data of fruit and vegetable sectors in Hungary [4] ............... 71
7.4. Table 7.8.: Sales revenue and value of production of sweet corn ............................... 75
7.5. Table 7.12.: Sales revenue and value of production of green peas production .......... 79
8.1. Figure 8.1.: Feed management: is a joining and a buffer point at the same time .......... 81
8.2. Figure 8.2.: Value of purchased compound feed in total animal output value in 2011 ...... 82
8.3. Figure 8.3.: The Food and Feed Chain in the EU ......................................................... 83
8.4. Figure 8.4.: Food Material Consumption by the Compound Feed Industry in the EU-27 in 2011 (151 mio U/0,3%) ........................................................................... 84
8.5. Figure 8.5.: Development of Compound Feed Production in the EU per category excl. MT, EL, LU 84
8.6. Figure 8.6.: EU-27 Dependency in Feed Proteins .......................................................... 84
8.7. Figure 8.8.: The System of Feed Supply ....................................................................... 85
8.8. Figure 8.7.: The main challenges for the agriculture sector ......................................... 88
8.9. Figure 8.8.: How to Feed the World? ......................................................................... 89
9.1. Figure 9.1.: Evolution of world milk production between 1996–2011 .......................... 90
9.2. Figure 9.2.: Distribution of world dairy production in 2011 ....................................... 91
9.3. Figure 9.3.: Distribution of milk production within the EU(27) in 2011 ....................... 91
9.4. Figure 9.3.: Per capita milk- and milk product consumption in the world ................... 92
9.5. Figure 4.: Change in producer price of raw milk in the world between 2001 and 2010 (previous year=100%) ........................................................................... 93
9.6. Figure 9.5.: Brief overview of the Hungarian dairy sector .......................................... 93
9.7. Figure 9.6.: Evolution of the domestic producer price of raw milk between October 2007 and October 2012 in Hungary ........................................................................... 95
9.8. Figure 9.7.: Factors have influence on the production value of milk production ........ 96
9.9. Figure 9.8.: Factors have influence on the production cost of milk production .......... 96
9.10. Figure 9.9.: The problem tree of the Hungarian dairy farms ....................................... 97
10.1. Figure 10.1.: The world map of cattle density ............................................................. 100
10.2. Figure 10.2.: Beef and dairy country distribution in the world ................................... 101
10.3. Figure 10.3.: World meat production ....................................................................... 102
10.4. Figure 10.4.: World cattle meat production share in 2011 ........................................ 103
10.5. Figure 10.5.: Per capita beef consumption in selected countries (2009) ..................... 103
10.6. Figure 2.6.: Growth in demand estimation for beef from 2000 to 2030 .................... 104
10.7. Figure 10.6.: Situation of the global cattle meat trade ............................................... 105
10.8. Figure 10.8.: The European Union cattle meat production ....................................... 105
10.9. Figure 10.9.: Cattle slaughtered by animal category in the EU, 2011 (in 1000 tonnes) .... 106
10.10. Table 10.1.: EU 27 beef and veal balance sheet ....................................................... 107
10.11. Figure 10.10.: EU agricultural meat market and consumer price developments (January 2000 until December 2012, Jan2000=100) ........................................................................... 107
10.12. Picture 10.1.: The basic cattle farming assets for small family farms ....................... 108
10.13. Figure 10.11.: Factors affecting the value of production in cattle farm .................... 109
<table>
<thead>
<tr>
<th>Page References</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>10.14.</td>
<td>Figure 10.12.:Factors affecting the production cost in cattle farm</td>
</tr>
<tr>
<td>10.15.</td>
<td>Table 10.2.:The European beef farms basic average parameters</td>
</tr>
<tr>
<td>10.16.</td>
<td>Figure 10.13.:Beef production costs and gross margins in EU-15 and EU-10</td>
</tr>
<tr>
<td>10.17.</td>
<td>Figure 10.14.:Income per EU group and type</td>
</tr>
<tr>
<td>11.1.</td>
<td>Figure 11.1.:Global Meat Consumption</td>
</tr>
<tr>
<td>11.2.</td>
<td>Figure 11.2.:Meat consumption in selected EU Member States in 2012.</td>
</tr>
<tr>
<td>11.3.</td>
<td>Figure 11.3.:The global meat production (2000-2011)</td>
</tr>
<tr>
<td>11.4.</td>
<td>Table 11.1.:World pork production in the last decade</td>
</tr>
<tr>
<td>11.5.</td>
<td>Figure 11.4.:The World market outlook of pig meat</td>
</tr>
<tr>
<td>11.6.</td>
<td>Table 11.2.:Forecast change of production of pig meat</td>
</tr>
<tr>
<td>11.7.</td>
<td>Figure 11.5.:Pig producers in the word</td>
</tr>
<tr>
<td>11.8.</td>
<td>Figure 11.6.:Meat Production in EU</td>
</tr>
<tr>
<td>11.9.</td>
<td>Figure 11.7.:Pig meat production, trade, and consumption in Hungary</td>
</tr>
<tr>
<td>11.10.</td>
<td>Figure 11.8.:Per capita meat consumption in Hungary</td>
</tr>
<tr>
<td>11.11.</td>
<td>Figure 11.9.:Pig production cycle</td>
</tr>
<tr>
<td>11.12.</td>
<td>Figure 11.10.:Prices for pig carcasses (grade E) in EU countries</td>
</tr>
<tr>
<td>12.1.</td>
<td>Figure 12.1:World meat production (2005-2011) (million tons)</td>
</tr>
<tr>
<td>12.2.</td>
<td>Figure 12.2:World broiler and turkey meat production (2006-2011) (million tons)</td>
</tr>
<tr>
<td>12.3.</td>
<td>Table 12.1:Global picture of the poultry meat sector</td>
</tr>
<tr>
<td>12.4.</td>
<td>Figure 12.3:Overview of the broiler production chain</td>
</tr>
<tr>
<td>12.5.</td>
<td>Figure 12.4:Europe’s 11 largest poultry processing companies</td>
</tr>
<tr>
<td>12.6.</td>
<td>Figure 12.5:The 10 larger poultry producer companies of USA (2009)</td>
</tr>
<tr>
<td>12.7.</td>
<td>Figure 12.6:Limits to broiler growth and quality</td>
</tr>
<tr>
<td>12.8.</td>
<td>Figure 12.7:Producer prices of chicken meat (USD/ton of live weight) (2007)</td>
</tr>
<tr>
<td>12.9.</td>
<td>Figure 12.8:Broiler live weight prices in the EU (producer prices of slaughter chicken)</td>
</tr>
<tr>
<td>12.10.</td>
<td>Figure 12.9:Chicken in whole (65%) processor sale prices in some EU countries</td>
</tr>
<tr>
<td>12.11.</td>
<td>Figure 12.10:Production cost for broilers (2007)</td>
</tr>
<tr>
<td>12.12.</td>
<td>Figure 12.11:World egg production (2000-2009)</td>
</tr>
<tr>
<td>12.13.</td>
<td>Figure 12.12:Leading hen egg producing countries (2011)</td>
</tr>
<tr>
<td>12.14.</td>
<td>Figure 12.13:Average producer prices of hen eggs (thousand tons and USD/ton) (2007)</td>
</tr>
<tr>
<td>12.15.</td>
<td>Figure 12.14:Table eggs (size M+L) prices at packaging station in the EU(2011-2012)</td>
</tr>
<tr>
<td>12.16.</td>
<td>Figure 12.15:Table eggs (size M+L) prices at packaging station in some EU countries (2011-2012)</td>
</tr>
<tr>
<td>12.17.</td>
<td>Table 12.3:Systems for producing eggs</td>
</tr>
<tr>
<td>12.18.</td>
<td>Figure 12.16:Relationship between costs for animal welfare and the areaper laying hen</td>
</tr>
<tr>
<td>12.19.</td>
<td>Figure 12.17:Production costs for eggs (2008)</td>
</tr>
<tr>
<td>13.1.</td>
<td>Table 13.1:An example of the average land requirement (in Hungary for a ewe and her lambs for one production year)</td>
</tr>
<tr>
<td>13.2.</td>
<td>Figure 13.1:Meat Consumption in the EU</td>
</tr>
<tr>
<td>13.3.</td>
<td>Figure 13.2:Sheep and Goat Population in the EU</td>
</tr>
<tr>
<td>13.4.</td>
<td>Figure 13.3:Sheep and Goat meet supply in the EU</td>
</tr>
<tr>
<td>13.5.</td>
<td>Figure 13.4:EU Sheep and Goat Meat Balance</td>
</tr>
<tr>
<td>13.6.</td>
<td>Figure 13.5:Light lamb Prices in the EU</td>
</tr>
<tr>
<td>13.7.</td>
<td>Figure 13.6:Light Lamb Prices in the EU</td>
</tr>
<tr>
<td>13.8.</td>
<td>Figure 13.7:Comparison between producer prices for animal products and feedstuff prices (Nominal Index 1995=100%)</td>
</tr>
<tr>
<td>13.9.</td>
<td>Figure 13.8:EBT per non-salaried AWU (kEuro/AWU)</td>
</tr>
<tr>
<td>14.1.</td>
<td>Table 14.1:Global production of fish and fisheries products</td>
</tr>
<tr>
<td>14.2.</td>
<td>Figure 14.1:Global production of capture fisheries and aquaculture</td>
</tr>
<tr>
<td>14.3.</td>
<td>Figure 14.2:Global fish utilisation and supply</td>
</tr>
<tr>
<td>14.4.</td>
<td>Figure 14.3:Consumption of fishery and aquaculture products (2007)</td>
</tr>
<tr>
<td>14.5.</td>
<td>Figure 14.4:Production (cathes and aquaculture) by Member State (2009)</td>
</tr>
<tr>
<td>14.6.</td>
<td>Table 14.2:Total aquaculture production in the EU27 (2009)</td>
</tr>
<tr>
<td>14.7.</td>
<td>Figure 14.5:Share of EU aquaculture production per product type (2009)</td>
</tr>
<tr>
<td>14.8.</td>
<td>Figure 14.6:Trade of fisheries and aquaculture products between EU and third countries in 2010 (volume in tonnes and value in 1000 EUR)</td>
</tr>
<tr>
<td>14.9.</td>
<td>Figure 14.7:Consumption of fisheries and aquaculture products in 2007(quantity in live weight: kg/capita/year)</td>
</tr>
<tr>
<td>14.10.</td>
<td>Figure 14.8:The most important fish producing regions in Hungary</td>
</tr>
<tr>
<td>14.11.</td>
<td>Figure 14.9:The fish production of aquaculture in Hungary (2002-2012)</td>
</tr>
</tbody>
</table>
14.12. Figure 14.10.: Share of the table size aquaculture fish production by species in Hungary (2012)
164
14.13. Figure 14.11.: The most important factors influencing yields ................................. 169
14.14. Figure 14.12.: System of factors determining production value in fish-pond cultures .... 171
14.15. Figure 14.13.: Trend of producer and consumer prices for carp .............................. 172
14.16. Figure 14.14.: System of factors determining production cost of fish production ......... 173
14.17. Table 14.4.: Annual cost structure of a full-scale pond fish culture ............................ 175
15.1. Table 15.1.: Global energy data (2011) ...................................................................... 177
15.2. Figure 15.1.: Biogas yields from energy grass compared with other organic matters .... 179
15.3. Table 15.2.: Basic technological data of the most important energy tree species ........ 181
15.4. Table 15.3.: The annual dry yields of open field experiments ...................................... 182
15.5. Table 15.4.: Main characteristics of bioenergy methods ............................................. 183
A táblázatok listája

1.1. Table 1.1.: Leading wheat producers in the world ................................................................. 8
1.2. Table 1.2.: World production of major oilseeds ................................................................. 11
3.1. Table 3.1.: World balance of the global wheat production and usage .................................. 30
3.2. Table 3.2.: World balance of the global rice production and usage ...................................... 30
5.1. Table 5.1.: Projected annual growth rates (average annual percent) for demand of potatoes for food and feed, 1993-2020 ................................................................. 51
6.1. Table 6.1.: Demand for fixed assets producing fruits at current prices .................................. 59
6.2. Table 6.3.: Main parameters of the introduced apple plantations ........................................... 61
6.3. Table 6.4.: Investment cost of the introduced apple plantations (‘000 HUF/ha) ..................... 62
6.4. Table 6.5.: Costs of apple production at high level technology and operations in an average year yielding 40 t/ha ........................................................................................................... 63
6.5. Table 6.6.: Post-harvest costs of apple production ............................................................... 64
6.6. Table 6.8.: Incomes and efficiency measures of apple plantations treated at high level in a standard year ......................................................................................................................... 65
7.1. Table 7.1.: Yield and area of production of horticulture over 2008-2011 .................................. 70
7.2. Table 7.2.: Gross output of agriculture by main product groups (calculated at current prices) . 70
7.3. Table 7.3.: Breakdown of gross value of production of horticulture by sectors ....................... 71
7.4. Table 7.4.: Demand for fixed assets producing (not-forced) vegetable .................................. 72
7.5. Table 7.5.: The average costs of current assets of the main enterprises of vegetable production 73
7.6. Table 7.6.: Breakdown of direct costs of sweet corn production a year by operations ............ 74
7.7. Table 7.7.: Direct and indirect costs of sweet corn production a year .................................... 75
7.8. Table 7.9.: Gross margin and efficiency measures of sweet corn production ....................... 76
7.9. Table 7.10.: Breakdown of direct costs of green peas production a year by operations .......... 77
7.10. Table 7.11.: Direct and indirect costs of green peas production a year ................................. 78
7.11. Table 13.: Gross margin and efficiency measures of green peas production ....................... 79
8.1. Table 8.1.: Feed Conversion Ratio (FCR), Feed Cost/Product unit, Average Cost ............... 87
8.2. Table 8.2.: Stock density on pasture - Sheep and Beef ....................................................... 88
11.1. Table 11.3.: Production level in Hungarian pig-farms ......................................................... 122
12.1. Table 12.2: ROSS 308 broiler performance objectives (2012) ........................................... 134
14.1. Table 14.3.: Community aid by axis (CFP 2007-2013) ....................................................... 162
Tárgymutató

Sectorial Economy II.

Authors:
- Ferenc Ágota (9. and 11. chapter)
- Anikó Bal (15. chapter)
- Bálint Bence (5. chapter)
- Benta Dianó (1, 2, and 3. chapter)
- Norbert Farkas (6. and 7. chapter)
- Zsófia Koss (9. chapter)
- Krisszán Kovács (10. chapter)
- Nóra László (4., 8., and 13. chapter)
- Andri Németh (11. chapter)
- Nóra Petsch (3. chapter)
- László Sallósi (12. chapter)
- János Szőcs (14. chapter)

Editor:
- Zsolt Bényi

TÁMOP-4.1.2.A/1-11/1-20
University of M
Service Sciences Methodology
1. fejezet - 1. ECONOMIC IMPORTANCE OF FOOD OF PLANT ORIGIN

Foods of plant origin are produce (fruits and vegetables), sprouts, culinary herbs, nuts, edible fungi, maple and honey products. This chapter tries to illustrate the economic importance of food of plant origin, especially the significance of the globally most important cereals (rice, maize, and wheat), oil crops, sugar, fruits and vegetables.

1. 1.1. Production and trade of cereals

Global cereal production was 2344.1 million tonnes in 2011, which can be considered a record crop. In 2012 production fell by 2.7 percent from previous year’s record crop, but almost matched the second best performance of 2008. The overall decrease reflects a 5.5 percent reduction in wheat, and a 2.5 percent decline in coarse grains, while the global rice crop is seen to grow by 0.7 percent above last season record. Severe droughts this year in the United States and across a large part of Europe and into central Asia have been the main cause of the reduced wheat and coarse grains crops. World cereal production in 2013, including rice, is forecast to reach a record 2 460 million tonnes (FAO-OECD, 2012).

1.1. ábra - Figure 1.1.: Production rate of the most important cereals in the world (2011)

Source: FAO-OECD, 2012

As Figure 1.1. demonstrates, the most significant cereals are maize (~34%), rice (~30%) and wheat (~27%) in the world as regards the production rate of them. The globally most important cereal producer countries are China (~20%), the United States of America (~16%), the European Union (~12%), India (~10%) and the Russian Federation (~4%) (Figure 1.2.).

Global trade of cereals was 12.5 percent of total production in 2011, i.e. it was 293 million tonnes. The largest exporters were the USA, Argentina and the Russian Federation; while the most significant importer countries were Japan, Egypt and Mexico.

1.2. ábra - Figure 1.2.: The most important cereal producers in the world in 2011

Source: FAO-OECD, 2012
1. ECONOMIC IMPORTANCE OF FOOD OF PLANT ORIGIN

Source: FAO-OECD, 2012

1.3. ábra - Figure 1.3.: Cereal production in the EU-27 in 2010

Source: FAO-OECD, 2012

As Figure 1.2. illustrates the third largest cereal producer in the world was the EU-27 in 2011. It contributed to global production by more than 12 percent. Cereal production was 283.3 million tonnes in 2010 in the EU-27. It
increased by 1.8% and reached 288.3 million tonnes in 2011. It is forecast to decrease in 2012, the amount of production is estimated to be 285.9 million tons (FAO-OECD, 2012). The major cereal producer countries within the European Union were France, Germany, Poland, the United Kingdom, Spain and Italy. The ‘top ten’ cereal producers gave more than 85 percent of the entire cereal production of the EU-27. Hungary is among the ‘top ten’ cereal producer countries within the EU-27 (Figure 1.3.). The three most important cereals within the EU-27 are wheat in the first place with the ratio of about 49 percent, maize as the second one with the rate of 20 percent and barely as the third one with the rate of 19 percent. The European Union is mainly an exporter as regards cereals, in 2011/12 it exported 21.5 million tons and imported 13.6 million tons cereals (Figure 1.4.).

1.4. ábra - Figure 1.4.: Trade of cereals in the European Union

Source: FAO-OECD, 2012

Hungary is among the ten largest cereal producer countries within the EU-27. In the case of cereals the area under cultivation was 2678 thousand hectares in Hungary, the average yield was about 5100 kg/hectare and production quantity was more than 13500 thousand tons in 2011 (Figure 1.5.). As regards cereals Hungary can be absolutely considered an exporter country.

1.5. ábra - Figure 1.5.: Evolution of cereal production in Hungary between 1990 and 2011

Source: HSCO1, 2012

---

1Hungarian Central Statistical Office
“Global cereal production is expected to grow by 1.1% per annum, on average, to 2021 and down from 2.5% per annum in the previous decade. A slowdown in both yield growth and area expansion are expected to be responsible for the deceleration in the pace of cereal output increase. World production of coarse grains and rice are projected to grow slightly more rapidly at 1.4% and 1.2% per annum, respectively, than global wheat production (0.9% per annum). The growth in global production of cereals is expected to be marginally less rapid than the projected growth in annual consumption to 2021, implying a general tightening of the cereal market supply situation” (OECD/FAO, 2012).

“Despite slower projected growth in cereal output, the production of wheat is set to expand strongly in traditional producing regions within the developed countries that will account for 59% of the additional output to 2021 (Figure 1.6.). For coarse grains, the United States continues to dominate the global industry, especially for maize, but with strong growth in output anticipated in China, the European Union, Brazil, India, Argentina, Mexico and Canada. Asian countries will continue to dominate rice production. World oilseed production is also projected to slow following strong growth in the previous decade as additional land was drawn into production in response to high prices. Nonetheless, global production of oilseeds is projected to increase by around 20% by 2021, when compared to the base period, with additional oilseed acreage contributing to about half the increase. Global vegetable oil production, which has been growing rapidly in response to strong demand, is projected to increase by more than 28% over the outlook period with seven countries (Argentina, Brazil, China, the United States, India, Indonesia and Malaysia) accounting for 75% of the expansion” (OECD/FAO, 2012).

“Sugar is one of the few products where world production is expected to post superior growth rates in the coming decade than was the case for the previous ten years. Production is expected to grow slightly faster at 1.9% per annum, on average, to 2021, compared to an estimated growth of 1.7% per annum, in the last decade” (OECD/FAO, 2012).

1.6. ábra - Figure 1.6.: Change in production of crops (Percentage change 2021 relative to average 2009-2011)

Source: OECD/FAO, 2012

1.1.1. The economic importance of maize production and trade

Global maize production was 880 million tons in 2011 and it is forecast to increase by 4.1% and reach 916.4 million tons in 2012. In 2011 the United States of America, China and the European Union contributed to the global maize production by 65%, Figure 1.7. demonstrates the ‘top ten’ maize producer countries in the world. In two of the three most important maize producer regions (the United States and the European Union) can be expected a decrease in production that primarily can be in connection with the severe drought in the major growing area of the USA and in central and eastern part of Europe. Meanwhile in China, latest information confirms a significant increase in maize production.

In 2011 8% of total maize production, i.e. 95 million tons gave the amount of international trade. International maize trade down almost 7% from the previous season’s near record volume of almost 101 million tons. This sharp decrease mostly reflects this season’s reduction in maize supply in the United States, the world largest
1. ECONOMIC IMPORTANCE OF 
FOOD OF PLANT ORIGIN

producer and exporter of maize. The largest maize exporter countries are the Unites States of America, Argentina and Ukraine, while the most significant importer countries are Japan, Mexico and China.

1.7. ábra - Figure 1.7.: The most important maize producer countries in the world

![Pie chart showing maize production by country, with USA at 35.7%, China at 21.8%, EU-27 at 7.6%, Brazil at 6.4%, and others at 15.5%.]

Source: FAO-OECD, 2012

Maize production was 57.3 million tons in 2010 in the EU-27. It increased by 16% and reached 66.6 million tons in 2011. In 2012 the amount of production is estimated to be 64 million tons. The ten largest maize producer countries in the European Union contributed to the total production by almost 95%. Hungary was the 4th most important maize producer as regards the production quantity in the EU-27 in 2010 did down Germany as well (Figure 1.8.).

1.8. ábra - Figure 1.8.: Maize production in the EU-27 in 2010

Source: FAO-OECD, 2012

As regards trade the European Union is a net importer, since in 2012 it imported 5.5 million tons maize, while its export quantity was 2.0 million tons.
1.9. ábra - Figure 1.9.: Evolution of maize production in Hungary between 1990 and 2011

![Graph showing maize production in Hungary (1990-2011)]

Source: HCSO, 2012

Figure 1.9. presents the evolution of maize production in Hungary between 1990 and 2011. In 2011 1.23 million hectares of arable land were utilized for maize production in Hungary, resulting in 7992 thousand tonnes of production quantity and an average yield of 6.5 tonnes/hectare. Hungary is in the 4th place in the range of the largest wheat producer countries in the EU-27 after France, Romania, and Italy. Hungary can be considered a maize exporter country in the European Union, although the import quantity of maize has been increasing year by year.

1.2. 1.1.2. The economic importance of rice production and trade

As Figure 1.10. demonstrates, the most important rice producer countries are mainly located in Asia. In 2011 China and India gave half of the global rice production, which was about 480 million tons in 2011/12. “The 2012 rice season is unfolding positively in most regions, as a revival of the monsoon rains has allayed fears of a repeat of the 2009 drought in India. As a result, global production is forecast to exceed last year’s record by about 1 percent and reach 486 million tons (milled rice basis), a level more than sufficient to cover world consumption in 2012/13” (FAO-OECD, 2012).

1.10. ábra - Figure 1.10.: The most important rice producer countries in the world in 2011

![Pie chart showing rice production by country (2011)]

Source: FAO-OECD, 2012
The world trade of rice was 36.4 million tonnes in 2011, which was 7.7% of global production and it is estimated to grow by 2.5% in 2012 and reach 37.3 million tonnes. The most significant rice exporter countries are India, Viet Nam, Thailand and the United States of America, while the largest rice importer countries are Nigeria, China and Iran.

“Global rice utilization in 2012/13 is predicted to increase by 1.4 percent to 475 million tonnes driven largely by population. Being a major staple food, over 85 percent of the total, or 402 million tonnes, are estimated to be destined for human consumption, with only a small amounts diverted to feed or industrial uses. Per capita consumption is expected to reach an estimated average of 56.8 kg per year, up from 56.7 kg in the previous year” (FAO-OECD, 2012).

1.3. 1.1.3. The economic importance of wheat production and trade

As the latest forecasts present (Table 1.1.) the global wheat production is about 661 million tonnes in 2012, which is under the latest year’s level by 5.5 percent, but close to the average of the past five years. This production level reflects the impact of severe draught in Eastern Europe and central Asia. As Table 1.1. illustrates wheat output in the Russian Federation is estimated 30 percent down from 2011; a similar decline is estimated in Ukraine and in Kazakhstan as well (FAO-OECD, 2012). FAO’s forecast for global wheat production in 2013 has been raised to a new record level of 702 million tonnes, 6.5 percent up from the last year’s reduced harvest.

1.1. táblázat - Table 1.1.:Leading wheat producers in the world

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Million tonnes</td>
<td></td>
<td>%</td>
</tr>
<tr>
<td>European Union</td>
<td>137.5</td>
<td>130.8</td>
<td>-2.1</td>
</tr>
<tr>
<td>China (Mainland)</td>
<td>117.4</td>
<td>119.0</td>
<td>-2.0</td>
</tr>
<tr>
<td>India</td>
<td>86.9</td>
<td>93.9</td>
<td>1.6</td>
</tr>
<tr>
<td>United States</td>
<td>54.4</td>
<td>61.8</td>
<td>8.5</td>
</tr>
<tr>
<td>Russian Federation</td>
<td>56.2</td>
<td>39.0</td>
<td>1.1</td>
</tr>
<tr>
<td>Australia</td>
<td>29.5</td>
<td>22.5</td>
<td>-11.9</td>
</tr>
<tr>
<td>Canada</td>
<td>25.3</td>
<td>26.7</td>
<td>3.2</td>
</tr>
<tr>
<td>Pakistan</td>
<td>24.3</td>
<td>24.0</td>
<td>-1.2</td>
</tr>
<tr>
<td>Turkey</td>
<td>21.8</td>
<td>20.1</td>
<td>-11.0</td>
</tr>
<tr>
<td>Ukraine</td>
<td>22.3</td>
<td>15.5</td>
<td>-37.2</td>
</tr>
<tr>
<td>Kazakhstan</td>
<td>22.7</td>
<td>10.8</td>
<td>-36.1</td>
</tr>
<tr>
<td>Iran Islamic Rep.</td>
<td>13.5</td>
<td>13.8</td>
<td>-3.6</td>
</tr>
<tr>
<td>Argentina</td>
<td>13.7</td>
<td>11.5</td>
<td>-3.0</td>
</tr>
<tr>
<td>Egypt</td>
<td>8.4</td>
<td>8.7</td>
<td>1.2</td>
</tr>
</tbody>
</table>
1. ECONOMIC IMPORTANCE OF FOOD OF PLANT ORIGIN

<table>
<thead>
<tr>
<th></th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
</tr>
</thead>
<tbody>
<tr>
<td>Uzbekistan</td>
<td>6.3</td>
<td>6.7</td>
<td>1.6</td>
</tr>
<tr>
<td>Other countries</td>
<td>59.2</td>
<td>56.4</td>
<td>-6.1</td>
</tr>
<tr>
<td>World</td>
<td>699.4</td>
<td>661.2</td>
<td>-3.6</td>
</tr>
</tbody>
</table>

Source: FAO-OECD, 2012

In 2011 147 million tons wheat, which was 21.02% of total wheat production, gave the amount of international wheat trade. Forecast for world wheat trade exports in 2012/13 (July/June) stands at 135 million tons (20.42% of global wheat production), down 1.7 million tons from 2011/12 and 4.6 million tons from the all time high of 139.7 million tons in 2008/09. Major wheat exporters are: the United States of America, the Russian Federation, Australia, Canada, the European Union, Argentina, Kazakhstan and Ukraine.

World wheat utilization was 663 million tons in 2010, 71% of this quantity was utilized as food, 18% of it was used as feed in the animal sector and the rest 11% represented the part of other uses – which include industrial use, seeds and post-harvest losses. The global wheat utilization in 2011 almost reached the value of 700 million tons and in 2012 it is forecast to decline and reach 687 million tons, down 1.5 percent from the high level in the previous year. The projected decline in total wheat utilization would be mostly on account of a lower feed usage of wheat by the animal sector (FAO-OECD, 2012).

1.11. ábra - Figure 1.11.: Wheat production in the European Union in 2010

Source: FAO-OECD, 2012
Wheat production was 139.1 million tons in 2010 in the EU-27. It decreased by 0.9% and reached 137.9 million tons in 2011. This tendency is forecast in 2012 as well, the amount of production is estimated to be 135.0 million tons in the European Union. The first ten largest wheat producer countries, among others France, Germany, the Unites Kingdom, Poland, Italy, Romania, give almost 90% of total wheat production in the EU-27 (Figure 1.11).

As Figure 1.12. presents the European Union is absolutely wheat exporter, but in the last year the amount of imported quantity started to increase, while the amount of exported quantity of wheat decreased.

1.12. ábra - Figure 1.12.: The evolution of wheat trade in the EU-27

![Wheat Trade Graph](image)

Source: FAO-OECD, 2012

Figure 1.13. illustrates the evolution of wheat production in Hungary between 1990 and 2011. In 2011 almost 1 million hectare arable land was utilized for wheat production in Hungary, this production resulted in 4107 thousand tons production quantity and 4.2 t/hectare average yield. With this production quantity Hungary is on the 11th place in the range of the largest wheat producer countries in the EU-27 after Bulgaria. Hungary can be considered a wheat exporter country in the European Union, although the import quantity of wheat has been increasing year by year.

1.13. ábra - Figure 13.: The evolution of wheat production in Hungary between 1990 and 2011

![Wheat Production Graph](image)

Source: HCSO, 2012
2. 1.2. The economic importance of oil crops production and trade

As Table 1.2. presents in the season of 2010/11 the total production of the major oilseeds was about 460 million tons. From this value soybeans represented 58% and its rate from total production is forecast to increase in the following season as well. As it is forecast there will be slight increase (4.9%) in production of the major oil crops and it will exceed the quantity of 460 million tonnes. The major producer countries were the United States, Brazil and China, which contributed to global oil crops production by more than 50% in 2011 (Figure 1.14.). Oil crops production was about 29 million tonnes in 2011 in the EU-27 and it is forecast to stagnate in 2012. The most important producer countries within the European Union were Germany, France Spain and Italy in 2010. Hungary was among the ‘top ten’ producer countries on the 9th place.

The international trade of oil crops gave 23.5% of the total production, i.e. about 110 million tonnes in 2010/11. The most significant exporters were the United States, Brazil and Canada, while the major importers were China, the EU-27 and Japan.

1.2. táblázat - Table 1.2.: World production of major oilseeds

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Million tonnes</td>
<td>%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Soybeans</td>
<td>265.2</td>
<td>239.8</td>
<td>268.6</td>
<td>12.0</td>
</tr>
<tr>
<td>Rapeseed</td>
<td>60.8</td>
<td>61.5</td>
<td>60.1</td>
<td>-2.3</td>
</tr>
<tr>
<td>Cottonseed</td>
<td>43.7</td>
<td>46.5</td>
<td>43.3</td>
<td>-6.8</td>
</tr>
<tr>
<td>Groundnuts</td>
<td>36.9</td>
<td>36.6</td>
<td>37.0</td>
<td>1.2</td>
</tr>
<tr>
<td>Sunflower seed</td>
<td>33.1</td>
<td>38.8</td>
<td>35.2</td>
<td>-9.3</td>
</tr>
<tr>
<td>Palm kernels</td>
<td>12.6</td>
<td>12.8</td>
<td>13.5</td>
<td>4.8</td>
</tr>
<tr>
<td>Corpa</td>
<td>4.9</td>
<td>5.3</td>
<td>5.4</td>
<td>2.5</td>
</tr>
<tr>
<td>Total</td>
<td>457.2</td>
<td>441.4</td>
<td>463.3</td>
<td>4.9</td>
</tr>
</tbody>
</table>

Source: FAO-OECD, 2012

1.14. ábra - Figure 1.14.: Distribution of oil crops production in the world in 2011
1. ECONOMIC IMPORTANCE OF FOOD OF PLANT ORIGIN

3. 1.3. The economic importance of fruit and vegetable production

Fruit production area in the world is about 50 million hectare. Global fruit production is circa 500-550 million tonnes. The European Union produces fruit on 6 million hectare and fruit production is about 60-70 million tonnes (Italy 19, Spain 15, France 12, Germany 5, Poland 5, Greece 4 million tonnes). Main species are apple, pear, peach, citrus fruit. Fruit import is about 20 million tonnes; the export is 30 million tonnes in the EU-27. Fruit consumption in the EU-27 is 40-50 million tonnes/annum. Per capita fruit consumption is 100-170 kg/capita/annum in the south regions, while elsewhere it is 50-80 kg/capita/annum.

Figure 1.15.: Global distribution of fruit production (2011)

Source: FAO-OECD, 2012

The global vegetable production is about 650 million tonnes. The vegetable production in the European Union is about 50-55 million tonnes (Italy 15, Spain 12, France 8, Greece 4 million tonnes). Main species are tomato, cauliflower, cucumber, lettuce. The world most important vegetable importer is the EU-27. Vegetable consumption in the EU-27 is 40-42 million tonnes/annum. Per capita vegetable consumption is 150-200 kg/capita/annum in the south regions, while elsewhere it is 60-90 kg/capita/annum.

4. Questions related to this Chapter
1. How could you define food of plant origin?

2. Sum up the current situation of global cereal sector! Which are the most important tendencies?

3. Describe the most significant features of the different cereals in the level of the world, EU-27 and Hungary!

4. How could you illustrate the world oil crops sector?

5. How could you describe the sugar production in the world?

6. Briefly sum up the importance of global fruit and vegetable production!

5. References


2. HSCO database (2012): http://www.ksh.hu/mezogazdasag

2. fejezet - 2. ECONOMIC IMPORTANCE OF FOOD OF ANIMAL ORIGIN

Fifteen main groups of food commodities are mentioned by FAO, nine are of plant origin, four of animal origin, and two of both plant and animal origin. The foods of animal origin consumed by humans comprise meat and offal, milk and milk products, eggs, fish and other sea foods. Such items are concentrated sources of protein, fat, vitamins and minerals which greatly contribute to human nutrition, health and development. As a rich source of proteins, minerals and vitamins, these foods of animal origin act as body building foods, protective foods and regulatory foods. Animal proteins are high quality protein i.e. containing all the essential amino acids. These are considered as superior protein than that from plant origin.

Meat is animal tissue used as food. Most often, it refers to skeletal muscle and associated fat. It may also refer to non-muscle organs, including the offal (heart, liver, kidney etc.).

Eggs are a common food and are important in many branches of the modern food industry. Hen’s egg is the most commonly used egg. Eggs from duck, goose and quail are occasionally used. Egg proteins are highly utilized in body i.e. biological value of egg is very high.

Milk is secreted by the mammary glands of mammals to feed their young ones. Cow/ Buffalo/ Goat milk a white fluid of low viscosity and slightly sweet taste is most commonly used as human food. Nutritionally, milk performs the full range of functions of a complete food.

Fish as a food indicates the edible parts of freshwater and saltwater dwelling, cold-blooded vertebrates with gills. Shellfish, such as molluscs and crustaceans fall into the broadest category of fish.

1. 2.1. The economic importance of meat

Global meat production in 2011 was 297.2 million tonnes. It is forecast to grow by 1.6% to 302.0 million tonnes in 2012. The largest meat producers are China, the European Union, the United States and Brazil. Figure 2.1. presents the rate of various meats in global production in 2011. According to the estimation of FAO-OECD (2012) there will be change in the production quantity of various meats: the production of pig meat is estimated to increase by 2.6% in 2012 and reach about 112 million tonnes; the production of poultry meat will also grow by 1.8% and reach 103.5 million tonnes; the production quantity of the less considerable ovine meat in global meat production is forecast to increase by 0.9% to 13.6 million tonnes; and the production of bovine meat is projected to stagnate in 2012.

2.1. ábra - Figure 2.1.: The rate of various meats in global production in 2011

![Chart showing the rate of various meats in global production in 2011]

Source: FAO-OECD, 2012

World trade in meat was 28.5 million tonnes in 2011; it was 9.6% of total meat production. It is forecast to grow and reach 29.2 million tonnes in 2012. The most significant exporters are the United States, Brazil, the European Union, China, Canada, while the major importers are China, Japan, the Russian Federation, Mexico and the
United States. Poultry meat represents almost the half of meats in world trade (45%), while the rate of pig meat and bovine meat is around 25% and the share of ovine meat in world trade is the less considerable with its 2% ratio (Figure 2.2.).

2.2. ábra - Figure 2.2.: Share of various meats in world trade in 2011

The global per capita meat consumption was around 42 kg/capita/year in 2011, but there is an essential difference between the developed and developing countries as regards meat consumption. In developed countries per capita meat consumption was 78.9 kg/capita/year, while in developing countries this value was 32.3 kg/capita/year in 2011 (FAO-OECD, 2012).

Meat production in the EU-27 stagnated in the last few years. The total meat production was 44.8 million tonnes in the EU-27 in 2010, it was 45.5 million tonnes in 2011 and it is forecast to stagnate or decrease by 0.9% in 2012.

2.3. ábra - Figure 2.3.: Meat production in the EU-27 in 2010
The ten largest meat producer countries in the European Union, among others Germany, France, Spain, Italy and Poland, gave 85% of total production within the EU-27 (Figure 2.3.). As regards meat the European Union can be considered net exporter, since its export quantity is forecast to exceed 3800 thousand tonnes, while its import quantity is about 1450 thousand tonnes in 2012. In comparison with the results of the previous year (2011) the quantity of meat export decreased, while the import quantity slightly increased in 2012 (FAO-OECD, 2012).

Hungary gave 1.9% of the EU-27 total meat production in 2010, meat production quantity was almost 750 thousand tonnes (Figure 2.4.). There can be observed a continuous decline in meat production in Hungary, which primarily due to the decreasing livestock. Parallel to the decreasing meat production, the per capita meat consumption has also diminished year by year. In 2012, the per capita meat consumption was 56.7 kg/capita/year in Hungary, which was significantly less than in other developed countries (HSCO, 2012).

2.4. ábra - Figure 2.4.: The Hungarian meat production between 1990 and 2010
2. ECONOMIC IMPORTANCE OF FOOD OF ANIMAL ORIGIN

2.2. The economic importance of poultry meat production

The global poultry meat production was stagnant in 2008-2009 due to the economic crisis. Production increased from 2010 to 2011 by more than 3% and this tendency is forecast to continue in 2012 as well. World poultry meat production in 2011 was 101.5 million tonnes and it is forecast to increase by 1.8% in 2012 to 103.5 million tonnes. Share of developed countries is 42% and developing countries is 58% from global production. In 2012, China and India (Asian countries) are forecast to increase their poultry meat production at higher pace than the others primarily due to the increasing rate of consumption.

2.5. ábra - Figure 2.5.: Distribution of world poultry meat production in 2011

Source: HCSO, 2012

Figure 2.5. demonstrates the ten most important poultry meat producer regions in the world in 2011. The United States, China and the European Union gave almost the half of the global poultry meat production in 2011. World trade in poultry meat was 12.6 million tonnes in 2011; it was 12.4% of the total poultry meat production. It is forecast to reach 13 million tonnes in 2012. The main important importers were China, Japan, the European Union, Saudi Arabia and Mexico, while the major exporters of poultry meat were Brazil, the United States China, the European Union and Thailand in 2011.

Poultry meat production in the EU-27 slowly increased in the last few years. The total poultry meat production was 12.06 million tonnes in 2010, it was 12.08 million tonnes in 2011 and it is forecast to reach 12.15 million tonnes in 2012.
2.6. ábra - Figure 2.6.: Poultry meat production in the EU-27 in 2010

Source: FAO-OECD, 2012

Figure 2.6. illustrates the poultry meat production in the European Union in 2010. The ten largest poultry meat producer countries in the European Union, among others France, the United Kingdom, Germany, Poland and Italy, gave more than 85% of total production within the EU-27. Hungary is among the ten largest poultry meat producer countries on the 9th place.

As Figure 2.7. shows in the near future the slight increase in poultry meat production and consumption will continue in the European Union, meanwhile there will be decline in poultry meat export and increase in poultry meat import. It is only for poultry meat that the total consumption is expected to increase in 2012 by 0.8% in the EU mainly triggered by a higher domestic demand and relatively cheap availability.

2.7. ábra - Figure 2.7.: Outlook for the EU poultry meat market (million tonnes), 1991 – 2014
Production of poultry meat was 375.6 thousand tonnes in Hungary in 2010 and there can be observed a hectic change in the volume of it. Hungary can be considered a net exporter as regards poultry meat, since its export quantity was about 158 thousand tonnes, while its import quantity was circa 38 thousand tonnes in 2010. The per capita poultry meat consumption was 24.6 kg/capita/year in Hungary in 2010 (Figure 2.8.).

2.8. ábra - Figure 2.8.: Evolution of poultry meat production, export-import and consumption in Hungary between 1992 and 2010

Source: Van Horne, 2007

3. 2.2. The economic importance of pig meat production

Source: HCSO, 2012
After last year’s drop, global pig meat production is expected to rebound by 2.6 percent in 2012 to 111.7 million tonnes. World pig meat production in 2011 was 108.9 million tonnes and it is forecast to increase in 2012 and reach 111.7 million tonnes. Share of developed countries is 39% and developing countries is 61% from global production. Figure 2.9, presents the ‘top ten’ pig meat producers in the world in 2011. The major producers are China, the European Union, the United States Brazil and Viet Nam.

World trade in pig meat was about 7.0 million tonnes in 2011. The major exporters were the United States, the European Union and Canada, while the most important importers were China, Japan and the Russian Federation.

Pig meat production in the EU-27 slowly increased from 2010 to 2011. The total pig meat production was 22.8 million tonnes in 2010 and then it was 23.2 million tonnes in 2011, but it is forecast to decrease to 22.9 million tonnes in 2012.

2.9. ábra - Figure 2.9.: Distribution of world pig meat production in 2011

Source: FAO-OECD, 2012

2.10. ábra - Figure 2.10.: Pig meat production in the EU-27 in 2010
The ten largest pig meat producer countries, among others Germany, Spain, France, Poland and Italy, in the EU-27 gave more than 85% of total pig meat production (Figure 2.10.). The European Union is one of the major pig meat exporters in the world; the export quantity was 2242 thousand tonnes in 2011, while the EU-27 imported only 19 thousand tonnes pig meat (FAO-OECD, 2012).

Production of pig meat was 300.6 thousand tonnes in Hungary in 2010 and there can be observed a continuous decrease in the volume of it. Hungary can be considered a net exporter as regards pig meat, since its export quantity was about 174 thousand tonnes, while its import quantity was 136 thousand tonnes in 2010. The per capita pig meat consumption was 25.3 kg/capita/year in Hungary in 2010 (Figure 2.11.).

2.11. ábra - Figure 2.11.: Evolution of pig meat production, export-import and consumption in Hungary between 1992 and 2010
4. 2.3. The economic importance of bovine meat production

Global beef production is forecast to stagnate at around 67.5 million tonnes in 2012. Much of the world increase is expected in Asia and Latin America and the Caribbean. Beef production is forecast to decline in North America and Europe. Figure 2.12. demonstrates the ten most important bovine meat producer regions in the world in 2011. The United States, Brazil and the European Union gave almost the half of the global bovine meat production in 2011. World trade in bovine meat was about 7.0 million tonnes in 2011 and it is forecast to expand to 9.5 million tonnes until 2018.

Bovine meat production in the EU-27 slowly increased from 2010 to 2011. The total bovine meat production was 8.1 million tonnes in 2010 and then it was 8.3 million tonnes in 2011, but it is forecast to decrease to 7.9 million tonnes in 2012. The ten largest bovine meat producer countries, among others France, Germany, Italy, the United Kingdom and Spain, in the EU-27 gave more than 85% of total bovine meat production (Figure 2.13.).

Bovine meat production in the EU-27 slowly increased from 2010 to 2011. The total bovine meat production was 8.1 million tonnes in 2010 and then it was 8.3 million tonnes in 2011, but it is forecast to decrease to 7.9 million tonnes in 2012. The ten largest bovine meat producer countries, among others France, Germany, Italy, the United Kingdom and Spain, in the EU-27 gave more than 85% of total bovine meat production (Figure 2.13.).
In the European Union there is no sharp difference between the export and import quantity of bovine meat, since the export quantity was 327 thousand tonnes, while the EU-27 imported 320 thousand tonnes bovine meat in 2011 (FAO-OECD, 2012).

Production of bovine meat was 27.6 thousand tonnes in Hungary in 2010 and there can be observed a continuous decrease in the volume of it. Hungary can be considered a net exporter as regards bovine meat, since its export quantity was about 17.4 thousand tonnes, while its import quantity was 15.8 thousand tonnes in 2010. The per capita bovine meat consumption was 2.5 kg/capita/year in Hungary in 2010 (Figure 2.14.).

2.14. ábra - Figure 2.14.: Evolution of bovine meat production, export-import and consumption in Hungary between 1992 and 2010
5. 2.4. The economic importance of world dairy sector

The number of the world’s dairy cows is around 250 million heads. More than two-thirds of the herd can be found in developing countries, although developed countries give only one-third of world milk production. The reason for this is the higher yields in developed countries (FAO-OECD, 2010).

On the basis of the market assessments of FAO-OECD (2011) world milk production was 701.4 million tonnes in 2009, it reach 713.6 million tonnes in 2010, it is estimated to grow by 2 percent to 730 million tonnes in 2011 and it is forecast to increase by 2.7 percent to 750 million tonnes in 2012. Much of the growth is likely to accrue in Asia due to increasing consumer demand. The top ten milk producer countries of the world are the EU (27), India, the USA, China, Pakistan, the Russian Federation, Brazil, New Zealand, Turkey and Ukraine (Figure 2.15.) (Blaskó, 2011).

Global demand for liquid milk is expected to grow by about 30% in the coming decade. It means that the current 270 billion litres annual milk consumption of the world will reach 350 billion litres by the end of the decade. However, this increase in consumption will be not detectable everywhere. It is estimated that for example in the United States and in the European Union slight decrease in milk consumption can be expected (TETRA PAK, 2011). In Europe, people will consume 2.5% less milk products in 2020 in comparison with the current 63 litres/capita/year average. On the other hand in milk consumption of the Asia-Pacific region a very high, almost 45% growth can be forecast (Szarvas, 2011). The average level of milk and milk products consumption is forecast to reach 103.1 kg/capita/year in the world in 2011. As regards the consumption of developed countries, the average level of it is expected to approach 233.7 kg/capita/year, while in developing countries it is only 69.4 kg/capita/year (FAO-OECD, 2011).

The ratio of global trade of milk and milk products to production was 6 percent, i.e. 44.3 million tonnes in 2009. This value increased to 47.8 million tonnes in 2010. In 2011, the amount of milk and milk products in international trade is estimated to reach 50.7 million tonnes, which represents the 6.9 percent of total milk production. In 2012 the trade share of total milk production is forecast to be 52.7 million tonnes. Purchases by Asian countries are anticipated to be moderately higher with import demand being maintained or increasing in China, Indonesia, the Republic of Korea, the Philippines, Singapore and Thailand. Imports by Algeria and Egypt are also expected to grow substantially. On the export side Argentina, Belarus, the EU, New Zealand and the United states are expected to increase in sales of dairy products (FAO-OECD. 2011).

The European Union is the largest contributor to the world milk production and it has approximately 10% of the world’s dairy cowherd, which means almost 25 million heads. The EU (27) produced 153 million tonnes milk in 2010 and it is estimated to reach 157 million tonnes in 2011, it is a 1% growth in production (FAO-OECD, 2011). France, Germany, the United Kingdom, Italy, Poland and the Netherlands give the 67% of total milk production within the EU (27). Hungary with its 1% contribution to the EU (27) production is placed as 19. Predictions for the milk production of the EU (27) are moderately optimistic. According to these predictions,
milk production in the EU (27) will expand by approximately 4% until 2020, which mainly will arise from the so-called “old” Member States, from the EU (15) (Fórián, 2011).

The second major exporter of milk and milk products in the world is the EU (27) with 9.9 million tonnes after New Zealand. The level of import is much lower; the EU (27) imports 1.2 million tonnes milk and milk products. Both in the export and in import structure cheese represents the highest rate.

6. 2.5. The economic importance of world egg production

The global egg production in 2010 was about 69 million tons, fast growth of egg production can be observed in Asia, especially in China. Figure 2.16. presents the distribution of egg production among the major producer regions. The absolute defining country in egg production is China, with its more than 40% contribution to the total production.

2.16. ábra - Figure 2.16.: Distribution of global egg production in 2011

Source: FAO-OECD, 2012

7. 2.4. The economic importance of global fish and fishery products

Aquaculture production was 59.9 million tonnes, capture fisheries production was 88.6 million tonnes in 2010 in the world. In both cases, Asia is the most defining continent (Figure 2.17., Figure 2.18.).

2.17. ábra - Figure 2.17.: Capture fisheries production in 2010

Created by XMLmind XSL-FO Converter.
2. ECONOMIC IMPORTANCE OF FOOD OF ANIMAL ORIGIN

Source: FAO-OECD, 2012

2.18. ábra - Figure 2.18.: Aquaculture production in 2010

Source: FAO-OECD, 2012

“Sustained demand for fish and fishery products is boosting aquaculture production worldwide and pushing prices higher, despite some consumer resistance in the more traditional markets in southern Europe. Overall production for the year is expected to grow by 2.1 percent to 157.3 million tonnes, thanks to a 5.8 percent increase in aquaculture output that more than offset a small decline in capture fisheries following limitations on catches of small pelagic species in the Pacific” (FAO-OECD, 2012).

8. Questions related to the this Chapter

1. How could you define food of animal origin?

2. Sum up the current situation of global meat sector! Which are the most important tendencies?

3. Describe the most significant features of the different meat sectors in the level of the world, EU-27 and Hungary!

4. How could you illustrate the world dairy sector?

5. How could you describe the egg production in the world and Hungary?

6. Briefly sum up the importance of global fisheries production!

9. References


2. ECONOMIC IMPORTANCE OF FOOD OF ANIMAL ORIGIN


3. fejezet - 3. Complex economic issues of cereal production (wheat, maize, rice, barley)

“The plant production area in the world is around 1,500 million hectares. Figure 3.1 depicts the sowing structure in 2009 on a global scale. The figure properly shows that the growers produce cereals on the 48% of the sowing area in the world, and that maize, rice, and wheat are the most significant crops within cereals. The rate of these three plants together is 36% within the entire sowing area, which is equal to 546 million hectares” (KISS – BENCZE, 2012).

The most important cereals on earth (2009) are the wheat (15%), maize and rice (11%), barley (4%) and sorghum (3%) (Figure 3.1). “Wheat has the largest sowing area within cereals, to be precise it is 225.4 million hectares and it occupies 15% of the area being under plant production in the world. Proportions of the three main cereals can be deemed steady in the examined years. According to us, significant changes are not expected in the sowing structure in the future. As mentioned above, the proportion of rice and maize is also significant beside wheat. The share of the other cereals is under 5% within the entire sowing area of the world” (KISS, 2011).

3.1. ábra - Figure 3.1.: Importance of the crop sector in the world (2009)

Source: FAO-OECD, 2011

In case of the EU-27 these plants also play the most important role (2009): wheat (35%), barley (19%), maize (12%), colza (8%) and sunflower (5%) (Figure 3.2.).

3.2. ábra - Figure 3.2.: Importance of the crop sector in the EU-27 (2009)
3. Complex economic issues of cereal production (wheat, maize, rice, barley)

In 2010/11 the world production of cereals amounted to 2,253.7 million tons, and it increased to 2,344.1 million tons by 2011/12. The world demand-supply ratio improved significantly in 2011 compared to previous year, and that resulted in a more favourable production in many areas of the world. According to the forecasts of FAO-OECD (2012) the world production will increase by 1% (27 million tons) in 2012/13 and with the yield of 2,371 million tons this will produce the highest result over the last years. The most significant grain grower territories are China (20%), USA (16%), EU-27 (12%), which adds almost the half (48%) of the world output. In addition, India (10%) and Russia (4%) show also remarkable result (Figure 3.3.). In 2011, 293 million tons went into world trade, which is 12.5% of the total production. The major exporters are: USA, Argentina, and Russia. The major importers are Japan, Egypt and Mexico.

3.3. ábra - Figure 3.3.: Top 10 cereal producers in the world (2011)

The member countries of the EU-27 harvested 283.3 million tons of cereals in 2010. The yield is different country by country, however the major countries are: France (68 million tons), Germany (44 million tons), Poland (27 million tons), UK (21 million tons) and Spain (19 million tons). Other notable countries are Italy (19 million tons), Romania (17 million tons), Hungary (12 million tons), Denmark (9 million tons) and Bulgaria (7 million tons). The top ten cereal grower countries give 86% of the total production. The production in some major countries decreased in 2011, such as in Germany, UK, Italy, Poland, while the yield compared to previous year improved in other countries such as Spain and Romania. In 2011 the overall yield improved by 1.8%, totalling up to 288.3 million tons. For 2012 the prediction says 285.9 million tons. In 2011, the amount of export was 21.5 million tons and 13.6 million tons were for the import. In 2012 a reduction (-6 million tons) of export and a growth (1 million tons) of import is expected.

1. 3.1. Economic importance of global wheat production
Based on the reports of AKI (2012) the global sown area of wheat exceeded the previous year by 3 million hectares in 2011, approaching a total of 221 million hectares. In many countries the farmers were motivated to increase the sown area by the high price of the product, but there was also an increase in areas, where due to the unfavourable weather conditions there was a significant production loss (Russia and North-America). The world output of wheat in 2010/11 was 655.6 million tons, which increased by 44.4 million tons (to 700m) by 2011/12. According to forecasts there will be a drop of 3.6% in 2012/13, totalling up to 675.1 million tons. The most significant drop will be in Ukraine, Morocco, and China and in the EU (Table 3.1.).

3.1. táblázat - Table 3.1.: World balance of the global wheat production and usage

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Production</td>
<td>655.6</td>
<td>700.0</td>
<td>675.1</td>
<td>-3.6</td>
</tr>
<tr>
<td>Trade</td>
<td>124.6</td>
<td>137.4</td>
<td>135.0</td>
<td>-1.7</td>
</tr>
<tr>
<td>Total utilization</td>
<td>664.1</td>
<td>690.7</td>
<td>686.5</td>
<td>-0.6</td>
</tr>
<tr>
<td>Food</td>
<td>468.0</td>
<td>473.5</td>
<td>475.5</td>
<td>0.4</td>
</tr>
<tr>
<td>Feed</td>
<td>120.8</td>
<td>138.9</td>
<td>133.8</td>
<td>-3.7</td>
</tr>
<tr>
<td>Other uses</td>
<td>75.2</td>
<td>78.3</td>
<td>77.3</td>
<td>-1.3</td>
</tr>
<tr>
<td>Ending stocks</td>
<td>188.2</td>
<td>195.3</td>
<td>182.7</td>
<td>-6.5</td>
</tr>
</tbody>
</table>

Source: FAO-OECD, 2011

In 2011, the major wheat grower countries are the EU (137.9 million tons) and China (117.9 Mt), the production of which will likely fall by 2%. Other significant wheat producers are India (86.9 million tons), Russia (56.2 Mt), USA (54.4 Mt) and Australia (29.5 Mt). The European Union (20%), China (17%) and India (12%) provide almost 50% of the world output. The world trade consumed 137 million tons of wheat in 2011. The major exporters are USA (29 million tons), Russia (22 Mt), Australia (19 Mt), Canada (18 Mt) and the EU27 (15 Mt). The major importers are Asia (59 Mt), Africa (40 Mt) and South America (18 Mt). In 2011 wheat was produced on 26 million hectares within the EU-27, and wheat was 46% of the total cereal production. The total wheat production in the EU amounted to 139.1 million tons in 2010 and dropped by 0.9% resulting in 137.9 million tons in 2011. The major wheat producers are France (41 million tons), Germany (24 Mt), UK (15 Mt), Poland (9 Mt) and Italy (7 Mt). The ten major wheat producing country gives 87% of the total production. The unfavourable weather condition in 2012 afflicted Poland the most, however France, Germany, Czech Republic, Bulgaria and Hungary were also partially impacted. As a consequence the wheat production will follow the decreasing tendency (135 million tons) according to predictions. The volume of export in 2011 was 16 million, the import was 7.5 million tons. As per the forecasts the export will fall by 1 million ton and import will grow by half million tons.

2. 3.2. Economic importance of global rice production

The total rice production worldwide amounted to 455 million tons in 2009/10, which increased to 468 million tons in 2010/11 and further increased by 2.6% to 480 million tons. (Table 3.2.)

3.2. táblázat - Table 3.2. World balance of the global rice production and usage

|-------------------|---------|---------------------|--------------------|------------------------------|

Created by XMLmind XSL-FO Converter.
3. Complex economic issues of cereal production (wheat, maize, rice, barley)

<table>
<thead>
<tr>
<th></th>
<th>Million tonnes</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Production</td>
<td>455.4</td>
<td>468.1</td>
</tr>
<tr>
<td>Trade</td>
<td>31.5</td>
<td>35.2</td>
</tr>
<tr>
<td>Total utilization</td>
<td>448.6</td>
<td>460.8</td>
</tr>
<tr>
<td>Food</td>
<td>382.4</td>
<td>389.3</td>
</tr>
<tr>
<td>Ending stocks</td>
<td>134.4</td>
<td>141.0</td>
</tr>
</tbody>
</table>

Source: FAO-OECD, 2011

More rice were harvested in 2011 in China, Pakistan, Vietnam, but also more in Argentina, Egypt and Australia than in the previous year. Major rice producer countries are China (29%), India (22%), Indonesia (9%). Together these countries contribute to almost 60% of the world production. In 2011 the world economy consumed 35 million tons, which is 4 million more than in previous year. The major exporters are Thailand, Vietnam and India. The most significant rice growing member countries of EU-27 in 2010 are: Italy, Spain, and Greece. Italy contributes with an outstanding performance in 2010 by giving with 1.5 million tons 80% of the total EU rice production. Other significant rice growers are Spain (929 thousand tons) and Greece (230 thousand tons). Other countries, such as Portugal (170 thousand tons), France (119 thousand tons) and Romania (62 thousand tons) are worth mentioning. The rice production of Hungary amounted to 8 thousand tons in 2010. The member countries (EU-27) produced 1.8 million tons in 2011; this volume will be produced also in 2012 according to forecasts. In 2010 the total volume of export was 0.3 million tons, the volume of import reached 1.2 million ton.

3. 3.3. Economic importance of global maize production

The total maize production worldwide amounted to 880 million tons. This will increase by 4.1% in 2012 and reaching 916.4 million tons. In China 14.5 million tons, in Ukraine 10.6 million tons, in Brazil 3.5 million tons of overproduction was achieved in 2011 compared to the previous year. The major maize producer countries are: USA (35%), China (22%) and the EU (8%) (Figure 3.4). USA is the biggest maize grower in the world and in 2012 it will produce 345 million. The other major maize producer country is China, which produced 190 million tons in 2011 and the expected volume in 2012 will be at the same level. The third position is taken by the EU with a volume of 64 million tons in 2011. USA (35%), China (22%) and the EU provide 65% of the world maize production.

3.4. ábra - Figure 3.4.: Top 10 maize producer in the world (2011)

![Diagram showing the top 10 maize producers in the world (2011)](image)

Source: FAO-OECD, 2012

In 2011, 95 million tons of corn went through world trade, this is 8% of the total production. The major maize exporters are the USA, Argentina, and Ukraine. The major importers are Japan, Mexico and China. In 2010 the total production of maize in the EU-27 amounted to 57.3 million tons, in 2011 it increased by 16% to a total of
3. Complex economic issues of cereal production (wheat, maize, rice, barley)

66.6 million tons. The 2012 prediction is 64 million tons. The ten major maize producing country adds 94% of the total EU production. The most significant maize producer was France, where 14 million tons were harvested, which is 25% of the total EU production. Romania and Italy with a production of 9 million tons are also accounted as significant players. Hungary’s contribution is 7 million tons which is 15% of the total. Other key countries are Germany (4 million tons) and Spain (3 million tons). The volume of import in the EU was 4 million tons, the export was 2 million tons. According to forecasts, the import will increase by 1.5% in 2012, and the export will be at the same level.

4. 3.4. Economic importance of global barley production

The major barley grower countries are EU-27 (40%), Russia (13%), Ukraine (8%), Canada (7%), Turkey (7%), Australia (3%) and United States (3%). The major barley exporters are Australia, France, Germany, Canada and Russia. The major barley importers are Saudi Arabia, China, Japan, Netherlands and Belgium. (Figure 3.5.)

3.5. ábra - Figure 3.5.:The major barley producer in the world (2010)

![Pie chart showing major barley producers](image)

Source: FAO-OECD, 2011

Figure 3.6 shows the global hunger map. Between 2007 and 2009, the most several food crises occurred in Africa. Hunger was the main factor that led to the fall of more North-African dictatorships in 2011, such as Egypt, Tunisia, Libya. Though these countries are not coloured by the darkest red in Figure 3.6, the figure depicts the status quo in a given period. The conditions changed significantly due to the high grain prices, and the civil population could not bear the situation after a while. Apparently, in these areas hit by food crisis not only the level of wheat consumption is lagging behind the level of consumption of the developed regions, but the consumption level of other food products as well, such as meat. Africa’s share of the world’s total meat consumption is only 6%, while its share from the world population is 14.1% (FAO, 2011)” (KISS, 2012).

3.6. ábra - Figure 3.6.:FAO Hunger Map between 2007 and 2009
3. Complex economic issues of cereal production (wheat, maize, rice, barley)


“Creating viable and possibly competitive food production systems—first of all grain production as primary source of food—in these regions would ease the pressure on the agriculture of the developed world that tries to supply food to the entire world population.” (KISS – BENCZE, 2012).

“The 2008 World Development Report published by the World Bank also found that for the poorest people, GDP growth originating in agriculture is about four times more effective in raising incomes of extremely poor people than GDP growth originating outside the sector. This way both the distribution of wealth and the current extremely variable consumption levels could be balanced, and it would be much easier to sustain an acceptable level of wheat consumption as well. According to a FAO study, the growth of the world population will slow down, which could ease the pressure on agriculture to provide food. According to this study, by 2050 total world population will reach nine billion. At the same time the study is also optimistic about the future world food supply, and it forecasts that by 2050 the number of undernourished will decrease to 290 million from 810 million in 2000, and the portion of well-fed (i.e., not classified as undernourished) from 83% to 96%. Nevertheless, the study also emphasizes the importance of local production to meet the growing food demand in developing countries (CONFORTI (Ed.), 2011)” (KISS-BENCZE, 2012).

3.7. ábra - Figure 3.7.: FAO Cereal Price Index (2002-2004=100)

Source: FAO Prices Index, 2013 In: FEHÉR-KISS, 2013

5. 3.5. Hungarian cereal sector
The total geographical area of Hungary is 9 million 303 thousand hectares, 81.2% of which is plant area. In 2011, out of the plant area of 7 million 360 thousand, the total agricultural land was 5 million 337 thousand hectares, which is 9% less compared to 2007. The plow land, which was 81% of the agricultural land started to decrease significantly in 2010. While in 2007 it was 4 million 506 thousand hectares, it fell to 4 million 322 thousand hectares by 2011. The importance of plant production can be clearly seen from the share of various cultivation methods of the land, because it gives 80% of the agricultural lands and 46% of the total land.

Cereals: The plow land production has been mainly described by the overweight of the cereals for many years. The sown area of the cereals is 68.9% of the total sown area and it fell to 66.7% by 2011. The major cereals grower regions are located in Alföld and in South-Dunántúl, but in Alföld we can see a decreasing tendency in the harvested areas, while in South –Dunántúl the harvested area has been increased. The harvested area of wheat was 1 million 146 thousand hectares in 2009, which dropped to 1 million 10 thousand hectares in 2010. The difference can be explained with the sales problems. In 2011 the sown area dropped to 987 thousand hectares, but it increased to 1 063 thousand hectares in 2012. The harvested area of corn was 29.5% of the total sown area in 2007, and starting from 2008 till 2010 it was stable, and then in 2011 it increased by 1%. While in 2009 the harvested area totalled up to 1 million 177 thousand hectares, it increased to 1 million 256 thousand hectares in 2011. The sown area in 2012 amounted to 1 280 thousand hectares. The sown area of barley was 7.7% of the total sown area in 2007, and it fell to 6.4% by 2011. The average area was 310 thousand hectares between 2009 and 2011, but in 2011, the total harvested area was only 263 thousand hectares. The sown area of rye decreased significantly compared to the average of 2007-2011. The sown area was 40 thousand hectares in 2009, but it was only 33 thousand hectares in 2011. We can see some slight increase in 2012, as the total sown area of rye was 36 thousand hectares.

In 2011 on a field of a little more than 2.6 million hectares the total harvested product amounted to 13 800 thousand tons. This volume is 12% higher compared to 2010, but the harvest average dropped by 5%.

The harvested volume of wheat was 3 987 thousand tons in 2007, one quarter of which was harvested from South-Alföld. The annual fluctuation is at large scale, which increases the market risk. The highest volume was in 2008 with an annual 5 631 thousand tons and the lowest result was in 3 745 thousand tons in the year 2010. In 2011 the wheat production was higher by almost 400 thousand tons compared to the previous year (4 107 thousand tons). 22% of the total wheat production was harvested in South-Alföld, and 17% in North-Alföld. Important to mention South-Dunántúl with 16% and West-Dunántúl with 15%.

The lowest production result was in Central-Hungary, with a result of 5%. The harvest average of wheat in 2011 amounted to 4.2t/ha, which is low compared to 2008, but it well exceeds to average of the recent years. Based on the 2010 results the harvest average of wheat was highest in West-Dunántúl (4.2 t/ha), and smallest in Central-Hungary (3.2t/ha). The year 2011 can be stated as particularly successful, even knowing the fact that an extraordinary drought aggravated the growers of the country. „The yield of wheat increased in all regions compared to the five year average in 2011. The highest increase was in the modestly important area of Central-Hungary, and in South-Dunántúl and North-Alföld, the smallest increase was in South-Dunántúl” (HCSO, 2012). The total harvested volume of barley was 1 018 thousand tons in 2007 and it increased to 1 467 thousand tons by 2009 due to the favourable weather conditions. There was a drastic drop in 2011, as the harvested volume was only 988 thousand tons. The most barley was grown in South-Alföld (226 thousand tons) and West-Dunántúl (201 thousands). The least barley was in North-Hungary (92 thousands) and Central-Hungary (49 thousand tons). The harvest average of barley was 4.4t/ha in 2008 which fell to 3.3t/ha in 2009. The harvest average was 3.8t/ha in 2011. After looking at regions we can state, that the highest harvest average is in South-Dunántúl (3.8t/ha) and West-Dunántúl (3.7t/ha). The lowest harvest average is in North-Alföld (2.8t/ha). The harvested volume of corn is continuously increasing, while in 2007 the total harvest was 4 027 thousand tons, then in 2011 it increased to 7 992 thousand tons. The highest harvested volume comes from South-Dunántúl (2 066 thousand tons), which is 700 thousand tons more than South-Alföld (1 381 thousand tons). The less corn was harvested in Central-Hungary (351 thousand tons) and North-Hungary (225 thousand tons). The harvest average of corn increased radically during the examined period. In 2007, the average was 3.7 tons per hectare, while it went to double in 2008. In 2009, the harvest average dropped to 6.4 tons per hectare, and it not only stayed at the same level during the next years, but also even increased to a very small extent. In 2010 the harvest average was highest in South-Dunántúl with a result of 7.2t/ha, and the smallest average was in North-Hungary (5t/ha) and North-Alföld (5.5t/ha). (Table 3.4; 3.5.)

3. Complex economic issues of cereal production (wheat, maize, rice, barley)
3. Complex economic issues of cereal production (wheat, maize, rice, barley)

<table>
<thead>
<tr>
<th>Title</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aggregate production, 1000 metric ton</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cereals</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wheat</td>
<td>3 987</td>
<td>5 631</td>
<td>4 419</td>
<td>3 745</td>
<td>4 107</td>
</tr>
<tr>
<td>Rye</td>
<td>81</td>
<td>112</td>
<td>73</td>
<td>78</td>
<td>75</td>
</tr>
<tr>
<td>Barley</td>
<td>1 018</td>
<td>1 467</td>
<td>1 064</td>
<td>944</td>
<td>988</td>
</tr>
<tr>
<td>Maize</td>
<td>4 027</td>
<td>8 897</td>
<td>7 528</td>
<td>6 985</td>
<td>7 992</td>
</tr>
<tr>
<td>Industrial crop</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rape</td>
<td>496</td>
<td>655</td>
<td>579</td>
<td>560</td>
<td>527</td>
</tr>
<tr>
<td>Sugar beet</td>
<td>1 693</td>
<td>573</td>
<td>737</td>
<td>819</td>
<td>856</td>
</tr>
<tr>
<td>Sunflower</td>
<td>1 060</td>
<td>1 468</td>
<td>1 256</td>
<td>970</td>
<td>1 375</td>
</tr>
<tr>
<td>Fodder-crop</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maize of silage and green maize</td>
<td>2 562</td>
<td>2 777</td>
<td>2 202</td>
<td>2 254</td>
<td>2 390</td>
</tr>
<tr>
<td>Medic</td>
<td>581</td>
<td>769</td>
<td>613</td>
<td>587</td>
<td>556</td>
</tr>
</tbody>
</table>

Source: HCSO, 2012

3.9. ábra - Table 3.5.: Average yield of major crops in Hungary (2007-2011)

<table>
<thead>
<tr>
<th>Title</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average yield, kg/hectare</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cereals</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wheat</td>
<td>3 590</td>
<td>4 980</td>
<td>3 850</td>
<td>3 710</td>
<td>4 200</td>
</tr>
<tr>
<td>Rye</td>
<td>2 040</td>
<td>2 580</td>
<td>1 810</td>
<td>2 110</td>
<td>2 300</td>
</tr>
<tr>
<td>Barley</td>
<td>3 170</td>
<td>4 450</td>
<td>3 320</td>
<td>3 360</td>
<td>3 780</td>
</tr>
<tr>
<td>Maize</td>
<td>3 730</td>
<td>7 470</td>
<td>6 390</td>
<td>6 470</td>
<td>6 500</td>
</tr>
<tr>
<td>Industrial crop</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sugar beet</td>
<td>41 040</td>
<td>59 670</td>
<td>53 600</td>
<td>59 090</td>
<td>56 510</td>
</tr>
<tr>
<td>Rape</td>
<td>2 200</td>
<td>2 170</td>
<td>2 220</td>
<td>2 050</td>
<td>2 260</td>
</tr>
<tr>
<td>Sunflower</td>
<td>2 070</td>
<td>2 670</td>
<td>2 350</td>
<td>1 930</td>
<td>2 370</td>
</tr>
<tr>
<td>Fodder-crop</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maize for silage and green maize</td>
<td>18 180</td>
<td>29 420</td>
<td>25 290</td>
<td>26 600</td>
<td>25 050</td>
</tr>
<tr>
<td>Medic</td>
<td>4 340</td>
<td>5 380</td>
<td>4 870</td>
<td>4 260</td>
<td>4 480</td>
</tr>
</tbody>
</table>

Source: HCSO, 2012

5.1. 3.5.1. Competitiveness of the Hungarian COP sector on the World market

“Figure 3.8. shows the carrying costs of the farm crops by modes of transport and destination. Hungarian crops can be competitive up to a distance of 500 km on land. Thus, the most important target countries of our crop export are close to Hungary (POPP, 2009)” (FEHÉR – KISS, 2013b).

3.10. ábra - Figure 3.8.: Carrying costs of the farm crops by modes of transport and destination
3. Complex economic issues of cereal production (wheat, maize, rice, barley)

“On the one hand, the carrying costs impose a very serious disadvantage for Hungary on the international crop market. On the other hand, we have to state that this disadvantage can protect the competitiveness of our crops against imports on the domestic market” (FEHÉR – KISS, 2013b).

5.2. 3.5.2. Export-import in Hungarian cereal production

Figure 3.9. demonstrates the quantity of export and import of the two most important cereals in Hungary. It can be claimed that the import quantity of maize and wheat are not remarkable because the Hungarian cereal production is rather export oriented. The Hungarian farmers produce above self-sufficiency level (FEHÉR – KISS, 2013b).

3.11. ábra - Figure 3.9: Quantity of the export and import of wheat and maize (2000 - 2010)

“Hungary exported significant quantities of these cereals every year. The export of wheat was the lowest in 2000, but afterwards it increased in 2001. It stagnated between 2002 and 2003. The Hungarian export of wheat rose gradually from 2004 to 2006. In 2007, it dropped again, but it increased again by 2008, in which Hungary exported 2.1 million tonnes of wheat. In 2009, it fell by 452 thousand tonnes. 2.18 million tons were exported in


Source: AKI, IGC in POPP, 2009
3. Complex economic issues of cereal production (wheat, maize, rice, barley)

2010; the highest point during this period. The export of maize was similar to the export of wheat between 2000 and 2006 in all years but one. This exception was 2002, because the export of maize by far exceeded the export of wheat in this year. In 2007, the export of maize shot up dramatically. It was twice as high as in the previous year. In 2007, the first reason of the change was that there was a serious drought in Europe and there was need for the Hungarian intervention stock. The second reason for the change was that the Hungarian farmers offered a great amount of maize to intervention between 2004 and 2006. The intervention stocks of maize reached the highest level by the year of 2007 due to their offer. The Hungarian farmers treated the intervention system as if it was a fixed market with fixed prices. Due to this kind of thinking, the Hungarian intervention stock was the highest in the European Union. On the other hand, the yield of the maize was quite good from 2004 to 2006 and the farmers could not sell their maize. In 2007, Hungary exported its stocks. In 2008 and 2009, the export of maize increased from 3.3 to 4.1 million tonnes. In these years, the yield of maize was invariably good. In 2010, it dropped a little bit” (FEHÉR – KISS, 2013b).

FEHÉR – KISS cannot talk about significant changes with regard to these target countries because Hungary is a landlocked country. “In 2009, the most important target countries of the Hungarian wheat export were Italy, Romania, Greece, Bosnia and Herzegovina, Austria and Slovenia. These were the top six countries in 2009. The share of Italy, Romania, Greece and Bosnia Herzegovina within the Hungarian wheat export was between 10 and 25%, respectively. Hungary exported 382 thousand tonnes to Italy, 285 thousand tonnes to Romania, 226 thousand tonnes to Greece, and 192 thousand tonnes to Bosnia and Herzegovina in 2009. Nowadays, the role of Romania in the Hungarian wheat export is very important, because 363 thousand tonnes were exported to Romania in 2008. In 2007, the quantity of the Hungarian wheat export towards Romania was 382 thousand tonnes. However, Hungary exported 538 thousand tonnes to Romania in 2003. This was the highest level in the last ten years. The reasons are very simple. Romania can produce a sufficient quantity of wheat, but the quality of their wheat is not similar to the Hungarian wheat, because Romania cannot produce sufficient quantity of edible wheat and their wheat is improved by the Hungarian wheat. On the other hand, Romania exported a remarkable quantity of feed wheat every year. This market phenomenon can generate a vacuum on the Romanian wheat market.

There were other important target countries of the Hungarian wheat export in 2009. Hungary exported 164 thousand tonnes to Austria, 75 thousand tonnes to Slovenia, 71 thousand tonnes to Israel, 50 thousand tonnes to Germany. Contrary to Romania, Israel and Germany are quite distant from Hungary. We can see that the most important target country of Hungary's maize export was Italy in 2009, when its share was 28% of the Hungarian maize export. However, in 2000 Italy’s share was only 1.39%. The Russian Federation was more important, because Hungary exported 119 thousand tonnes to Russia in 2000, but only 3.1 thousand tonnes in 2009.

That is why we can claim that there were significant changes in the rank of the target countries of the maize export. Italy has become the most noteworthy target country after Hungary’s accession to the EU. The role of Romania was of the same importance as the role of Italy in 2009. Romania ranked second within the target countries of the Hungarian maize export in this year with 882 thousand tonnes. The position of Romania among our target countries became stronger after Romania’s accession to the EU” (FEHÉR – KISS, 2013).

6. References


3. Complex economic issues of cereal production (wheat, maize, rice, barley)


11. KSH (Központi Statisztikai Hivatal) (2010): A szántóterület regionális megoszlása


4. fejezet - 4. ECONOMIC ASPECTS OF PROTEIN AND OIL CROPS (Sunflower, Rapeseed, Soybean, Alfalfa)

1. 4.1. The most commonly used arable crops for oil and protein production

Oil crops include both annual (usually called oilseeds) and perennial plants whose seeds, fruits or nuts are either consumed directly as food or crushed to obtain oil (used by the food, oleo chemical, biofuel and other industries) as well as protein-rich meal (used as feed in the livestock sector). Some of the crops included are also fibre crops in that both the seeds and the fibres are harvested from the same plant. Such crops include coconuts, kapok fruit, cotton, linseed and hempseed. These crops or their by-products are often rich in protein. In this paper, the most commonly used oil and protein crops are introduced through their importance, and the economic analysis of their production. What are these? These are sunflower, rapeseed, soybean and alfalfa. ¹

2. 4.2. Situation of oilseed production and usage in the EU

The EU no longer has any specific support measures for oilseeds. About two-thirds of the oilseeds consumed in the EU each year are produced in the EU but the EU imports about half the oilseed meals used annually in animal feed. Import tariffs for oilseeds are set at zero. As of 2012, the EU no longer has any specific support measures for protein crops. Import tariffs for the main protein crops are set at zero. Oilseeds such as rapeseed, sunflower seed, soybeans and linseed are grown on more than 11 million hectares in the EU and are used for food, feed, fuel and industrial purposes. Crushing oilseeds provides vegetable oil and meal. Vegetable oil is used in the food industry and to produce biodiesel, as well as having many other industrial uses. Oilseed meals are an important protein-rich animal feed ingredient. The targets set out in the Renewable Energy Directive with regard to the mandatory use of biofuels in the EU by 2020 have encouraged the use of vegetable oils in the EU. As a result, domestic oilseed production has grown considerably in recent years (Table 4.1.).

4.1. ábra - Table 4.1.: Oil Seed and Protein Crop Production in the EU

¹ According to Wikipedia some basic synonym and information: (1) Sunflower (Helianthus annuus) is an annual plant native to the Americas. It possesses a large inflorescence (flowering head), and its name is derived from the flower's shape and image, which is often used to depict the sun. (2) Rapeseed (Brassica napus), also known as rape, oilseed rape, rapa, rapi, rapaseed (and, in the case of one particular group of cultivars, canola), is a bright yellow flowering member of the family Brassicaceae (mustard or cabbage family). (3) Soybean (US) or soya bean (UK) (Glycine max) is a species of legume native to East Asia, widely grown for its edible bean which has numerous uses. Fat-free (defatted) soybean meal is a significant and cheap source of protein for animal feeds and many prepackaged meals; soy vegetable oil is another product of processing the soybean crop. For example, soybean products such as textured vegetable protein (TVP) are ingredients in many meat and dairy analogues. (4) Alfalfa, Medicago sativa, also called lucerne, is a perennial flowering plant in the pea family Fabaceae cultivated as an important forage crop in many countries around the world.
Regarding protein, the most important feed materials are soybean meal, mainly imported from third countries, rape seed meal from the European crushing industry. The industry also uses protein rich material from the starch and ethanol industries. Protein sources are essential to achieve a balance diet for animals. Due to past agricultural policy decisions (end of tariffs protection in 1962, Blair House agreements in 1992, reduction of specific support for protein crops in the framework of Agenda 2000) the EU is not in the position to fulfil its own requirements for protein feeds (Figure 4.1.). The EU feed industry needs to source its proteins on the global market, on which soya has been the most important source for many years.

4.2. ábra - Figure 4.1.:EU-27 Dependency in Feed Proteins

4.3. ábra - Figure 4.2.:Self Sufficiency of Soybean of the Largest Users of the World
4. ECONOMIC ASPECTS OF PROTEIN AND OIL CROPS (Sunflower, Rapeseed, Soybean, Alfalfa)

According to the Figure 4.2. data EU and China protein-dependency are the highest. Soybean is used also for human and animal consumption in both countries.

3. 4.3. The economic importance and usage of sunflower

The sunflower is a distinctive, flowering the seeds of which contain valuable edible oil that contains more Vitamin E than any other vegetable oil. Most sunflower oil is used in food products. The seeds of confection varieties of sunflower are also sold for human consumption and birdseed. Sunflower is one of the most important oilseed crops in the world. Global seed production grow steadily in last 25 years, FAO expect a total world output close to 60 million tons by 2050. Russia, Ukraine, European Union and Argentina are the largest producers (Figure 4.3.), they account for 70% of global production, with an exponential growth of production in the last ten years in the Black Sea region, with increased acreage an higher yields achieved by the replacing old varieties by hybrid seeds.

Sunflower seeds are crushed mostly locally and seed world trade represents less than 10% of global production. World sunflower oil trade accounts for 30% of total consumption. The European Union is the major destination of the Ukrainian and Argentina exports.


4.4. ábra - Figure 4.3.: Production volume of sunflower seed in major producer countries from 2000/02 to 2011/12 (in million metric tons)
Consumption/capita of sunflower oil has increased marginally in last years (from 1.0 kg/year to 1.4 kg/year in last 30 years). Edible oil for human consumption was the major way of usage. Today, only 10% of the global production is used for industrial purpose.

FAO sunflower oil production forecast for 2050 is 22.4 million metric tons, which implies a significant increase on consumption/capita: Once there is a sharp increase in edible sunflower oil consumption/capita (from 1.4 to 2.3 kg/year), driven by lower production costs and or incremental quality differential. Twice there is a sharp increase of industrial use, particularly biofuel (human consumptions as edible oil 1.8 kg/year) (FAO, 2012). Sunflower oil has lost market share of total world edible oil consumption.

Future projections will indicate a recover of oil demand, but further genetic improvement, changes in crop management and adaptation to marginal regions will be necessary to reach reverse the trend. Due to certain limitations to use the sunflower oil in biodiesel (e.g. Cold Filter Plug Point), it seems that future demand would continue to be for human food. Sunflower oil is a very good choice in terms of healthy oils, being cheaper than olive oil, and having a wide range of options for food industry.

Higher oil yield per hectare, oil quality differentiation, oil adjustments to full fill to the biofuels market requirements are possible ways to explore to increase the coming sunflower oil demand. To enlarge the sunflower world value chain, intense scientific and agro technological work should be done in next 20 years. Orientation for sunflower breeders should be lighted by the urgent need of improving the crop competitiveness versus other soft oils substitutes (rape, canola and corn oil), both on production costs and quality differentials. Improvement of agronomic practices to increase farmer plots actual yields and to adapt to different environments and situations, will be vital to the future growth of the sunflower oil market share of total oil world output and consumption.

4. 4.4. The Importance and Use of Rapeseed

Rapeseed is a mustard crop grown primarily for its seed, which yields about forty percent oil and a high-protein animal feed. Rapeseed oil generally contains a high level of erucic acid, which is mildly toxic to humans in large doses. Traditional and other uses have been for lamp oils, soap making, high-temperature and tenacious high-erucic acid lubricating oils, and plastics manufacturing. With the shift to rapeseed 00 in the European Union, the low erucic acid content of the resulting rapeseed oil and its specific fatty acid composition make it a highly appreciated edible oil. As the European rapeseed production is “conventional” (that is non-GMO), the
4. ECONOMIC ASPECTS OF PROTEIN AND OIL CROPS (Sunflower, Rapeseed, Soybean, Alfalfa)

Preference of the European food customer goes to rapeseed oil produced in Europe over other oils or other origins that might be produced from GMO.

Rapeseed oil has also become the primary feedstock for biodiesel in Europe (estimates for 2006: more than 4.0 million tons of rapeseed oil went into biodiesel).

Processing of rapeseed for oil production provides rapeseed animal meal as a by-product. The by-product is a high-protein animal feed. The feed is mostly employed for cattle feeding, but also for hogs and poultry (though less valuable for these). The meal (from rapeseed oil) has a very low content of the glucosinolates responsible for metabolism disruption in cattle and pigs (Soyatech, 2013).

Rapeseed is normally processed in two steps: Physical pressing of the rapeseed and subsequent hexane extraction of the remaining oil in the press-cake. Some smaller plants are only press-plants and do not apply the second step of hexane extraction. This results in a high oil content in the cake, which makes this process economically not viable because of the high price differential between rapeseed oil and rapeseed meal or cake. Products of rapeseed production are important feedstuffs and oil products (Figure 4.4.).

Higher prices have resulted from a good demand for rapeseed oil for food and for biodiesel in the European Union. EU oilseed farmers will therefore be stimulated to increase rapeseed surface. This success of rapeseed in the EU is also inspiring Eastern European countries producers to expand rapeseed production (Soyatech, 2013).

4.5. ábra - Figure 4.4.: The main rapeseed products

5. 4.5. Vegetable oil production and consumption

Global supply of vegetable oil remained relatively stable in the 2012 crop year based on growing palm oil production and a more limited impact of the US drought on the global oilseed oil production (Figure 4.5.). The present tightness in the market is mostly due to strong demand for food and biodiesel uses World vegetable oil production is expected to increase by 25% or 39 Mt over the Outlook period, relative to the 2010-12 average. It is likely to remain very concentrated with eight major producers (Indonesia, Malaysia, China, the European Union, the United States, Argentina, Brazil and India) accounting for almost 80% of total production throughout the projection period. Malaysia’s and Indonesia’s palm oil output is projected to grow on average at about 1.9%
4. Economic Aspects of Protein and Oil Crops (Sunflower, Rapeseed, Soybean, Alfalfa)

p.a., a slower rate than in the past as land restrictions, environmental constraints and labour costs become more constraining. Due to this lower growth in production, the share of palm oil in total vegetable oil output should stabilise at about 34%. Based on its use of imported seeds in domestic crush, China ranks third in vegetable oil production. Population growth and rising per capita income are expected to lead to an average 2.1% p.a. growth of food vegetable oil use in developing countries. Annual food vegetable oil use per capita is expected to average 19 kg across developing countries, but no more than 9.5 kg in least developed countries by 2022. As a group, developed countries are showing a stable consumption level of 24-25 kg but individual countries differ based on tastes and preferences in their diets (FAO, 2012).

6. 4.6. Vegetable oil for biofuels

With the promising development of biofuels worldwide, diverse vegetable oils have been target for numerous tests to evaluate their global performance for the current standards, mainly EN 14214 (European Standard). The European Union targeted to increase the biodiesel production and consumption with variable and raising values in each country share – intra European Union – averaging almost 9 million tons in the last 3 years. Unlike soybean oil and rapeseed oil, sunflower oil presents some limitations to use it for biodiesel production.

4.6. ábra - Figure 4.5.: World consumption of vegetable oils from 1995/1996 to 2011/2012 (million metric tons)

Source: US Department of Agriculture, Agrarmärkte 2011

These limiting factors are close related with the fatty acid composition, been highly dependent on weather conditions, environment and agricultural practices – that include hybrids and sowing dates. There is a fundamental parameter, which determines the biodiesel versatility in the European Union, and is related to the cold point or Cold Filter Plug Point (CFPP), and in this factor, the sunflower oil does not show a standard value. On the other hand, and in different with soybean oil, sunflower oil has higher waste in refined process, declining competitiveness with other vegetable oils. In addition, it requires wintering process, to remove waxes from the oil (this it means a higher industrial cost).

Globally, the use of edible vegetable oil for biodiesel production is expected to expand by about 11 Mt to 30 Mt p.a. over the Outlook period. This constitutes a 61% increase over 144 the base period and takes up almost one-third of the total production growth of vegetable oil. The European Union is expected to remain the largest...
4. ECONOMIC ASPECTS OF PROTEIN AND OIL CROPS (Sunflower, Rapeseed, Soybean, Alfalfa)

producer of biodiesel with a declining but still dominant share of global output throughout the decade. Other important producing countries are Argentina, Brazil and the United States (FAO, 2012.).

Assuming normal yields in all producing regions, world production of oilseeds should rebound in marketing years 2013 and 2014 resulting in a sharp reduction of international oilseeds and products prices. After this correction, prices are expected to increase slowly based on strong food and fuel demands of vegetable oil and a solid feed demand for protein meal. Relative profitability of oilseeds versus coarse grains is expected to favour the distribution of land toward oilseeds and lead to a 26% increase in world production when combined with yield gains. With 93% of global exports in 2022, the Americas should confirm their role as the oilseeds basket of the world. China is expected to further solidify its position as the leading oilseeds importer but its share of world oilseeds crush is expected to stabilize at 25% of world total. After a period of over-proportional growth in palm oil production, its share in total oilseed oil output is projected to stabilize at around one third of the total vegetable oil production. World vegetable oil production remains very concentrated in the coming decade as growth originates in the main producing regions. Demand for food remains strong based on income and population growths, fuel uses are supported by consumption mandates. Global protein meal output is projected to increase by 25% or 67 Mt. Two-thirds should come from four countries: Argentina, Brazil, China and the United States. Compared to the past decade, consumption growth of protein meal slows down significantly reflecting both slower absolute growth in global livestock production and slower growth in the relative use of protein meal in feed rations, signalling a less rapid structural transformation process in the livestock sector in the coming decade (Forecast by FAO, 2012).

7. 4.7. The importance and usage of soybean

Soybeans have been cultivated in China for over 5,000 years for food and as a source of drugs. Before soybeans were used for a variety of modern food products – soy sauce, tempeh, natto and miso – they were used as a natural nitrogen-fixing, soil-enriching ground cover that could be plowed under when it was time to plant other crops. Soybeans were introduced to the wider world as trade between Europe and Asia increased. They arrived in Europe in the early 18th century and the American colonies in 1765, where they were initially cultivated for hay. Now, soybean is a major global source for vegetable oil and animal feed and global production has increased substantially to satisfy a rise in demand to meet the world’s changing food habits, feed and fuel industry. Soybeans compete for acreage on a global scale with canola/rapeseed, sunflower, corn and wheat. Soybeans produce their best yields in hot, wet and humid climates where the land is fertile.

Soybean oil is used in human foods, biodiesel production and industrial applications (for instance, environmentally friendly printing inks and plastics). The majority of soybean oil production is used by food processors and food service operators as an ingredient for baked and fried food products or packaged in bottles for sale as cooking oil. Recently, the biodiesel industry, which has started to develop in the U.S. and the European Union, has begun to use soybean oil as a feedstock to produce an environmentally friendly form of renewable fuel (Soybean Export Council). Soybeans are consumed in two ways. They can be consumed directly as human food products, or they can be crushed into meal and oil, which are used both for human food and animal feed. Beans grown for direct human consumption are generally consumed in Asia, particularly China, Japan and Indonesia, and are either used directly as a whole seed or are processed and incorporated as a high protein ingredient into food like tofu, tempeh, soy milk, soy cheese or other products. These soybeans account for a very small percentage of the demand market. The vast majority of soybeans are processed by crushers in origination countries such as the U.S., Brazil, Argentina and China (Fig. 6.), which produce the seed, or destination markets such as China which imports the majority of beans it consumes. A crushed soybean produces about 79% meal, 18.5% oil and 2.5% waste and hulls (Soybean Export Council).

Two types of oilseed-processing techniques are employed to extract meal and oil from the bean. (Fig.7.) Soybean meal is consumed primarily by animal feed mills and feedlots as a high-protein feed for livestock and poultry. This meal is preferred because of its protein content, which can reach 50%, assuring rapid muscle mass and weight gains for livestock and poultry. Over the past four decades, soybean meal has become the most readily available source of protein for animal feed manufacturers globally.

4.7. ábra - Figure 4.6.: Soybean Production of the World
4. ECONOMIC ASPECTS OF PROTEIN AND OIL CROPS (Sunflower, Rapeseed, Soybean, Alfalfa)

At the beginning, processors have crushed soybeans primarily for the meal, but today oil prices have risen so rapidly. High due to increased international demand for food applications, and the demand for biodiesel, those processors are crushing more for oil. This has led to a large increase in soybean oil’s percentage of the crusher’s profit.

Recent developments affecting soybean production, consumption and trade include:

• rapid growth of economies in the developing world, especially in Asia, where increased per capita income is leading to increased demand for animal protein and cooking oil;

• there is a shortage of protein rich compound feed components in Europe - high demand for farm animal production (especially pig and poultry);

• increase in Chinese processing capacity rise in global biodiesel production;

• dietary concerns over trans fats;

Source: WASDE, 2013

4.8. ábra - Figure 4.7.: Soybean processing

Source: Soyatech, 2013
higher demand for specialty oils;

financial institutions entering the global soybean market;

vegetable oils are usage for bio-fuel production;

GMO provide higher yields and specialized production.

8. 4.8. The importance and usage of alfalfa

Alfalfa has been heralded as having the highest feeding value of all commonly grown hay crops, producing more protein per acre than any other crop for livestock. It is believed that alfalfa originated in southwestern Asia and was first cultivated in Persia.

Alfalfa is one of the world’s most versatile crops. Alfalfa can grow on soils ranging from beach sands to heavy clays. It is grown as an intensive cash crop under irrigation, or as a lower-intensity rainfed pasture crop in forage mixes. Alfalfa is the key forage crop for dairy producers in the US and the world.

Alfalfa can be fed as pasture or green chop, or preserved as hay, or dehydrated meal, pellets or cubes or preserved as hay or silage. It is mainly produced for livestock.

Alfalfa has been used for human consumption in the form of “alfalfa sprouts” a minor use of alfalfa seeds or as diet supplements made from leaves.

Industrial use of alfalfa for production of enzymes, or fractination of the crop to use the stem as bioenergy source are currently being researched. Organic alfalfa production is a basic feed for organic milk production. Alfalfa seed production is also a possibility of increasing income from the industry.

Alfalfa production has steadily developed because of the crops strong vitality, wide range of adaptation, high production, superior quality and multiple uses. Currently, alfalfa production is mainly distributed in temperate regions such as the US, Canada, Italy, France, China and south Russia in the Northern Hemisphere, and Argentina, Chile, South Africa, Australia and New Zealand in the Southern Hemisphere. Alfalfa is grown on about 30 million hectares (ha) worldwide, down from about 33 million ha in the 1970s, and 32 million ha in the 1980s.

The area of production declined by about 10% due to numerous reasons such as high petroleum prices that virtually eliminated the alfalfa dehydration (“dehy”) industry in North America, some disease and insect pests, and higher values (or policy incentives) of grain crops. The global area of alfalfa production has rebounded since the 1990s, and has been fairly stable at 30 million ha to the present (Hu Yuegao - Dennis Cash).

Alfalfa utilization varies considerably - North America produces mostly dry hay for domestic use, whereas beef cattle direct-graze a significant area of the alfalfa produced in Argentina. In the US, alfalfa is recognized as “Queen of the Forages”, and its planted land area follows only that of corn, wheat Alalfa in the US is grown principally in the northern states or in the west under irrigation. The annual production value of dry alfalfa hay in the US is about $USD 8.1 billion.

In European countries such as Italy, Romania, France, Bulgaria, Spain and Hungary the area of alfalfa production within each country is relatively small. However, alfalfa is intensively grown, and taken as an aggregate the hay and processed alfalfa are major agricultural products in Europe. In contrast to North America, Argentina and Europe the alfalfa production systems in China and Siberia are generally extensive due to the long-standing production practices and natural conditions.

Alfalfa has broad economic value: alfalfa is often characterized as being of ‘low value’, its true economic impact is much greater than just its gross receipts. Alfalfa is the beginning of a complex food chain, and affects many industries from dairying, sheep, goat, and beef production and horseracing. Protecting, reaching the soil in nitrogen and enhancing water use efficiency.

Alfalfa must compete economically with other arable corps. It has maintain its position in the crop rotation due to its steady demand, cash-flow characteristics, rotation and soil benefits. Alfalfa production requires lower investments and it has lower biological and economic risk of crop failure than many other arable crops.
provides reliable income and profit potential, and enjoys consistent demand. Alfalfa can provide early and periodical income – depending on the production – and steady return after each harvest. So many growers keep alfalfa in the crop rotation mix primarily due to its benefit for the next crops and a steady cash-flow characteristic. The highest costs are raised at the times of harvest of hay or silage (machinery, transport and handling). Market is existing for hay, because there is a continuous demand. (Animal production: dairy, horse, small ruminants).

Modern commercial markets for alfalfa have developed parallel to the rapid development of animal husbandry industries during the 20th century, primarily the large-scale dairy industry. Several significant shifts occurred during this period that increased marketing demands for alfalfa. These included the increased consumption of meat, poultry and dairy products, large-scale industrialized animal production systems, and the emphasis by many countries for domestic production of reliable and safe supplies of meat, milk and dairy products.

9. References


6. OECD-FAO Agricultural Outlook 2013

7. WASDE, 2013 (Soybeanmeal Infocenter) http://www.soymeal.org/grahs.html

8. USDA; Coceral, Agrarmärkte 2011,


10. FEFEAC Nwesletter, 2012
5. fejezet - 5. Economics of “Industrial Crop” Production (potato, sugar, tobacco)

1. 5.1. Potato production

Potato is one of the most important crops. Thanks to its ability of biological adaptation, potato is grown on all continents in almost 150 countries. It can grow from sea level up to 4700 metres. There are more than 4300 varieties of native potatoes, mostly found in the Andes and over 180 wild potato species. Nowadays potato is the third most important food crop behind rice and wheat.

The origin of cultivated potato dates back to 8000 years to the Andes, to Peru and Bolivia. Spanish sailors returning from America brought potatoes to Europe in the 16th century from which distribution started throughout the world in the late 17th century. Initially potato was used for animal feeding in Europe the human consumption started in the middle of 19th century when other crops became scarce due to wars and famines (Horton and Anderson, 1992). Nowadays potato is grown on more than 18 million hectares and the estimated production is over 320 million tons annually, which increase continually. In the last two decades, the increase was almost 40% (Figure 5.1).

5.1. ábra - Figure 5.1: Trends in world potato production

As Figure 5.1. shows the reason of the increase was the significant growth in developing countries. Since 1991, the production in these regions has increased by more than 125% while in developed countries, it has decreased lightly and in the last decade, it has stagnated so now the developing countries, mainly Asia gives half of the production (Figure 2). Potato is an excellent source of carbohydrates, protein, Ca, Vitamins A, B, it gives an exceptionally high yield, produces more edible energy and protein per unit area and time than most of the other crops, fits well into multiple-cropping systems prevalent in tropical and subtropical agro-climatic conditions, its cultivation is profitable and it provides employment. Thus, potato cultivation is expanding rapidly in developing countries. The role of potatoes could be dominant as a staple food with the increasing human population. Whereas the developed countries make the most diversified use of potatoes as food, feed and raw material for processed products, starch and alcohol, the developing countries are increasingly adopting the potato primarily as a food crop. (H.P Singh, 2008) Approximately 50% of potatoes are predicted to be consumed fresh. The
remaining is processed into food products and ingredients, animal feed or provides seed. Potato is also an important source of starch. For example, within the EU 18% of potato crops are used for starch extraction (P.R.J. Birch et al., 2012).

5.2. ábra - Figure 5.2: Potato production share by region (1992 – 2011)


The top producing countries are China (23%), EU-27 (17%), India (11%), Russia (9%), Ukraine (6%), US (5%). Only 2-3% of the about 350 million tons of world potato production is traded internationally. Import and export of fresh potatoes from and to developed countries account for 83 and 86 percent of total world trade, respectively. The export share of developing countries for fresh potatoes (14.3%) and frozen potatoes (2.9%) does not commensurate with their 47% contribution to world potato production. The export of potatoes from developing countries faces several constraints and concrete measures need to be undertaken to address these. Surveys of potential export markets and strengthening of a suitable infrastructure for export like cold storage, surface transportation and shipping facilities are essential components of successful exports. The database on potato exports, price, grade standards, phytosanitary standards, processing standards, consumer preferences, seed standards, etc. need to be prepared for all importing countries so that all information is readily available to the exporters and manufacturers. The export and import of potatoes mainly take place within the European countries and five other countries, namely Canada, Cyprus, Egypt, Turkey and the United States. The trade among these countries account for 80% of the global potato trade. Asia’s share in export and import of potatoes is only 9.8% and 11.6 %, respectively. The countries of Asia and the Pacific region can supply fresh potatoes year-round because potatoes are grown throughout the year in one or the other part of the region, unlike in European countries where potatoes are grown only during the summer months. The poor trade performance of potatoes among the countries of Asia and the Pacific region can be attributed to several factors such as trade barriers, lack of marketing infrastructure, lack of seed production systems and poor market intelligence (SINGH, 2008).

Potatoes were eaten as part of around 10.3 billion meals made at home each year, which is an average of 3.3 meals a week for each member of the population. Three main forms: Fresh potato, frozen potato, chips. The average potato consumption was 32.6 kg/capita/year in 2009. According to the International Food Policy Research Institute and the International Potato Centre total potato production in the world in 2020 will be 403.5 million tons with China producing about 87.8 million tons and India 43.3 million tons. During the same period, worldwide demand for potatoes for food, processing and animal feed is expected to increase by about 40% (Table 5.1). There are several challenges to achieve these targets, namely an increasing population, the decreasing amount of arable land, the reducing water availability, and improved purchasing power leading to an increased demand for food, more environmental degradation, a reduction in input use efficiency and adverse changes in climate and sea levels. Since land and water are shrinking resources for agriculture, there is no other option except to produce more food from less land and water. In other words, we have to produce more food per unit land, water, energy and time. The other major constraints in potato production have been the incidence of a wide range of pests, difficulties in production and distribution of quality seed, inadequacies of transport and cold storage facilities, indiscriminate use of pesticides resulting in environmental problems, emergence of new pests and price fluctuations (SINGH, 2008).
5.1. táblázat - Table 5.1.: Projected annual growth rates (Average annual percent) for demand of potatoes for food and feed, 1993-2020

<table>
<thead>
<tr>
<th>Country/Region</th>
<th>Food</th>
<th>Feed</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A*</td>
<td>B*</td>
<td>A*</td>
</tr>
<tr>
<td>China</td>
<td>2.20</td>
<td>2.78</td>
<td>0.27</td>
</tr>
<tr>
<td>India</td>
<td>3.09</td>
<td>3.80</td>
<td>0.00</td>
</tr>
<tr>
<td>Developing countries</td>
<td>2.33</td>
<td>2.75</td>
<td>0.37</td>
</tr>
<tr>
<td>Developed countries</td>
<td>0.37</td>
<td>0.34</td>
<td>0.22</td>
</tr>
<tr>
<td>World</td>
<td>1.20</td>
<td>1.39</td>
<td>0.26</td>
</tr>
</tbody>
</table>

*According to IFPRI’s International Model for Policy Analysis of Agricultural Commodities and Trade (IMPACT), 2000. A= Baseline scenario and B= High demand/production growth scenario.

Source: SINGH, 2010

According to SCHWARTZMANN (2010) the future of potato production and trade will depend on the ability of the sector to respond to the following challenges:

- the growth of the world population, which is a challenge of food security;
- the change in consumption patterns, with the growing demand worldwide for processed, ready to-eat products;
- the climate changes which should bring motivation to adapt the product to new growing conditions (drought resistant varieties), and the need to find treatments filling the new environmental requirements;
- resistance to pests and diseases, which is a current challenge;
- developing storage to reduce the waste of production, regulate the marketing of the product and avoid low prices.

2. 5.2. Sugar sector

Sugar is produced in over 100 countries worldwide. In most years, over 70% of world sugar production is consumed domestically, which allowed the development of a large export market. However, a significant share of this trade takes place under bilateral long-term agreements or on preferential terms. Since only a small proportion of world production is traded freely, small changes in production and government policies tend to have large effects on world sugar markets. World sugar production was over 174 million tons in 2012. The top producing countries are Brazil with 38.6 million tons which are more than 22% of global production following by India (15.6%), EU-27 (8.9%), China (8%), Thailand (5.7%), US (4.7%), Mexico (3.8%), Australia (2.6%) and Russia (2.4%).

Sugar production has two sources: sugarcane and sugar beet. Sugarcane is a perennial grass that is produced in tropical and subtropical climate zones. It matures in 12 to 16 months. Once the cane is harvested, the sucrose starts breaking down. Thus, sugarcane mills are located close to the cane fields to minimize transport costs and sucrose losses. Mills convert sugarcane into raw sugar, which is shipped to refineries for further processing. In contrast to raw sugar producing mills, refineries are unconstrained by seasonal production patterns and operate throughout the year. Unlike sugarcane, sugar beets are an annual crop of temperate climate zones. Since sugar beets are bulky and costly to transport, beet processing facilities are located close to production. In contrast to sugarcane, sugar beets are directly processed into refined sugar. Raw sugar is produced only from sugarcane. Raw sugar and refined sugar are two different products. They are both traded internationally. Beet sugar
producing countries export refined sugar, while cane sugar producing countries export either raw or refined sugar (Koo and Taylor, 2011).

The major sugar exporting countries were Brazil, Australia, Thailand, and South Africa. These countries accounted for 59% of global exports from 2006 to 2010. A relatively few number of countries dominate world sugar exports, but imports are less concentrated. Major importing countries were Russia, the United States, Indonesia, Korea, Canada, Algeria, China, and Japan. Imports by these countries accounted for about 28% of all sugar imports from 2006 to 2010. Under the Lome Convention, the EU was required to import sugar under preferential terms from certain African, Caribbean, and Pacific countries.

Brazil is and will remain the world’s leading sugar and ethanol producer and exporter, and the major centre of international price discovery for sugar. With the composition of Brazil’s private-vehicle fleet increasingly being dominated by flex-fuel vehicles over the Outlook period, the derived demand for sugar cane from ethanol is expected to surge over the projection period, especially in the context of high projected crude oil prices. As a result, the projected share of the sugarcane crop going to ethanol increases from 51% on average in 2005-07 to 66% in 2017-18. Nevertheless, this development is not expected to unduly constrain the amount of cane available for sugar production and sugar exports, since sugarcane production in Brazil is foreseen to rise by over 75% from the base period to 2017. However, in the wake of steadfast domestic and international demand, there will be a propensity for sugar prices to strengthen over the projection period. On the ethanol front, a number of other sugar producing countries are currently embarking on, or reinvigorating existing, renewable energy programmes, such as the EU, Japan, Malaysia, Indonesia, India, South Africa, Colombia, and the Philippines, particularly for use in the transport-fuel sector. Most of these fledgling fuel ethanol programmes, however, are expected to use molasses or starch sources rather than raw sugarcane juice as the preferred feedstock. As molasses is produced as a by-product of the sugar refining process, molasses-based bio-ethanol production should not greatly impair sugar production in these countries and may even stimulate further growth in cane and sugar output. Furthermore, in some regions, such as the EU, specific sugar crops (industrial beets) are being separately designated and developed for non-food uses such as bio-ethanol production (OECD-FAO, 2008).

5.3. ábra - Figure 5.3: Global sugar production and consumption

![Image of global sugar production and consumption]

*2013 estimated

Source: USDA, 2013.

The average sugar consumption is 21 kg/capita/year. The highest consumption is Cuba (61 kg/cap) followed by Australia (60 kg/cap), Brazil (56 kg/cap.) and Mexico (50 kg/cap). Per capita sugar consumption was lowest in China at 7 kg per capita, and in Indonesia (16kg/cap) and India (17 kg/cap) but that may increase substantially as per capita income increases. Annual global sugar consumption for the 2006-2010 period was 154 million metric tons. The Figure 5.3. shows the relation between the sugar production and consumption.
The world sugar price is mainly determined by different sugar policies. As Figure 5.4. shows the prices have changed significantly during the years in the last two decades.

5.4. ábra - Figure 5.4: World sugar prices, 1991–2007, and the price outlook, 2007–2017 (USD/ton)


Global sugar production for 2013/14 is forecast at 175 million (metric) tons, narrowly setting a record with growth in Brazil and Thailand more than offsetting sharply lower production in India. International raw sugar prices are at levels not seen in nearly three years with prices less than half the peak set in February 2011. Low prices are expected to stimulate global consumption and trade, with exports forecast 4 percent higher at 59 million tons.

3. 5.3. Tobacco sector

Tobacco is grown in more than 120 countries in the world. Most successfully in the tropical and sub-tropical areas. Tobacco has a special biological ability to adapt that is why it can be grown successfully in most areas with temperate climate. Tobacco production is done in poor quality sandy soils where economical production of other plants is not possible. Tobacco is grown mostly in areas which have the least advantageous climate and the poorest soil. In regions which are the least developed economically and socially, and where this activity has an outstanding economic and social role (BORSOS et al., 2008).

Based on FAOSTAT (2013) data the world tobacco production was 7 million tons in the last years. In estimation of world leader tobacco producer company the total production is about 6 million tons (ULT, 2013). Tobacco is divided into 8 type groups:

I. Flue cured,
II. Light air cured,
III. Dark air cured,
IV. Fire cured, V
V. Sun cured, VI.
VI. Basmas,
VII. Katerini,
VIII. Kaba-Koulak.
The Flue-cured tobacco gives almost 80% of total production, the Burley gives 15%. The Figure 5.5. shows the change of production in the last two decades.

5.5. ábra - Figure 5.5.: Changes in the world’s tobacco production

![Figure 5.5.](image)


The greatest tobacco growing countries—China, Brazil, India and the US—together give 60-70% of the world’s tobacco growing. China’s production is almost totally for its own consumption. Figure 5.6. shows the trends in top producer countries.

5.6. ábra - Figure 5.6.: Trend in tobacco production in top producer countries

![Figure 5.6.](image)


While the demand for tobacco products constantly rises the consumption have fallen in developed countries and nowadays developing countries represent most of the world’s production and consumption.

There are big rearrangements in the world’s tobacco production. Production is being transferred from developed areas to developing countries. The main reasons for this are the following:

- The growth of consumption, which mainly results from the fast increase of the population.
• Tobacco can be produced at lower cost, due to better climate and cheaper labour force.

• The agricultural policy support for tobacco growing is less and less in the developed countries.

Besides their climate and cheap workforce, another advantage of developing countries in the world market competition is their support from the WTO. In addition, there is regrouping of profit among the participants of the sector, as from cheaper raw material you can make products that are more profitable.

World cigarette production was 6,293.2 billion pieces in 2011. World cigarette production increased in 2011 by 32.4 billion sticks, or 0.5 percent, as production rose to a new record level. World cigarette production grew by 0.9 percent on a compound annual basis between 2006 and 2011, down somewhat from the growth rate for the longer period 2001-2011 of 1.1 percent. According the WHO until 2025 the number of smokers grows from 1.1 billion to 1.7 billion.

Cigarette production grew strongly in China for the ninth consecutive year. For the period 2006-2011, PRC cigarette production has grown at a compound rate of 3.7 % per year vs. a decline of - 0.6 % for the world excluding China. China now represents 38.6 percent of world cigarette production. By comparison, China represented 30.4 % of world production in 2002.

Overall E.U. production increased slightly in 2011 by about 0.6 billion sticks, primarily due to increases in Poland, Romania, Bulgaria, and Germany, partially offset by decreases in the United Kingdom, Spain, Denmark, and the Netherlands. Production in the CIS countries decreased by about 10 billion sticks, or 1.7 percent, primarily due to Russia and the Ukraine.

Production in the Americas decreased about 2 percent, as estimated production in Paraguay decreased significantly, while Mexican production decreased slightly. U.S. production declined in 2011 for the fifteenth straight year, decreasing by about 8 billion sticks, or 2.4 percent. The decline in U.S. cigarette production was due to decreases in exports as well as production for domestic use. Middle East production increased slightly, with a significant increase in the United Arab Emirates partially offset by notable decreases in Jordan and Turkey. African production decreased 4.8 percent, with notable declines in the Republic of South Africa and Zimbabwe (ULT, 2013).

In the European Union tobacco has been grown on 132,000 hectares in 12 countries out of the 27 member states of the EU. In Europe tobacco growing is regionally concentrated. Tobacco is grown mostly in areas which have the least advantageous climate and the poorest soil. In regions which are the least developed economically and socially, and where this activity has an outstanding economic and social role. Figure 5.7. shows the change in EU tobacco production.

5.7. ábra - Figure 5.7: Evaluation of tobacco production area 2004-2010 in EU
Farmer prices vary considerably by the demand on different types of raw tobacco (special character) and are influenced by several factors: quality (habitat, variety), price policy of big companies, etc. In case of oriental tobaccos, market pays for their unique character, special role in blends and limited quantity. Filler tobacco prices in EU are influenced by supply and demand in the world market, and not by tobacco quantity produced in the EU, or according to payment system. In the case of FCV and Burley tobaccos, there is no determining connection between the quantity of tobacco produced in the EU and the average farmer prices of raw tobacco.

4. References

Sources (potato):

1. FAOSTAT, 2013.


Sources (sugar):


Sources (tobacco):


12. FAOSTAT, 2012

13. Tobacco Atlas: Growing tobacco

6. fejezet - 6. economics figures and general attributes of fruit production

1. 6.1. Basic terms

First of all we have to introduce some basic terms of fruit production considering that they are of importance to understand our topic.

Many different fruit production systems have been developed and applied simultaneously. Farm management point of view it is advisable to classify them at least into two main types, differing them as intensive or traditional plantations and giving their main attributes. Those attributes – apart from fruit species – can be summarized as follows:

- **Intensive plantations** have: stock with weak growing, high number of trees per area unit (standard > 1 000 trees/ha), supporting-pillar, irrigation system.

- **Traditional plantations** have: stock with middle-strong or strong growing, low number of tree per area unit (standard < 600 trees/ha), no supporting-pillar system, no irrigation system.

Categories of intensive and traditional are not precise classifications since a lot of technologies with some overlapping exist in practice. Such example for this is called semi-intensive, or we can find out some differences for fruit species in the interpretation of the intensity defined by technological applications.

It is important to know that plantations have two periods such as establishment (investment making period) and production (fruiting period).

**Investment making period** – irrespective of the intensity of a plantation – includes the planting and the time need of turning to fruit, while production phase includes fruiting up to the clearing of the plantation. These phases of a plantation life-cycle last differently for intensive and for traditional plantations.

- **For intensive plantations** it is a three year turning to fruit that follows the establishment, thus farmers get a fruiting plantation by the end of the vegetation season of year three, which is the time of putting the investment into operation from financial accounting aspect. In year four production start off which is called fruiting period as a horticultural term. In standard circumstances farmer can count on 12-15 fruiting years that is to say the plantation would be cleared in the age of 15-18 years.

- **For traditional plantations** (pomaceous fruits and nuts cases) it needs six years to turn to fruit and fruiting starts in year seven that can be easily followed by 15-20 years of fruiting, which is to say that a plantation can exist over 21-26 years. (Please, note that time need for turning to fruit for walnut is 10 years, while it is only 1-2 years for berries.)

From economic point of view it is recommended to consider a plantation as fruiting one when yielding such an amount that can provide as sum of sales revenue as needed to cover the costs of production.

The **production phase** (one year operation in this sense), furthermore, can be taken apart two phases such as fruit growing and „post-harvest”.

- **The growing phase** includes all the operations done in the plantation starting with pruning up to the jobs after harvesting in a specific year.

- **The post-harvest phase** includes all the operations after harvesting that are not done to the trees in the plantation (garden) but done to the fruit as harvested yield. In broad sense this includes all the processes after harvesting such as storing, sorting, marketing, logistics in order to distribute the products.

Since fruit production as a farm enterprise differ from crop production and other farm operations, it is vital to highlight those special features and attributes that make the difference. Farm business attributes (advantages and disadvantages) can be summarized as follows:

Main farm business **advantages** of fruit production:
• Some fruit species are not so sensitive to soil quality
• High value of production per area unit can be generated
• Good years can yield high revenue, giving high gross margin
• Overheads are not much relatively, thus gross margin can easily cover it
• Small farm business can earn complementary revenue by fruit production

Main farm business disadvantages of fruit production:
• This is a capital intensive sector
• Long-term return characterizes it
• High inputs use is essential to generate profit
• Labor intensive (on-seasons) operations features it
• Low turnover of current assets farmer have to consider
• Inputs can be calculated and provided on a solid basis, but the yield is highly dependent on the weather conditions, therefore it can call „output sensitivity‖ that farmers have to face
• High volatility in profitability per annum which is almost part of the normal business operation nowadays
• Long term decisions have to make with corresponding production risk
• High demand for well skilled and trained labor that is a basic production factor
• Special machinery is needed, therefore it is difficult to pair with other enterprises within a farm business in order to share and utilize machinery on the farm.

Farmers have to consider all the positive and negative attributes listed above if establishing fruit plantations.

2. 6.2. Fruit production need for capital

Fruit production is a capital intensive enterprise, for which farmers can get capital from two different classes of capital:
• Capital to be invested in to set up fixed assets such as land, plantation, machinery, constructions, integuments etc.
• Working capital that is meant to finance the operation itself and use of the fixed assets on a year basis.

Capital to be invested in means the assets that money in this sense which is needed to start the enterprise up. Because this is a capital intensive one, which can take relatively long time to provide, it is a step by step process how a complete enterprise can be formed in practice. Anyway it can take even a decade and is a never-ending story because of the amortization of the assets and technology parallel with a constant demand for innovation forced by market turbulence. For this reason the capital demand exists continuously over long time. In spite of the continuous demand over years, Table 6.1. can show how intensive this demand is for a fruit production enterprise, which capital is tied up in the horticultural production even for decades.

6.1. táblázat - Table 6.1.: Demand for fixed assets producing fruits at current prices

<table>
<thead>
<tr>
<th>Denomination</th>
<th>Fixed assets (‘000 HUF/ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Land to cultivate</td>
<td>500-2 000</td>
</tr>
</tbody>
</table>
Demand for invested capital of a fruit producing enterprise can range in wide intervals based upon fruit species, the way of farming, machinery used, post-harvest infrastructure available act. If we take a sour cherry or a plum plantation with moderate capital demand, which does not need storage rooms, sorting and packaging machinery, then farmers can count on 4-5 million HUF of assets’ demand per hectare. The other extreme might be a most up-to-date intensive technology of apple production that has a full post-harvest capacity, then from 20 million HUF up to 30 million HUF per hectare capital demand can easily arise (Table 6.1.).

Besides having established the enterprise and invested in the necessary fixed assets over years, farmers have to finance the production phase in each year or vegetation period that needs high sums. These sums together are called working capital that differs for different fruit species and their yielding standards (Table 6.2.). Table 6.2. shows fruit production need for working capital at high technology level and input use up to and inclusive of harvesting.

Post-harvest operations can generate up to 1.0-1.5 million HUF/ha of expenses during the production phase in each year.

6.1. ábra - Table 6.2.: Fruit production need for working capital at high technology level and input use (without postharvest)
6. economics figures and general attributes of fruit production

<table>
<thead>
<tr>
<th>Fruits</th>
<th>Working capital demand (‘000 HUF/ha)</th>
<th>Favorable yield</th>
<th>No yield*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apple</td>
<td>1 000-1 200</td>
<td>700-800</td>
<td>500-800</td>
</tr>
<tr>
<td>Pear</td>
<td>700-1 000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sour cherry – harvest by hand</td>
<td>800-900</td>
<td>300-500</td>
<td></td>
</tr>
<tr>
<td>Sour cherry – harvest by machinery</td>
<td>500-700</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cherry</td>
<td>1 000-1 200</td>
<td>400-500</td>
<td></td>
</tr>
<tr>
<td>Apricot</td>
<td>1 000-1 200</td>
<td>600-700</td>
<td></td>
</tr>
<tr>
<td>Peach</td>
<td>800-1 100</td>
<td>500-600</td>
<td></td>
</tr>
<tr>
<td>Plum – harvest by hand</td>
<td>700-900</td>
<td>300-500</td>
<td></td>
</tr>
<tr>
<td>Plum – harvest by machinery</td>
<td>500-700</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note*: provided that total loss of yield happens at the first half of the vegetation period.

Source: own compilation

### 3. 6.3. Economic issues of apple production

Introducing the economics of apple production we give an example for producing table apple. Considering that the most used technologies are intensive and semi-intensive ones, thus the example calculations deal with them. Since they are broad sensed terms, this is why the main parameters are given for both (Table 6.3.).

<table>
<thead>
<tr>
<th>Denomination</th>
<th>„Intensive”</th>
<th>„Semi-intensive”</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stock</td>
<td>Poor growing stock (M9, or M26)</td>
<td>Middle growing stock (MM106)</td>
</tr>
<tr>
<td>Space</td>
<td>3.6-4.0 x 0.8-1.2 m</td>
<td>4.5-5.5 x 1.5-2.5 m</td>
</tr>
<tr>
<td>Number of stocks</td>
<td>2 080-3 470 tree/ha</td>
<td>730-1 480 tree/ha</td>
</tr>
<tr>
<td>Crown form</td>
<td>Slim spindle</td>
<td>Free spindle</td>
</tr>
<tr>
<td>Construction</td>
<td>Supporting-pillar with cable</td>
<td>No</td>
</tr>
<tr>
<td>Irrigation system</td>
<td>Drip irrigation</td>
<td>Drip irrigation</td>
</tr>
<tr>
<td>Potential yield level</td>
<td>40 t/ha</td>
<td>40 t/ha</td>
</tr>
<tr>
<td>Table apple ratio</td>
<td>85-95%</td>
<td>65-75%</td>
</tr>
<tr>
<td>Produce sold</td>
<td>Table apples produced are harvested by hand and collected in containers in the field, pre-sorting is done by labor harvesting and produce is sold right after harvesting in the shape (size, color etc.) and ripeness expected from that specific apple variety. No storing, sorting, packaging, shipping costs, while by-product is handled and shipped as bulky product.</td>
<td></td>
</tr>
</tbody>
</table>

Source: own compilation

In the next subchapters first we discuss the economic issues of the establishment period and the production for a vegetation period, then considering the rentability over the total life-cycle of a plantation.
3.1. 6.3.1. Costs of inputs, investment and production

3.1.1. 6.3.1.1. Investment making period of the life-cycle

Establishment of an intensive apple plantation is very capital intensive nowadays, which needs least 4-5 million HUF per hectare. It is the cost of stock that accounts for the biggest portion of that sum. Supporting-pillar system costs 1 million HUF/ha, while irrigation system cost, which is a dripping one, can range between 600 thousand and 1200 thousand HUF/ha. Land preparation includes all the operations’ costs such as fertilization, ploughing etc. that are needed to form stock-bed with good quality. Land preparation costs do not differ significantly by fruit species. Other costs include fencing, authority fees etc. (Table 6.4.).

Plantations with stocks with semi-strong growing and low number of stocks per hectare have lower investment cost, in regard to the fact that they have no supporting-pillar system, but have a higher interval resulting in ½ or 1/3 of the stock needed of the intensive ones. These two items make 2.0-2.5 million HUF of difference, while there are no other corresponding differences in the rest of the operations costs between the two types of plantations.

6.3. táblázat - Table 6.4.: Investment cost of the introduced apple plantations (‘000 HUF/ha)

<table>
<thead>
<tr>
<th>Denomination</th>
<th>„Intensive”</th>
<th>„Semi-intensive”</th>
</tr>
</thead>
<tbody>
<tr>
<td>Land preparation</td>
<td>475</td>
<td>475</td>
</tr>
<tr>
<td>Lay out supporting system</td>
<td>1 070</td>
<td>0</td>
</tr>
<tr>
<td>Stock and planting</td>
<td>2 075</td>
<td>735</td>
</tr>
<tr>
<td>Set up irrigation system</td>
<td>775</td>
<td>680</td>
</tr>
<tr>
<td>Other operations</td>
<td>250</td>
<td>250</td>
</tr>
<tr>
<td>Total costs of the establishment</td>
<td>4 645</td>
<td>2 140</td>
</tr>
<tr>
<td>Treatment cost up to the time of fruiting*</td>
<td>1 190</td>
<td>1 460</td>
</tr>
<tr>
<td>Total investment cost</td>
<td>5 835</td>
<td>3 600</td>
</tr>
<tr>
<td>Sales revenue summed up by the starting of the fruiting phase</td>
<td>1 280</td>
<td>1 696</td>
</tr>
<tr>
<td>Net investment cost</td>
<td>4 555</td>
<td>1 904</td>
</tr>
<tr>
<td>Amortization over production phase</td>
<td>380</td>
<td>127</td>
</tr>
</tbody>
</table>

Note: * time need till fruiting are 3 and 5 years for intensive and semi-intensive plantations, respectively

Source: own compilation

Investment costs we summed up before would be higher with the costs of treatment, which is vital to provide good conditions for the trees, resulting in the total investment cost arisen by the time of fruiting (Table 6.4.). Remember that from economic point of view it is recommended to consider a plantation as fruiting one when yielding such an amount that can provide as sum of sales revenue as needed to cover the costs of production. Reducing total investment cost by the sales revenue summed up by the time of the beginning of fruiting phase, we get 4.5 million HUF and 1.9 million HUF for intensive and semi-intensive plantations, resulting in 380 thousand HUF/ha and 127 thousand HUF/ha of amortization, respectively.
3.1.2. 6.3.1.2. Fruiting period of the life-cycle

Production costs of the plantations described before were counted on a standard year with 40 t/ha yield (Table 6.5.). For a plantation with high technology and input level total direct costs per hectare is between 1.3-1.5 million HUF. There is no significant difference between the sums of production cost, provided that both are cultivated as high level as expected, although the amortization costs differ based on the differences in investment costs. Unfortunately, it is 70-80% of 1.3-1.5 million HUF/ha direct costs that can be considered as “fixed” costs, which is irrespective of the yield, charging the production even in a year of no yield. Adding overheads charged on the enterprise to the total direct costs results in total production costs per hectare which amount to 1.5-1.7 million HUF per hectare.

6.4. táblázat - Table 6.5.: Costs of apple production at high level technology and operations in an average year yielding 40 t/ha

<table>
<thead>
<tr>
<th>Operations</th>
<th>„Intensive”</th>
<th>„Semi-intensive”</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Unit cost</td>
<td>Unit cost</td>
</tr>
<tr>
<td></td>
<td>(‗000 HUF/ha)</td>
<td>(HUF/kg)</td>
</tr>
<tr>
<td>Prune in winter time</td>
<td>30</td>
<td>0,8</td>
</tr>
<tr>
<td>Soil and line space cultivation</td>
<td>23</td>
<td>0,6</td>
</tr>
<tr>
<td>Fertilization</td>
<td>180</td>
<td>5,0</td>
</tr>
<tr>
<td>Plant protection</td>
<td>392</td>
<td>9,3</td>
</tr>
<tr>
<td>Irrigation (as current cost)</td>
<td>31</td>
<td>0,8</td>
</tr>
<tr>
<td>Yield regulation</td>
<td>59</td>
<td>1,4</td>
</tr>
<tr>
<td>Other operations and costs</td>
<td>120</td>
<td>3,0</td>
</tr>
<tr>
<td>Total inputs of growing</td>
<td>835</td>
<td>20,9</td>
</tr>
<tr>
<td>Harvest</td>
<td>227</td>
<td>5,6</td>
</tr>
<tr>
<td>Amortization of the plantation</td>
<td>380</td>
<td>9,5</td>
</tr>
<tr>
<td>Total direct costs</td>
<td>1 442</td>
<td>36,0</td>
</tr>
<tr>
<td>Overheads</td>
<td>200</td>
<td>5,0</td>
</tr>
<tr>
<td>Total costs of production</td>
<td>1 642</td>
<td>41,0</td>
</tr>
</tbody>
</table>

Source: own compilation

6.2. ábra - Figure 1.: Trend in average cost of a kilogram of apple taken as a function of unit yield (postharvest costs not included)
Table 6.5 shows the average growing cost of table apple per unit, which does not include storing, sorting, packaging, and shipping costs, is around 40 HUF/kg. As with all other fruit species, this cost can, however, vary depending on the weather conditions each year. The reason for this is the high portion of costs behaving as fixed ones among the production costs that do not change much in years with different weather conditions. In the meanwhile, unit yields are highly subject to those weather conditions each year of production, ranging from zero up to 50 t/ha. Thus, this 40 HUF/kg average cost can be considered as favourable one, which might be much higher such as 65-75 HUF/kg in a half-yielded year. A worst case scenario, if it is a production year of 10 t/ha of yield of table apple, which increases the average cost of unit up to 130-150 HUF/kg (Figure 6.1.).

Calculations introduced before were done neglecting the post-harvest processes, considering that apple is sold right after harvesting. Table 6 shows, however, how significant the expenses that the operations, which are storing, sorting, packaging, and shipping, relating to post-harvest can charge to the enterprise.

6.5. táblázat - Table 6.: Post-harvest costs of apple production

<table>
<thead>
<tr>
<th>Operations</th>
<th>Unit cost* ('000 HUF/ha)</th>
<th>Unit cost* ('000 HUF/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Storing</td>
<td>500-800</td>
<td>15-25</td>
</tr>
<tr>
<td>Sorting</td>
<td>200-400</td>
<td>5-10</td>
</tr>
<tr>
<td>Packaging</td>
<td>300-1 100</td>
<td>10-30</td>
</tr>
<tr>
<td>Transportation</td>
<td>150-1 000</td>
<td>4-30</td>
</tr>
<tr>
<td>Selling</td>
<td>50-200</td>
<td>1-5</td>
</tr>
<tr>
<td>Direct post-harvest costs</td>
<td>1 200-3 500</td>
<td>35-100</td>
</tr>
</tbody>
</table>

Note: * given that there is 40 t/ha average yield and 70-90% table apple ratio

Source: own compilation

Note that amortization accounts for 40-70% of the post-harvest costs, which means that those operations need for high valued (expensive) investments generating such costs of which the highest portion is fixed irrespective of the yield.

3.2. 6.3.2. Yield and revenue
When calculating sales revenue, the premise is that both plantation types can yield around 40 t/ha at similar input use level. It is the table apple ratio that makes the difference. An intensive plantation is expected to give 90% of table apple ratio in a good production year, while semi-intensive plantations with the greater crowns can provide only 60-70% of table apple ratio. The reasons for this are heterogeneous sizes of fruits and poorer coloring.

Using the data introduced before, namely 90% for intensive and 70% for semi-intensive, and 40t/ha for both, Table 6.7. shows sales revenue calculations for both plantation types. Thus sales revenue is up to the selling price. Price for table apple in Hungary has been showing high volatility, ranging between 40-140 HUF/kg. Of course, it is highly dependent on the variety, size of fruit, color, and the time of selling. Apple varieties harvested in summer and early autumn are sold at reasonable prices, which range between 60-100 HUF/kg in general. Following this, farmers have to face a decrease in prices, because of the current harvest giving a lot of apple with no storage to the markets, resulting in a decrease by 50-60 HUF/kg. In general, the next January-February brings a slight recovery, because table apple in the interim store-houses would be sold out by that time, giving a push to the price that could reach 80-140 HUF/kg.

6.3. ábra - Table 6.7.: Sales revenues of apple plantations treated at high level in a standard year

![Table 6.7.](image)

Source: own compilation

For the calculation in Table 6.7. we use 60 HUF/kg of selling price as an average price in autumn, resulting in 2.0-2.5 million HUF of sales revenue per hectare, which come from plantations cultivated at high level and the yield is sold right after harvesting. For semi-intensive plantations, sales revenue is less by 10-20% caused by the lower ratio of table apple. If the apple harvested in autumn is stored over a few moths to be sold in spring time, the prices could be higher resulting in 3.0-4.0 million HUF of sales revenue per hectare. Note that this approach generates costs of post-harvest increasing the total cost of production per hectare.

3.3. 6.3.3. Profit, profitability

Table 6.8. shows income figures based on costs and revenue figures discussed in former subchapters.

6.6. táblázat - Table 6.8.: Incomes and efficiency measures of apple plantations treated at high level in a standard year

<table>
<thead>
<tr>
<th>Denomination</th>
<th>M.u.</th>
<th>„Intensive“</th>
<th>„Semi-intensive“</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sales revenue</td>
<td>HUF/ha</td>
<td>2 228</td>
<td>1 884</td>
</tr>
<tr>
<td>Total direct costs</td>
<td>HUF/ha</td>
<td>1 442</td>
<td>1 280</td>
</tr>
<tr>
<td>Gross margin</td>
<td>HUF/ha</td>
<td>786</td>
<td>604</td>
</tr>
<tr>
<td>Overheads</td>
<td>HUF/ha</td>
<td>200</td>
<td>200</td>
</tr>
<tr>
<td>Total costs of production</td>
<td>HUF/ha</td>
<td>1 642</td>
<td>1 480</td>
</tr>
</tbody>
</table>
Source: own compilation

In a standard year farmers can expect 600-800 thousand HUF of gross margin per hectare from a plantation treated at high level, which is to cover the overheads and gives the net income. If we take either the gross margin or the net income, it is the intensive plantation that can provide higher figures by 30-40%. The efficiency measures - net income per total costs of production ratio – are cca. 40% and 30% for the intensive one and the semi-intensive one, respectively.

It is worth mentioning that the critical yield is around 25-30 t/ha under these costs, quality, and prices conditions, which is the break-even yield. To cover the current operation expenses farmers need to harvest 20-25 t/ha of apple. In case of higher than 25-50% of yield loss, therefore, farmers are pushed into a loss making situation. And a total loss of apple yield results in 1.1-1.3 million HUF of loss per hectare.

### 3.4. 6.3.4. Rentability over the life-cycle of the plantation

To analyse rentability, first of all, we have to clarify the factors that determine it. With some simplification, we can say that they are the next below:

- investment cost;
- the way of financing the investment (the extent of support if any);
- costs of production;
- yields and product quality;
- selling prices.

Figure 6.2. depicts the trends in NPV reduced by interest rate counted on the tied capital over the life-cycle of the plantation (r=7%).

The curves start with the investment costs, which are 4.6 and 2.1 million HUF, going downwards over the first few years, since the expenses exceed revenues. From the years 2 and 4, profits generated each year increases the cumulated income, which becomes positive for both plantation types by the years 10-11. The investments are recovered that is to say that the revenues added up over the years exceed the total sum of the next three, namely the investment cost, the costs of operations, and the value of yield of the potential bank deposit counted on the standard interest rate on deposits. After having made the investment (planted the tree etc.), that time would have to go by in order to reach the same financial situation as if a farmer would have put his money in a bank.

**6.4. ábra - Figure 6.2.:** Trends in NPV reduced by interest rate counted on the tied capital over the life-cycle of the plantation (r=7%)
By the end of the life-cycle, an intensive plantation and a semi-intensive one can generate 2.5 and 1.4 million HUF of cumulated income (NPV), respectively. This means that the plantations return the investment cost, the yield at 7% interest rate on deposits for both ones, plus those 2.5 and 1.4 million HUF, respectively, over 15 years. Profitability is around 11% for both, moreover, a bit higher for the semi-intensive plantation. Profitability is acceptable between 10-15%, but good between 15-20% or more. In comparison with the interest rates on deposits, these plantations can yield at 5-7% higher rate, which is not remarkable.

It worth noting that an intensive plantation can generate by 80% more NPV than a semi-intensive one, in the meanwhile the lay-out period is almost the same and the return on capital is hardly the same or even lower in comparison with a semi-intensive plantations figures. These results point out the experience in practice that there are standard differences between intensive and semi-intensive plantations, namely a higher profit per unit for the intensive but better rate of return on 100 HUF for the semi-intensive.

6.5. ábra - Figure 6.3.: Trends in NPV of “intensive” plantations with different yields

Note: 16%, 14%, 11% rates of return on capital, which belong to the curves running high, medium, and low, respectively

Source: own compilation

Wrapping up what we have learned from the above is that a 40 t/ha yield can generate only an acceptable but far not favourable rent ability, with even a high table apple ratio. The turning point of rent ability is around 35-40 t/ha, which has to be produced over years as average by a plantation in order to reach the same financial situation as if a farmer would have put his money in a bank.
6.6. ábra - Figure 6.4: Trends in NPV of “semi-intensive” plantations with different yields

Note: 16%, 14%, 11% rates of return on capital, which belong to the curves running high, medium, and low, respectively.

Source: own compilation

Counting on 20-25% average yield loss over the life-cycle of a plantation because of the unfavourable weather conditions, farmers must harvest 45-50 t/ha yields in favourable years to recover the losses, reaching the minimum criterion of rentability. Nevertheless farmers have to target 40-50 t/ha or higher (60 t/ha) yields with as high table apple ratio as possible in good years (Figures 6.3. and 6.4.).
7. fejezet - 7. Complex economic issues of vegetable production

1. 7.1. Importance of vegetable production in Hungary

Horticultural industries produced 3.0-3.5 million tons of goods in general in the 1980s. This quantity radically decreased in the 1990s, but there was a slight increase by the end of the decade. After the EU joining those industries faced a turbulent competition in both the inner and export markets, thus a lot of uncompetitive farm business with lack of capital shut down that has been resulting in decreasing production.

The last five years were featured by disasters such as frost in spring time in 2007, too much precipitation in 2010, droughts in 2011 and 2012 which were caused by extreme weather conditions resulted in 20-25% yield loss of horticultural production in average. Suffering from these effects we have realized 2.0-2.5 million tons of fruit and vegetable yield (Figure 7.1.).

7.1. ábra - Figure 7.1.: Dynamics of fruit and vegetable production

![Graph showing dynamics of fruit and vegetable production](source)

Source: Fruitveh, 2011.

There is a slight negative tendency in the performance of horticulture showing by the export-import trade balance, which has the export being in stagnant and a slight increase in the import. Despite of these, the fruit and vegetable sector, which is the main value creator of the horticulture in Hungary, has a positive foreign trade balance of 60-70 thousands of million HUF (Figure 7.1.).

Similar consequences we found in the production area of horticulture. There has been a decrease in the production area of vegetable that was around 100 thousands hectares in the last years but became 60-80 thousands hectares by now (Figure 7.2.).

7.2. ábra - Figure 7.2.: Dynamics of fruit and vegetable area of production
There is around 6.0 million hectares of cultivated land of agriculture in Hungary, of which horticulture accounts for 4-5%. Vegetable production uses 70-90 thousand hectares with slight volatility each year, of which it is mainly outdoor vegetable production, while forced vegetable production accounts for 4-5 thousand hectares only. Fruit production area is around 100 thousand hectares, while grape production area decreased by 20-30 thousand hectares from the same size to 70-80 thousand hectares by now. Output of horticulture is highly dependent on weather conditions each year, although the average yearly output ranged between 2.0-3.0 million tons, of which vegetable, fruit, and grapes account for 50-60%, 20-30%, and 10-15%, respectively (Table 7.1.).

### Table 7.1.: Yield and area of production of horticulture over 2008-2011.

<table>
<thead>
<tr>
<th>Product</th>
<th>Area (‗000 hectares)</th>
<th>Yield (‗000 tons)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vegetable</td>
<td>70-90</td>
<td>1 500 – 2 000</td>
</tr>
<tr>
<td>Fruit</td>
<td>90-100</td>
<td>700 – 1 000</td>
</tr>
<tr>
<td>Table grapes</td>
<td>70-80</td>
<td>300 – 500</td>
</tr>
<tr>
<td>Aromatics, spices, and herbs</td>
<td>5-10</td>
<td>40 - 50</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>250-300</strong></td>
<td><strong>2 000 – 3 000</strong></td>
</tr>
</tbody>
</table>

Source: Fruitveb 2011.

It is a modest portion of horticulture out of agricultural land that does not reflect faithfully the significance of it in the agriculture and the national economy. With regard to that, sectors belonging to horticulture can generate high unit values - their average values in monetary terms per hectare cultivated land are from threefold to six fold of those values per hectare of crops - and account for a higher share of value creation and foreign trade. It is the 15-20% share of gross value of agricultural production that horticulture accounts for in general (Table 7.2.), of which main portion is generated by fruit and vegetable sector and viticulture (Table 7.3.). These sectors account for 20-25% of yearly export turnover in average.

### Table 7.2.: Gross output of agriculture by main product groups (calculated at current prices)

7.2. táblázat - Table 7.2.: Gross output of agriculture by main product groups (calculated at current prices)
7. Complex economic issues of vegetable production

<table>
<thead>
<tr>
<th>Denomination</th>
<th>2009-2011 (thousands of million HUF)</th>
<th>Shares (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crops</td>
<td>600-980</td>
<td>40-45</td>
</tr>
<tr>
<td>Horticultural produce</td>
<td>300-320</td>
<td>15-20</td>
</tr>
<tr>
<td>Plant produce</td>
<td>900-1 300</td>
<td>60-65</td>
</tr>
<tr>
<td>Animal produce</td>
<td>600-700</td>
<td>35-40</td>
</tr>
<tr>
<td>Agricultural output in total</td>
<td>1 500-2 000</td>
<td>100</td>
</tr>
</tbody>
</table>


7.3. táblázat - Table 7.3.: Breakdown of gross value of production of horticulture by sectors

<table>
<thead>
<tr>
<th>Products</th>
<th>Shares (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vegetable</td>
<td>40-45</td>
</tr>
<tr>
<td>Fruit</td>
<td>20-25</td>
</tr>
<tr>
<td>Table grapes</td>
<td>1-2</td>
</tr>
<tr>
<td>Wine</td>
<td>20-30</td>
</tr>
<tr>
<td>Aromatics, spices, and herbs</td>
<td>5-10</td>
</tr>
<tr>
<td>Total</td>
<td>100</td>
</tr>
</tbody>
</table>


7.3. ábra - Figure 7.3: Export-import data of fruit and vegetable sectors in Hungary [4]

2. 7.2. Farm business attributes of vegetable production

Farm business attributes (advantages and disadvantages) can be summarized as follows:

Main farm business advantages of vegetable production:

• Mach production year a new structure of enterprises can be developed;
• High value of production per area unit can be generated;
• Good production years can yield high revenues;
• Overheads can be easily covered;
• Small farm businesses can earn significant revenue to complete the total revenue;
• Some vegetable enterprises can be extremely intensified.

Main farm business disadvantages of vegetable production:

• The most are capital intensive enterprises;
• Only long-term return we can expect;
• High input demand characterises the vegetable enterprises;
• Labour intensive enterprises in general, but highly they are on seasons;
• Low turnover of current assets we can expect;
• Irrigation intensive and there is no vegetable production unless reliable irrigation system is available;
• High volatility in farm gate prices within a year;
• Long term decision with corresponding production risk;
• Demand for well skilled and trained labour cannot be neglected.

Outdoor vegetable production is as capital intensive - 3-8 million HUF per hectare - as fruit production on plantations, depending on farm size, enterprise structure, and utilization of assets (Table 7.4.). Forced vegetable production represents a higher value scale of capital demand, namely greenhouses made from foils and glasshouses demand for 5-15 million HUF per hectare and 20-40 million HUF per hectare, respectively.

It is a main feature of fruit and vegetable sectors that they can generate high revenue per unit, but they demand for high input level for doing this. During the production year the costs arise, on the one hand, as costs stemming from the utilization of fixed assets such as amortization and maintenance costs which account for a small portion of the total cost. On the other hand, the yearly costs are related to the current assets, the costs arise as the cost of inputs for production, such as labour, materials, and spareparts etc., which account for the main portion of those costs.

7.4. táblázat - Table 7.4.: Demand for fixed assets producing (not-forced) vegetable

<table>
<thead>
<tr>
<th>Denomination</th>
<th>Fixed assets (‘000 HUF/ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Land to cultivate</td>
<td>500-2 000</td>
</tr>
<tr>
<td>Power machinery</td>
<td>200-500</td>
</tr>
</tbody>
</table>
7. Complex economic issues of vegetable production

<table>
<thead>
<tr>
<th>Machinery</th>
<th>200-400 (1 100)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constructions (machinery shed, store-house, others etc.)</td>
<td>30-50</td>
</tr>
<tr>
<td>„Production phase“ investments:</td>
<td>930-2 950 (3.550)</td>
</tr>
<tr>
<td>Cool storage-room</td>
<td>(0) 2 000-4 000</td>
</tr>
<tr>
<td>Sorting hall and machinery</td>
<td>(0) 200-500</td>
</tr>
<tr>
<td>Packaging machinery</td>
<td>(0) 200-400</td>
</tr>
<tr>
<td>Machinery for in-farm movements of goods</td>
<td>40-60</td>
</tr>
<tr>
<td>Integuments</td>
<td>60-90</td>
</tr>
<tr>
<td>„Postharvest“ investments:</td>
<td>(0) 2 500-5 050</td>
</tr>
<tr>
<td>FIXED ASSETS IN TOTAL:</td>
<td>(930) 3 430-8 000 (8 600)</td>
</tr>
</tbody>
</table>

Source: own compilation

The average costs of current assets – the operation costs not including amortization - of the main enterprises of vegetable production are shown in Table 7.5.

7.5. táblázat - Table 7.5.: The average costs of current assets of the main enterprises of vegetable production

<table>
<thead>
<tr>
<th>Enterprise</th>
<th>Current assets demand (‘000 HUF/ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sweetcorn</td>
<td>300-400</td>
</tr>
<tr>
<td>Greenpeas</td>
<td>350-500</td>
</tr>
<tr>
<td>Tomato (outdoor)</td>
<td>900-1 100</td>
</tr>
<tr>
<td>Green pepper (outdoor)</td>
<td>1 500-2 000</td>
</tr>
<tr>
<td>Forced vegetable production (green- and glasshouses)</td>
<td>10 000-50 000</td>
</tr>
</tbody>
</table>

Source: own compilation

These enterprises have the operation costs ranging from 300 thousand HUF up to 2 000 thousand HUF per year that sums of capital have to be covered by the total sales revenue. As it is shown in Table 7.5., the most capital intensive vegetable enterprise is the forced vegetable production with 10 000-50 000 thousand HUF of current assets demand per hectare a year.

3. 7.3. Economic issues of sweet corn production

3.1. 7.3.1. Inputs and cost of production
On good environmental conditions sweet corn yielded 16.5 tons/ha in 2010, which faithfully represents the last five year average. It was around 300 thousand HUF per hectare that was spent as operation cost, thus the high yield per unit caused a moderate average cost of 19 thousand HUF per ton.

### 7.6. táblázat - Table 7.6.: Breakdown of direct costs of sweet corn production a year by operations

<table>
<thead>
<tr>
<th>Operation</th>
<th>Unit cost (HUF/ha)</th>
<th>Unit cost (HUF/t)</th>
<th>Share (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soil cultivation</td>
<td>44 925,00</td>
<td>2 722,73</td>
<td>14,30</td>
</tr>
<tr>
<td>Fertilization</td>
<td>66 160,00</td>
<td>4 009,70</td>
<td>21,07</td>
</tr>
<tr>
<td>Sowing</td>
<td>26 965,00</td>
<td>1 634,24</td>
<td>8,59</td>
</tr>
<tr>
<td>Plant protection and treatment</td>
<td>58 200,50</td>
<td>3 527,30</td>
<td>18,53</td>
</tr>
<tr>
<td>Irrigation</td>
<td>22 500,00</td>
<td>1 363,64</td>
<td>7,16</td>
</tr>
<tr>
<td>Harvest and transportation</td>
<td>67 110,00</td>
<td>4 067,27</td>
<td>21,37</td>
</tr>
<tr>
<td>Drying and cleaning</td>
<td>0,00</td>
<td>0,00</td>
<td>0,00</td>
</tr>
<tr>
<td>Storing</td>
<td>0,00</td>
<td>0,00</td>
<td>0,00</td>
</tr>
<tr>
<td>Other operations</td>
<td>0,00</td>
<td>0,00</td>
<td>0,00</td>
</tr>
<tr>
<td>Other direct costs</td>
<td>28 200,00</td>
<td>1 709,09</td>
<td>8,98</td>
</tr>
<tr>
<td><strong>Total direct costs</strong></td>
<td><strong>314 060,50</strong></td>
<td><strong>19 033,97</strong></td>
<td><strong>100,00</strong></td>
</tr>
</tbody>
</table>

Source: Borbély (2011)

Table 6. shows the breakdown of direct costs of sweet corn production a year by operations. Harvest and transportation together and fertilizing account for more than 2/5th (1/5th each) of the total direct costs. Significant portions such as 18% and 14% were generated by plant protection and soil cultivation, respectively.

Soil cultivation includes stubble-stripping, ploughing in autumn (26-32 cm deep), finishing of ploughing, and seed bed formation.

Fertilization is a part of an intensive technology starting with spreading of 100 kgs of complex fertilizer of Nitrogen-Phosphorus-Potassium in 8:21:21 ratio in late October as the first step. As the second step in next March, 500 kgs of Ammonium-nitrate with 34% of active ingredient is spreaded. Loading and transportation is done by using lorries and trucks, while filling the spreading machinery up is a handy job following spreading. Considering that old make lorries and trucks are used for transportation and fertilizer spreading does not need for the most expensive machinery, thus it is the material used that accounts for the highest portion of the cost of this operation.

As time goes by, sowing is done in April accounting for 9% of the total direct cost, of which 90% is the material cost of sowing, namely 27 kgs of sowing seeds per hectare. Plant protection and treatment accounts for 18% of the total direct cost, including only soil disinfection in spring time using disinfectant of 6,5 kgs of Force 1,5 G per hectare, which is spreaded simultaneously during sowing. Without soil disinfection, corn beetle infects the plants damaging a lot to them. In general, there is no reason to spread chemicals against pests and diseases during the vegetation period after having done soil disinfection. The next steps of plant treatment are handy jobs such as selecting and tasseling done in June and in July, respectively. Irrigation is done by using linear
systems with the dosage of 30 mm of water, accounting for 7% of the total direct cost. Sweet corn is harvested by a harvester make which is quite general in Europe, thus harvesting accounts for only 4% of the total direct cost. Since the yield is directly shipped to the canning factory, there is no drying, cleaning, and storing costs arisen. Other direct costs include land rent fee and insurance fee.

7.7. táblázat - Table 7.7.: Direct and indirect costs of sweet corn production a year

<table>
<thead>
<tr>
<th>Denomination</th>
<th>Unit cost (HUF/ha)</th>
<th>Unit cost (HUF/t)</th>
<th>Share (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Materials</td>
<td>107 085.50</td>
<td>6 490.03</td>
<td>31.82</td>
</tr>
<tr>
<td>Labour</td>
<td>28 340.00</td>
<td>1 717.58</td>
<td>8.42</td>
</tr>
<tr>
<td>Machinery and constructions</td>
<td>150 435.00</td>
<td>9 117.27</td>
<td>44.71</td>
</tr>
<tr>
<td>Other direct costs</td>
<td>28 200.00</td>
<td>1 709.09</td>
<td>8.38</td>
</tr>
<tr>
<td>Total direct costs</td>
<td>314 060.50</td>
<td>19 033.97</td>
<td>93.33</td>
</tr>
<tr>
<td>Overheads</td>
<td>22 431.00</td>
<td>1 359.45</td>
<td>6.67</td>
</tr>
<tr>
<td>Total cost of production</td>
<td>336 491.50</td>
<td>20 393.42</td>
<td>100.00</td>
</tr>
</tbody>
</table>

Source: Borbély (2011)

Table 7.7. shows the direct and indirect costs of sweet corn production a year. The highest portion of the total cost of production is generated by the use of machinery and constructions that account for 44% of that total, of which the most significant are transportation and soil cultivation accounting for 17% and 14%, respectively. It is material cost that follows the mark of cost of machinery and constructions, accounting for 32% of the total, of which fertilizer account for 19%, coming to half of the material costs. Labour cost accounts for around 9% that stems from plant treatment only. Finally, it is the land rent fee which is significant as other direct cost.

3.2. 7.3.2. Yield, revenue, value of production

Sales revenue and value of production of sweet corn is shown in Table 7.8. For sweet corn production, there is no by-product to reckon with, thus no revenue generated by. Level of selling price is highly dependent on the time of marketing. In our case, it is 450 thousand HUF of sales revenue per hectare we can count on, topping it up with 35 000 HUF of SAPS and 7 000 HUF of TOP-UP. Thus, they result in a sum of 500 thousand HUF per hectare as total value of production.

7.4. ábra - Table 7.8.: Sales revenue and value of production of sweet corn
3.3. 7.3.3. Profit, profitability, efficiency

The table below helps us summarize the cost and value figures we learned before (Table 7.9.). Using the figures learned before such as total value of production and total direct costs per hectare, we could calculate the gross margin per unit that amounts to around 180 thousand HUF per hectare. Thus, the average direct cost per unit of sweet corn is about 19,000 HUF. Efficiency measures such as Income/Total direct cost ratio, Income/Total cost ratio, and Total cost/Production value ratio are 57.85%, 32.12%, and 67.88%, respectively, which are favourable.

7.8. táblázat - Table 7.9.: Gross margin and efficiency measures of sweet corn production

<table>
<thead>
<tr>
<th>Denomination</th>
<th>M.u.</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total value of production</td>
<td>HUF/ha</td>
<td>495 750,00</td>
</tr>
<tr>
<td>Total direct cost</td>
<td>HUF/ha</td>
<td>314 060,50</td>
</tr>
<tr>
<td>Gross margin</td>
<td>HUF/ha</td>
<td>181 689,50</td>
</tr>
<tr>
<td>Average direct cost per unit</td>
<td>HUF/t</td>
<td>19 033,97</td>
</tr>
<tr>
<td>Income/total direct cost ratio</td>
<td>%</td>
<td>57.85</td>
</tr>
<tr>
<td>Income/total cost ratio</td>
<td>%</td>
<td>32.12</td>
</tr>
<tr>
<td>Total cost/production value ratio</td>
<td>%</td>
<td>67.88</td>
</tr>
</tbody>
</table>

Source: Borbély (2011)

4. 7.4. Economic issues of green peas production
4.1. 7.4.1. Inputs and cost of production

Just like for sweet corn, farmers need for good quality soils in which green peas can be produced with success, on the condition that favourable weather conditions are around. But then again, the soils of good quality provide farmers with a solid basement of a wide range of outdoor plant (arable) production.

7.9. táblázat - Table 7.10.: Breakdown of direct costs of green peas production a year by operations

<table>
<thead>
<tr>
<th>Denomination</th>
<th>Unit cost (HUF/ha)</th>
<th>Unit cost (HUF/t)</th>
<th>Share (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soil cultivation</td>
<td>52 200,00</td>
<td>6 960,00</td>
<td>13,88</td>
</tr>
<tr>
<td>Fertilization</td>
<td>62 160,00</td>
<td>8 288,00</td>
<td>16,52</td>
</tr>
<tr>
<td>Sowing</td>
<td>46 330,00</td>
<td>6 177,33</td>
<td>12,31</td>
</tr>
<tr>
<td>Plant protection and treatment</td>
<td>69 913,10</td>
<td>9 321,75</td>
<td>18,58</td>
</tr>
<tr>
<td>Irrigation</td>
<td>45 000,00</td>
<td>6 000,00</td>
<td>11,96</td>
</tr>
<tr>
<td>Harvest and transportation</td>
<td>72 405,00</td>
<td>9 654,00</td>
<td>19,25</td>
</tr>
<tr>
<td>Drying and cleaning</td>
<td>0,00</td>
<td>0,00</td>
<td>0,00</td>
</tr>
<tr>
<td>Storing</td>
<td>0,00</td>
<td>0,00</td>
<td>0,00</td>
</tr>
<tr>
<td>Other operations</td>
<td>0,00</td>
<td>0,00</td>
<td>0,00</td>
</tr>
<tr>
<td>Other direct costs</td>
<td>28 200,00</td>
<td>3 760,00</td>
<td>7,50</td>
</tr>
<tr>
<td>Total direct costs</td>
<td>376 208,10</td>
<td>50 161,08</td>
<td>100,00</td>
</tr>
</tbody>
</table>

Source: Borbély (2011)

Table 7.10. shows the breakdown of direct costs of green peas production a year by operations. As with sweet corn, it is harvesting and transportation that account for around 1/5th of total direct costs for green peas. Harvest and transportation is of great importance with the share of 19% of the total direct costs, following by plant protection and treatment and fertilizing that account for 18% and 16%, respectively.

Soil cultivation as an operation includes stubble-stripping and autumn middle ploughing, following finishing of ploughing. Each year they stress upon finishing of ploughing, because it is an early sowing that is part of the technology and there is no much time in early spring time to cultivate. It is seedbed formation that comes next in March, which is a critical operation in order to provide good soil conditions to sow evenly. This operation accounts for 14% of total direct cost.

Fertilization – just like the sweet corn production in our case – means use of chemicals only in the framework of an intensive technology, starting with basal fertilization in September. In Autumn, 200 kg of complex fertilizer of Nitrogen-Phosphorus-Potassium in 8:21:21 ratio as the first step. As the second step, 300 kg of Ammonium-nitrate with 34% of active ingredient is spreaded before the sowing.

Sowing is to be done in the first half of March, by when the soil temperature at the level of sowing becomes 3-4 °C, accounting for 12% of the total direct costs, of which cost of sowing seeds gives the highest portion. The next operation in the line is plant protection and treatment that accounts for 1/5th of the total direct costs. Plant protection starts up with spreading soil disinfectant - 6,5 kg Force 1,5 G in our case - simultaneously when
sowing in March. Weed killing, which is very important part of the technology because it is need very much, amount to a significant portion of plant protection costs. Herbicide is spreaded in April, which happens after the sowing but before plant emerging. There is a pest control using pesticides in April too. Following this in May, fungicide is to be spreaded against fungi.

The stand needs to be irrigated in April and May, accounting for 12% of the costs in general, although it is inevitably up to the weather conditions. In spring 2010, there was enough precipitation from this point of view, allowing the farmers not to use irrigation to assist plant emerging.

Harvest is done by a green peas combine harvester, which is a widely used make in Europe, and this operation accounts for 5% of the total direct costs. Green peas are very sensitive produce when harvested, for that very reasons, the yield is to be shipped immediately to the canning factory on a precisely scheduled basis. So, it is of one the main attributes of green pea production that drying, cleaning, and storing are not operations of the production process. Other direct costs include land rent fee and insurance fee that account for 7,5% of the total.

### 7.10. táblázat - Table 7.11.: Direct and indirect costs of green peas production a year

<table>
<thead>
<tr>
<th>Denomination</th>
<th>Unit cost (HUF/ha)</th>
<th>Unit cost (HUF/t)</th>
<th>Share (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Materials</td>
<td>155 663,10</td>
<td>20 755,08</td>
<td>39,30</td>
</tr>
<tr>
<td>Labour</td>
<td>390,00</td>
<td>52,00</td>
<td>0,10</td>
</tr>
<tr>
<td>Machinery and constructions</td>
<td>191 955,00</td>
<td>25 594,00</td>
<td>48,46</td>
</tr>
<tr>
<td>Other direct costs</td>
<td>28 200,00</td>
<td>3 760,00</td>
<td>7,12</td>
</tr>
<tr>
<td>Total direct costs</td>
<td>376 208,10</td>
<td>50 161,08</td>
<td>94,98</td>
</tr>
<tr>
<td>Overheads</td>
<td>19 898,00</td>
<td>2 653,07</td>
<td>5,02</td>
</tr>
<tr>
<td>Total cost of production</td>
<td>396 106,10</td>
<td>52 814,15</td>
<td>100,00</td>
</tr>
</tbody>
</table>

Source: Borbély (2011)

Table 7.11. shows the direct and indirect costs of green peas production a year. The highest part of the direct costs, almost half of them, comes from the use of machinery and constructions. Within this operation cost, the most significant ones are soil cultivation and produce transportation, which together account for 60% of machinery and constructions cost.

Material costs constitute 39% of the direct costs, of which chemicals are of significance. Labour costs is so moderate (0,1%), but other direct costs amount to more than 7%, including land rent fee as an important item.

### 4.2. 7.4.2. Yield, revenue, and value of production

On good weather conditions and soils the use of up-to-date technology gives a yield of 7-8 tons per hectare, which is only the yield of main product, not producing marketable by-products or any other ones. In our case the average selling price was 57 200 HUF/t.

Table 7.12. shows the sales revenue and value of production of green peas production. The unit price of 57 200 HUF/t times 7,5 t/ha yield of main product results in 429 thousand HUF sales revenue per hectare, which is completed by subsidies adding up to 471 thousand HUF per hectare. This 471 thousand HUF/ha sum comes from the total of 429 000 HUF/ha of the total sales revenue, 35 000 HUF/ha of SAPS, and 7 000 HUF/ha of Top-up.
7. Complex economic issues of vegetable production

7.5. ábra - Table 7.12.: Sales revenue and value of production of green peas production

<table>
<thead>
<tr>
<th>Denomination</th>
<th>M.u.</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yield value: -main product</td>
<td>t/ha</td>
<td>7,5</td>
</tr>
<tr>
<td>- by-product</td>
<td>t/ha</td>
<td>0,0</td>
</tr>
<tr>
<td>Selling price: - main product</td>
<td>HUF/t</td>
<td>57 200,0</td>
</tr>
<tr>
<td>- by-product</td>
<td>HUF/t</td>
<td>0,0</td>
</tr>
<tr>
<td>Sales revenue: - main product</td>
<td>HUF/ha</td>
<td>429 000,0</td>
</tr>
<tr>
<td>- by-product</td>
<td>HUF/ha</td>
<td>0,0</td>
</tr>
<tr>
<td>Total sales revenue</td>
<td>HUF/ha</td>
<td>429 000,0</td>
</tr>
<tr>
<td>SAPS</td>
<td>HUF/ha</td>
<td>35 000,0</td>
</tr>
<tr>
<td>Top up</td>
<td>HUF/ha</td>
<td>7 000,0</td>
</tr>
<tr>
<td>Agro-environmental management payment (basic)</td>
<td>HUF/ha</td>
<td>0,0</td>
</tr>
<tr>
<td>Agro-environmental management payment (arable-integrated)</td>
<td>HUF/ha</td>
<td>0,0</td>
</tr>
<tr>
<td>Other direct subsidies</td>
<td>HUF/ha</td>
<td>0,0</td>
</tr>
<tr>
<td>Total value of production</td>
<td>HUF/ha</td>
<td>471 000,0</td>
</tr>
</tbody>
</table>

Source: Borbély (2011)

4.3. 7.4.3. Profit, profitability, efficiency

Table 13. below helps us summarize the cost and value figures we learned before.

7.11. táblázat - Table 13.: Gross margin and efficiency measures of green peas production

<table>
<thead>
<tr>
<th>Denomination</th>
<th>M.u.</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total value of production</td>
<td>HUF/ha</td>
<td>471 000,00</td>
</tr>
<tr>
<td>Total direct cost</td>
<td>HUF/ha</td>
<td>376 208,10</td>
</tr>
<tr>
<td>Gross margin</td>
<td>HUF/ha</td>
<td>94 791,90</td>
</tr>
<tr>
<td>Average direct cost per unit</td>
<td>HUF/t</td>
<td>50 161,08</td>
</tr>
<tr>
<td>Income/total direct cost ratio</td>
<td>%</td>
<td>25,20</td>
</tr>
<tr>
<td>Income/total cost ratio</td>
<td>%</td>
<td>15,90</td>
</tr>
<tr>
<td>Total cost/production value ratio</td>
<td>%</td>
<td>84,10</td>
</tr>
</tbody>
</table>

Source: Borbély (2011)

Using the figures learned before such as total value of production and total direct costs per hectare, we could calculate the gross margin per unit that amounts to around 95 000 HUF per hectare. Thus, the average direct cost per unit of sweet corn is about 50 000 HUF. Efficiency measures such as Income/Total direct cost ratio, Income/Total cost ratio, and Total cost/Production value ratio are 25,2%, 15,9%, and 84,1%, respectively. These figures say that green peas production is not as profitable as sweet corn, but farmers can get a reasonable profit.

5. References
7. Complex economic issues of vegetable production


8. fejezet - 8. ECONOMIC ASPECTS OF FEED MANAGEMENT

The proper nutrition of farm animals is the main factor of a profitable and successful production system. Feedstuffs usually accounts for the largest input cost (even 60-80% of total cost) associated with any kind of farm animal. An understanding of the feeding process which covers demand, supply and nutrition are required for effective feeding and management.

1. 8.1. Basic aspects of feed management

There are different aspects of feed management as a conversion system. Depending on the approach we can differentiate:

1. Biologic aspect: transformation of biological nutrients into animal products. (Measurement: natural efficiency.) (Most of the feeding stuffs are directly eligible for human consumption e.g.: grain, legume seed…), but grass and by-products can only be utilized through animal production.

2. Economic aspect: inputs and costs are transformed into yield, income, and added value. (Measurement: economic efficiency.)

3. Other aspects: some feeds are: (a) easily malleable into food or luxury food: alcohol, isosugar or directly edible and (b) used as alternative energy: solid fuel, biodiesel, bioethanol, biogas.

2. 8.2. Concept of the feed management at farm level

Traditionally it is a task which makes a connection between plant production and animal production on a farm. Furthermore it is also a reasonable utilisation of feeds for enhancing incomes of the farm.

81. ábra - Figure 8.1.: Feed management: is a joining and a buffer point at the same time

3. 8.3. Objectives of the Feed Management in Generally

- To establish (produce or buy) a feeding stuff-base and an efficient utilisation of feed-stocks.
- To use the least amount of feed or land area to produce a unit of animal product. Meanwhile there is a sharp competition between food and feed crops for arable land and other inputs.
- To maximise: yield - income - profit.
To minimise: resources - assets – labour - cost.

The **largest operating cost in a livestock production enterprise** is the feed bill. To keep this cost low, we must supply the right amount of feed to the animals. Overfeeding is wasteful. Underfeeding will decrease animal performance and profitability. Therefore, proper animal feeding and nutrition are crucial to the profitability of the livestock enterprise.

### 4. Factors of global feed management

Global feed requirement depends on the level and rise of animal production which based on the population and consumption growth (Multiplicative effect):

- Growing animal product consumption of the World especially China’s, growing animal production issue of the World and EU (by 3-6% per year), (higher grain and protein requirement of fast growing poultry and pig industry);

- By 2050, an expanded world population will be consuming two-thirds more animal protein than it does today, bringing new strains on the planet's resources (FAO Report, 2011.).

- Type and feed requirement and utilisation of the animal: (1) cattle need some 5 kg of feed to produce 1 kg of meat and a (2) pigs some 3 kg , (3) chickens eat less than 2 kg , in fact 1,7 kg , to achieve the same 1 kg of live weight;

- Water requirement: producing 1 kg of (1) chicken meat requires, in total, 3 900l of water, while for (2) pork the volume is 4 800l and for beef 15 500l (FAO Report, 2011.).

- Price level of feeds depends on the energy and protein content of them, so it based on the world market price of grain, oil and protein plants,

- Requirement of other industries from feed raw materials: e.g.: (80% of grain is used for human consumption in Africa or the grain requirement of bio energy sector.

- Health and Food Safety concerns are putting pressure on better quality feed ingredients.

- There is growing concern with environmental issues in animal production.

#### 4.1. Trends of the EU compound feed production and consumption

Meat and other animal products in the EU-27 represented app. 156.5 bio. € in 2011, i.e. 41% of the total value of farm production and 11% more than in 2010. However, this increase must not be seen as a sign of recovery from the 2009 crisis, since feed costs increased dramatically in 2011, thus further hampering farmers’ income. Animal feed is indeed the most important livestock production cost factor and represented in 2011 up to 83% of the farm gate value of poultry. The EU-27 farm animals are fed with app. 470 mio. t of feedstuffs, thereof app. half are roughages produced on farm, 10% are grains produced on farm, 10% are purchased feed materials and 30% are industrial compound feed (Figure 8.2.).

8.2. ábra - Figure 8.2.: Value of purchased compound feed in total animal output value in 2011
The chart on Figure 8.3. illustrates the relations between key operators of the feed and food chain. The flows between operators have different colours depending on the type of product, i.e. vegetable food products, animal products, feed and production factors such as plant protection products, fertilisers or veterinary medicines (so-called intermediate consumption). The elements of this chain which are connected to feed manufacturers, either as suppliers or customers, are outlined in green.

Despite the huge variations in feed material prices over the last years, the proportion of feed materials per categories remained relatively stable (Figure 8.4. and 8.5.): 48% for cereals, 28% for oilseed meals.

**8.3. ábra - Figure 8.3.: The Food and Feed Chain in the EU**
8. ECONOMIC ASPECTS OF FEED MANAGEMENT

Source: Fefac, 2009

8.4. ábra - Figure 8.4.: Food Material Consumption by the Compound Feed Industry in the EU-27 in 2011 (151 mio t/-0,3%)

Source: FEFAC, 2012

8.5. ábra - Figure 8.5.: Development of Compound Feed Production in the EU per category excl. MT, EL, LU

Source: FEFAC, 2012

Regarding protein, the most important feed materials are soybean meal, mainly imported from third countries, rape seed meal from the European crushing industry. The industry also uses protein rich material from the starch and ethanol industries (Figure 8.6.).

Protein sources are essential to achieve a balance diet for animals. Due to past agricultural policy decisions (end of tariffs protection in 1962, Blair House agreements in 1992, reduction of specific support for protein crops in the framework of Agenda 2000) the EU is not in the position to fulfil its own requirements for protein feeds. The EU feed industry needs to source its proteins on the global market, on which soya has been the most important source for many years.

8.6. ábra - Figure 8.6.: EU-27 Dependency in Feed Proteins
5. 8.5. Feed management at farm level

5.1. 8.5.1. Elements and system of feed supply

Feed represents the major cost to animal production. It varies according to type of farm animals, intensity, production purpose or system. Thus the efficiency of its use can have a considerable impact on the performance of an enterprise.

Feed management is a complex task of the farm management, covers the main elements of the feed supply, which means: (1) production; (2) harvesting; (3) buying; (4) conservation; (5) storage; (6) preparation and (7) feeding of feedstuffs according to the objectives of the animal production.

Feed supply system based on the endowments of the farm and type of farm animal and production system. Farm manager has to calculate and decide feed stock management: production, purchasing and supply. It is a complex thinking about possibilities, prices and production from both sides: plant products and animal products also.

8.7. ábra - Figure 8.8.: The System of Feed Supply
5.2. 8.5.2. The Process of Feed Management

Feed management process basically an important part of the farm yearly business planning process. As the main “cost- creator” it is the dominant factor of reducing costs or improving efficiency (biologically and economically as well. Feed supply is highly exposed to the climate (plant production) as also to the market prices (buying feed stuffs) and storage conditions (quality). So feed supply require substantial and careful planning.

5.2.1. 8.5.2.1. Planning of Feed Base

a. Estimation of animal STOCK NUMBER (on the base of average stock size for daily, weekly, monthly or yearly periods in accordance with the change of each flock within the stock).

b. Planning of NUTRIENT REQUIREMENT of the animals (Depending on the species, type and intensity of the production)

c. Planning of the FEED REQUIREMENT (There are different methods from empirical to sophisticated models).

Efficiency is the min the goal which means (biological and economic) utilisation of feed is dependent on the following elements: (1) knowledge of the nutrient value of the range of feedstuffs available; (2) knowledge of the nutrient requirement of animals.

An ability to formulate diet and rations from a mixture of feedstuffs which will meet nutrient requirements within the potential voluntary food intake of animals and also the expectations of cost effectiveness and profitability.

5.2.2. 8.5.2.2. Feedstuff production and/or purchasing - decision on the basis of feed-balance

5.2.3. 8.5.2.3. Evaluation of feed supply

a. Overall evaluation can be accomplished together with the animal production (species, feed intake, weight gain, intensity, feed cost, etc.)
b. Effectiveness can be measured through the results of the animal production (cost of animal products, feed conversion efficiency)

c. Different evaluation must be applied for utilisation of forages, roughages and by-products

d. Sources of feeds are also important factors of evaluation (produced or purchased).

5.2.4. 8.5.2.4. Planning of feed utilisation - according to farm, animal and production type

5.2.5. 8.5.2.5. Feedstuff consumption (feeding– distribution: by automatized or manual syst.)

5.2.6. 8.5.2.6. Analysis of feed utilisation

It can be done: (1) by the quantity of utilised feedstuffs; (2) by the nutrient content of the used feedstuffs; (3) by the cost of utilised feedstuffs and (4) by the arable land used for the production of the utilised feedstuffs. The most important element of this entire process of formulation is that of meeting nutrient requirements most economically.

Measurement of the efficiency of feed utilisation: generally we use two concepts of efficiency:

1. Technological efficiency (measurement: natural unit/natural unit): occurs when we measure the ratio between the used input and produced output.
   a. feed conversion ratio (FCR), efficiency in converting feed mass into increased body mass (kg/kg);
   b. Kg of feed mass or forage or protein /1 litre or kg of milk (kg/l or kg).

2. Economic efficiency (measurement: financial unit/natural unit or financial unit): production of a unit of good is considered to be economically efficient when that unit of good is produced at the lowest possible cost. Economic efficiency depends on the prices of the factors and conditions of production. Something that is technologically efficient may not be economically efficient. But, something that is economically efficient is always technologically efficient.
   a. Calculated cost of production or feed cost/unit of animal product or income or production value or profit (HUF/kg, 1…, $/kg,l,$) (€/kg,l,€) (Table 8.1.);
   b. Feed cost per kilogram of dry matter, feed cost per kg of milk or live weight gain, income over feed costs, and feed efficiency provide valuable economic comparisons.

8.1. táblázat - Table 8.1.: Feed Conversion Ratio (FCR), Feed Cost/Product unit, Average Cost*

<table>
<thead>
<tr>
<th>Unit</th>
<th>Milk</th>
<th>Beef</th>
<th>Pig</th>
<th>Broiler</th>
<th>Egg</th>
</tr>
</thead>
<tbody>
<tr>
<td>Feed conversion ratio</td>
<td>0,3-0,6kg/l</td>
<td>4-5kg/kg</td>
<td>2,7-3,5kg/kg</td>
<td>1,7-2,5kg/kg</td>
<td>0,16-0,30kg/piece</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2,3 -2,5kg/kg</td>
</tr>
<tr>
<td>Feed cost per feed unit</td>
<td>35-40HUF/l</td>
<td>350-380HUF/kg</td>
<td>150-200HUF/kg</td>
<td>120-150HUF/kg</td>
<td>12-15HUF/piece</td>
</tr>
<tr>
<td>Average Cost</td>
<td>64HUF/l</td>
<td>475HUF/kg</td>
<td>290HUF/kg</td>
<td>180HUF/kg</td>
<td>22HUF/piece</td>
</tr>
</tbody>
</table>

* FCR and Feed Cost / Feed Unit are calculated on the basis of an average Hungarian farm. 1 EUR = 278,99 HUF and 1 USD = 215,22 HUF Source: National Bank of Hungary, Oct. 15. 2012.
The nutritional requirements and the efficiency of feed utilisation of animals vary according to species, the stage of development of the animals and type of the technology.

We have to talk pasture – an absolute feed for ruminants. And also the key of low cost feeding. On Table 8.2. showed stock density/ha for sheep and beef (in Hungary where pasture management are based on the natural extensive technology).

8.2. táblázat - Table 8.2.: Stock density on pasture - Sheep and Beef

<table>
<thead>
<tr>
<th>Denomination</th>
<th>Extensive technology</th>
<th>Intensive technology</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of ewes (head/ha)</td>
<td>1-3</td>
<td>4-6</td>
</tr>
<tr>
<td>Produced lambs (head/ha)</td>
<td>0,8 -2,4</td>
<td>3,2 – 4,8</td>
</tr>
<tr>
<td>Number of beef cows (head/ha)</td>
<td>0,5</td>
<td>1-2</td>
</tr>
<tr>
<td>Produced calves (head/ha)</td>
<td>0,25</td>
<td>0,5-1</td>
</tr>
</tbody>
</table>

Source: Lapis-Nábrádi, 2008

6. 8.6. Trends and Challenges in Agriculture

The question is: Feed, Food or/and Energy? Some agricultural crop products are available for Food Feed and also as Fuel. These crops are serves as renewable raw materials and fibre plants as well and competing for limited sources of arable land and water. The factors showed on Figure 8.7. and 8.8. are great challenges for the world agriculture.

Political and economic decisions are needed to find the balance. Under the given conditions: rapidly growing world population, living standards are continually rising and consumerism is driving economic progress, we must emphasise the importance of keeping our food from animal sources safe and in sufficient quantities to meet growing demand. The ability of the feed industry to add value to the co-products from the food and biofuels industries (like cereal bran, oil meals, distillers grains, sugar beet pulp, etc.)

8.8. ábra - Figure 8.7.: The main challenges for the agriculture sector
To meet the challenges and constraints of the twenty-first century, the livestock industry requires appropriate institutions, research, development interventions and governance that reflect the diversity within the sector and the multiple demands placed upon it.

8.9. ábra - Figure 8.8.: How to Feed the World?

Source: Cargill

7. References:

1. FEFAC Newsletter, 2012
2. AVEC, Annual Report, 2012
3. FAO, Report 2011
4. Bayer Crop Science, 2009
5. AKI, Report of Agricultural Test Farms, 2010
9. fejezet - 9. ECONOMICS of the MILK PRODUCTION

The classic concept of milk was defined in 1924 by the agricultural government of that time: „Milk is a sweet, fresh liquid obtained from cow by uninterrupted milking, which does not contain any foreign matter and does not lose any of its own components.” So milk means cow’s milk, in the case of other milks the name of the species has to be added, for example: sheep’s milk, goat’s milk, buffalo milk, mare’s milk.

1. 9.1. International and national importance of dairy sector

On the basis of assumption world milk production in 2011 reaches 727 million tonnes. Milk production is expected to increase and it can even rise above 794 million tonnes in 2017. Figure 9.1. shows the tendency of world milk production between 1996 and 2011. In 2011 there is an increase of 1.1% from last year, but it remains below the 2.1% average annual growth experienced in the past decade (Blasko, 2011; FAO-OECD, 2012).

9.1. ábra - Figure 9.1.: Evolution of world milk production between 1996-2011

Source: FAO-OECD, 2012

The major contributors of the production growth in 2011 are India and China, but Brazil, the EU(27) and the United States also play important role in it. Figure 9.2. illustrates the ‘top ten’ milk producers of the world and their contribution to world milk production. The EU(27) is the most significant milk producer in the world with its 153 million tonnes production, although its production rate remains at the same level in 2011.

The production of the Russian Federation is 33 million tonnes in 2010, and there is only a slight growth in it due to the increase of feed prices. In 2010 production increases by almost 3% to 61 million tonnes in South America, where Brazil gives one-third of total milk production.

In Oceania farmers could expand output last year due to good weather conditions. New Zealand is expected to reach 18 million tonnes production, which demonstrates a 6% growth, while in Australia growth is only 2% due to high feed prices, so production is more than 9 million tonnes. In Africa milk production reaches 37 million tonnes in 2010, it demonstrates a slight 1.3% growth.
In accordance with Figure 9.2. EU(27) is the largest contributor to the world milk production. The EU(27) produced 155.25 million tonnes milk in 2011.

Figure 9.3. demonstrates the distribution of milk production within the EU(27), where France, Germany, the United Kingdom, Italy, Poland and Netherlands give the 67 percent of total milk production. Hungary with its 1 percent contribution to the EU(27) production is placed as 19.

Source: FAO-OECD, 2012
All over the world people cover approximately 13% of their protein requirement from milk and milk products based on the available data and estimates. There is a continuous growth in consumption of milk and milk products and this tendency will probably not change. In 2009 however, for the first time in years the global per capita consumption of milk declined by 0.4%. The main reason for the decline was the complex credit crisis in the world economy. Another reason for the decrease was the slowing down in the growth of Chinese dairy consumption due to the melamine crisis.

On the basis of FAO-OECD data per capita milk and milk product consumption was 106.1 kg in 2012 (Figure 9.3.). As regards the consumption of developed countries the average level of it is 234.0 kg/capita/year, while in developing countries it is only 69.5 kg/capita/year. The ideal and healthy level of milk and milk product consumption would be 260-270 kg/capita/year. Developed countries approach this level, but in developing countries the level of milk consumption is far below the healthy value (Szakály 2006).

Consumption of milk and milk products significantly depends on income, so liquid milk can be considered an inferior good. An inferior good is a good that decreases in demand when consumer income rises. As the consumers become monetarily better off (earn higher incomes) the demand for such goods (such as liquid milk) falls because consumers can now afford higher priced substitutes. In accordance with the above-mentioned definition the consumption of liquid milk rises up to a certain point (income) and then its consumption slows and starts to decrease since processed products with higher added value (mainly butter, cheese and yoghurt) take its place (Blaskó et al., 2011).

The average liquid milk consumption in the EU(27) was 32.2 million tonnes and 64.5 kg/capita in 2009. These values show a 1.2% decrease in comparison with the year 2008. Within the EU(27) the top six consumers are Estonia, Ireland, Finland, the United Kingdom, Sweden and Denmark. As liquid milk consumption butter consumption also decreased in the EU(27) in 2009. Its average value was 1.7 million tonnes and 3.5 kg/capita. France, Germany, the Czech Republic, Austria, Poland and Estonia are on the top of butter consumption. Cheese consumption of the EU(27) was almost 8.3 million tonnes in 2009 and it increased by almost 1% in comparison with the previous year. The average per capita cheese consumption was 16.6 kg. Greece, France, Germany, the Netherlands, Italy and Finland consumed cheese in the largest quantity.

The ratio of international trade of milk and milk products to production is 6.8%, i.e. about 50 million tonnes, and it may expand, driven by strong demand from Asian countries and the Russian Federation. Export growth results from the United States, New Zealand and the EU(27). There is a strong import growth in Asian countries and the Russian Federation. In addition, Algeria, Mexico, Saudi Arabia and the United States are also relevant importers.

The second major exporter of milk and milk products in the world is the EU(27) with 12.2 million tonnes after New-Zealand. The level of import is much more lower, the EU(27) imports 0.8 million tonnes milk and milk products. Both in the export and import structure cheese represents the highest rate.
Since the start of 2009 the dairy market was confronted with a period of extraordinary low prices. The financial crisis in the world economy had a dramatic impact on product prices during the first half of the year 2009. After bottoming out, prices were slowly stabilising during the second part of 2009. At the end of the summer international prices started to strengthen. The strong recovery in prices was triggered by increases demand, mainly from oil exporting countries, but also from China. The last quarter of 2009 was characterized by steady rise in prices (Blaskó et al, 2011). The trend described above is illustrated by Figure 9.4., which introduces the changes in the producer price of raw milk from year to year.

**9.5. ábra - Figure 4.: Change in producer price of raw milk in the world between 2001 and 2010 (previous year=100%)**

![Figure 4: Change in producer price of raw milk in the world between 2001 and 2010](image)

Source: Blaskó, 2012

Figure 9.4. demonstrates the change in milk producer price in case of the EU(27), the USA, New-Zealand and Hungary. First of all New-Zealand gives almost the half of the international trade of milk products, thus the world market price of milk essentially depends on the milk production of New-Zealand. The EU(27) is the second major exporter on the global milk market followed by the USA.

Figure 9.4. compares the international changes with the changes in Hungarian milk price. The deepening crisis in the year 2009 can be well investigated in the evolution of the producer price of raw milk, from which, regarding prices, dairy sector managed to recover in 2010 (Figure 9.4.) (Blaskó, 2012).

In the last two decades the number of the Hungarian dairy cows declined from 630 thousand to 311 thousand animals. In the beginning the decreasing number of cow livestock was not perceptible in the amount of raw cow milk production, which was around 1.9-2.1 million tonnes. Later the increasing specific cow yield was not able to compensate the national milk production descent. Since then the Hungarian raw milk production has been continuously falling down. Currently the national milk production is around 1.65 million tonnes (Figure 9.5.).

**9.6. ábra - Figure 9.5.: Brief overview of the Hungarian dairy sector**
As Figure 9.5 illustrates the number of dairy cows significantly declined in the past twenty years. In accordance with the aforementioned statement the specific yield per cow was able to compensate this decline in cow number, so the volume of raw milk production remained stable. This correlation is down to the fact that with our EU accession most of the rural dairies ceased to exist and small producers with only a few dairy cows and low yields were forced to stop production. In this way the average Hungarian yield per cow started to increase (Blaskó et al., 2011).

1987 was an outstanding year in per capita consumption, because in this year Hungary managed to approach the consumption level of Western-European countries. Currently the average level of milk and milk product consumption is about 145-165 kg/capita/year, which is only the half of the average of the most developed European countries. In all probability cheese consumption will increase in the next few years in Hungary. The average liquid milk consumption is 65.7 litre/capita/year in Hungary (Blaskó et al., 2011).

The EU accession was defining in all aspects; it had significant impact on our foreign trade position. After 2004 Hungary became a net importer in the field of milk and milk products. Currently Hungary primarily export liquid milk (~180 million tonnes) to Italy, Romania and Slovenia. While milk products with higher added value (~330 million tonnes) arrive from Germany, Poland, Slovakia and the Czech Republic. The foreign trade balance of Hungary is unanimously negative (Blaskó et al., 2011).

Hungarian dairy market can be characterized by rising raw material prices. Figure 9.6. also illustrates that the price of raw milk after its bottoming out in 2009 – it was 54-55 HUF/kg – start to approach the peak of the year 2008, when price was above94 HUF/kg. The reason for the high level of milk prices experienced in 2008 was that in the growing financial crisis the stock market transactions and other activities had an indirect impact on the agricultural sector, among others on dairy sector. So dairy industry was not directly affected by the financial crisis, but the sluggish global economy in 2009 indirectly influenced the dairy sector in a negative way; which can be observed in Figure 9.6. Beside the aforementioned stock market transactions the financial crisis had also an impact on consumption, and the decreasing demand directly influenced prices. On the background of the upward trend experienced after 2009 was the increase in EU prices and the devaluation of the Hungarian Forint. The price increase, however, reflected a significant increase in input costs; the high level of feed prices and the unfavourable change in macroeconomic environment must be highlighted. The rising excise duty of diesel fuel, the VAT increase had a direct impact on the situation of the Hungarian dairy farmers. The above-mentioned negative factors, which have increased the costs of the sector narrowing the scope of the sector’s stakeholders in efficient operation (Blaskó, 2012).
9.7. ábra - Figure 9.6.: Evolution of the domestic producer price of raw milk between October 2007 and October 2012 in Hungary

Source: Blaskó, 2012

2. 9.2. The importance of milk production at farm level

We can find some advantages and disadvantages in the field of milk production at farm level (Blaskó et al., 2011):

1. Advantages:
   a. Proper utilization of fodders;
   b. Manure production for plant production;
   c. Continuous income that based on milk selling;
   d. Well-developed technological systems;
   e. Continuous employment.

2. Disadvantages:
   a. Significant demand on assets;
   b. Long payback period;
   c. Regular market disorders;
   d. Low income generating capacity;
   e. Significant demand on forage area
   f. Large interval between generations ("slow breeding animals").

Figure 9.7. illustrates the factors have influence on the production value of milk production. The three main factors are yields, sales prices and other factors increasing production value. Yields mainly depend on the biological base and forage technology, while sales prices are mostly influenced by the relation between demand and supply, quality and quantity of milk. Other factors include different supports in most cases.
9.8. ábra - Figure 9.7.: Factors have influence on the production value of milk production

<table>
<thead>
<tr>
<th>PRODUCTION VALUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yields</td>
</tr>
<tr>
<td>- Biological base</td>
</tr>
<tr>
<td>- Breeding technology</td>
</tr>
<tr>
<td>- Forage technology</td>
</tr>
<tr>
<td>- Animal health</td>
</tr>
<tr>
<td>- Microclimate</td>
</tr>
<tr>
<td>- Work organization</td>
</tr>
<tr>
<td>- Human factors</td>
</tr>
<tr>
<td>- Other inputs</td>
</tr>
<tr>
<td>Sales prices</td>
</tr>
<tr>
<td>- Quality (physical, biological)</td>
</tr>
<tr>
<td>- Quantity</td>
</tr>
<tr>
<td>- Fat content</td>
</tr>
<tr>
<td>- Protein content</td>
</tr>
<tr>
<td>- Demand - Supply</td>
</tr>
<tr>
<td>- Price supplement</td>
</tr>
<tr>
<td>Other factors increasing Production Value</td>
</tr>
<tr>
<td>- Support</td>
</tr>
<tr>
<td>- Insurance compensation</td>
</tr>
<tr>
<td>- Profit or loss on financial operations</td>
</tr>
<tr>
<td>- Other revenues</td>
</tr>
</tbody>
</table>

Source: Blaskó et al., 2011

Figure 9.8. illustrates the factors have influence on the production cost of milk production. The three main factors are inputs, price level of inputs and other factors increasing production cost. Inputs mainly contains material – first of all forage – use, while price level of inputs is mostly influenced by the price of own produced inputs and price of purchased inputs.

9.9. ábra - Figure 9.8.: Factors have influence on the production cost of milk production

<table>
<thead>
<tr>
<th>PRODUCTION COST</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inputs</td>
</tr>
<tr>
<td>- Materials</td>
</tr>
<tr>
<td>- Energy</td>
</tr>
<tr>
<td>- Animals</td>
</tr>
<tr>
<td>- Working hours</td>
</tr>
<tr>
<td>- Machinery operation</td>
</tr>
<tr>
<td>- Consumables</td>
</tr>
<tr>
<td>- The means of production</td>
</tr>
<tr>
<td>- Other inputs</td>
</tr>
<tr>
<td>Price level of inputs</td>
</tr>
<tr>
<td>- Price of own produced inputs</td>
</tr>
<tr>
<td>- Price of purchased inputs</td>
</tr>
<tr>
<td>- Time of procuring</td>
</tr>
<tr>
<td>- Volume of procuring</td>
</tr>
<tr>
<td>- Relationships</td>
</tr>
<tr>
<td>Other factors increasing Production Cost</td>
</tr>
<tr>
<td>- Interests</td>
</tr>
<tr>
<td>- Costs of financial operations</td>
</tr>
<tr>
<td>- Insurance fee</td>
</tr>
<tr>
<td>- Membership fee</td>
</tr>
<tr>
<td>- Duties</td>
</tr>
<tr>
<td>- Other expenditures</td>
</tr>
</tbody>
</table>

Source: Blaskó et al., 2011

3. 9.3. The problem tree of the Hungarian dairy farms

Hungarian milk production can be characterised by low income-generating capacity as the problem tree of the Hungarian dairy farms presents on the Figure 9.9. It essentially originates from four main problems: decreasing demand for domestic milk products, the low farm prices, the high production costs of dairy farmers and the low level of other resources. Several factors play important role in development of this four defining problems (Blaskó et al., 2011).

Due to the low level of cooperation in production stage of dairy product chain negotiation power of dairy farmers is poor and they can be described by increased defencelessness against the rest of the product chain. The result of the increased defencelessness of dairy farmers is the weaker bargaining power against the dairies, which leads to low farm prices. However farm prices are depressed not only by the more concentrated processing sector, but the increasing presence of import products and the “unfavourable” product choice of price-sensitive consumers. Milk price became stable in 2007 and 2008 at a high level, internationally. Growing production and the economic crisis, however, led to a dramatic relapse in the price, leaving a number of producers in uncertainty (Borbély et al., 2010).
The above-mentioned consumer price-sensitivity and the growing demand for cheaper import products contribute to another main problem, to the decreasing demand for domestic milk and milk products. Disposable income essentially determines the level of milk and milk product consumption of the Hungarian population. Hungarian consumers are not loyal for domestic products. In many cases they choose the cheaper import products of retail chains. They are usually not aware of the features and components of products, do not know the origin of them and they are not interested in the method of production, i.e. they are not conscious and in the first place price influences their buying decisions. Lack of community marketing is typical in Hungary. However the successfuss of this sector exactly depends on the creation of consumer awareness and strengthening of health consciousness, to which community marketing tools should be invoked (Popp et al 2008).

9.10. ábra - Figure 9.9.: The problem tree of the Hungarian dairy farms

A survey carried out by Szakály et al. (2005) also proved that in relation to milk and milk products significant misconceptions prevail among consumers. Essential interest of dairy industry is to clarify these existing misconceptions, since the lack of awareness building may have adverse effects on all categories of dairy products. Primary task is to strengthen consumer mentality among domestic products. Szakály et al. (2005) and Major (2007) also emphasise the importance of community marketing, which is beneficial to the participants, because they can preserve the independence of their core activity, but apportion the costs of advertising, market research, exhibitions and product policy among each other. However, sectorial and national community marketing activity cannot function effectively without the establishment of producer organizations and marketing cooperatives. The most important finding of Szakály et al. (2005) is that “the domestic community marketing can only be fully effective if a grassroots, marketing oriented system is managed to establish taking maximum into account the market needs and demands.”

As described above the Hungarian consumer is specifically price-sensitive and less susceptible to the more expensive novelties. Nevertheless the domestic dairies are not able to compete with the cheaper, foreign mass products. Thus the market share of the domestic dairies continues to decline as a result of increasing import, which further reinforces the expansion of foreign dairy products (Popp et al 2010). Examining their values the import increased fivefold, while export doubled compared to the year prior our EU accession. Examining the product structure finished product sales are prevalent on the import side, while on the export side export of raw materials grew significantly. Our cheese export, which is primarily aimed at third countries, almost halved in the past. It must be highlighted that 80% of the import products come from the following four EU Member States: Germany, Poland, Slovakia, Czech Republic (Hungarian Dairy Association 2010).

Hungarian milk production is relatively expensive in comparison with the competitors (Popp et al 2008). Feeding costs represent the highest rate in cost structure of production, based on the statement of Vágó (2008) 43% of the costs are feeding costs. One reason for the high feeding costs is that dairy farms often do not have their own land to produce feed. If they can do they produce the necessary feed in leased land, however in worse

Source: Blaskó et al., 2011

As described above the Hungarian consumer is specifically price-sensitive and less susceptible to the more expensive novelties. Nevertheless the domestic dairies are not able to compete with the cheaper, foreign mass products. Thus the market share of the domestic dairies continues to decline as a result of increasing import, which further reinforces the expansion of foreign dairy products (Popp et al 2010). Examining their values the import increased fivefold, while export doubled compared to the year prior our EU accession. Examining the product structure finished product sales are prevalent on the import side, while on the export side export of raw materials grew significantly. Our cheese export, which is primarily aimed at third countries, almost halved in the past. It must be highlighted that 80% of the import products come from the following four EU Member States: Germany, Poland, Slovakia, Czech Republic (Hungarian Dairy Association 2010).

Hungarian milk production is relatively expensive in comparison with the competitors (Popp et al 2008). Feeding costs represent the highest rate in cost structure of production, based on the statement of Vágó (2008) 43% of the costs are feeding costs. One reason for the high feeding costs is that dairy farms often do not have their own land to produce feed. If they can do they produce the necessary feed in leased land, however in worse
case they base their production on purchased feed placing them even more vulnerable position. Moreover there is decreasing supply of the relatively cheap sugar-beet processing and cannery by-products, which further complicates the situation of producers. Losses from animal health problems cannot be disregarded in the cost structure of production. In Hungary annual loss caused by reproductive disorders is roughly 150-300 EUR/cow, which can even be 9-11% of the farm’s revenue. Another significant problem also causing serious losses is mastitis (Öszvári 2007).

However further problem beside high feeding costs is our worse natural indicators, which are often caused by poor feed conversion and in many cases inefficient use of labour. All the above-mentioned factors contribute to the high production costs of dairy farmers. In 2008 centre of average cost was 0.28 EUR in case of defining commodity producers. The so-called better farms could produce milk 27% cheaper, for 0.21 EUR, while the less cost-effective farms produced milk for 0.32 EUR. The differences mainly arise from the costs of feeding (Béládi and Kertész 2009).

Although the above-mentioned specific yield per cow is above the EU average, as regards the nutritive values Hungary falls behind the competitors. Compared with other Member States the average protein and fat content of domestic milk is relatively low, which in long run reduces the competitiveness of the dairies (Popp and Potori, 2010). Based on Mándi-Nagy (2011) the nutritive values of domestic raw milk are the followings: 3.29% protein, 3.72% fat. Poor nutritional indicators may be primarily caused by high-yielding varieties, inappropriate housing and low nutrient content of forages.

On the one hand low income-generating capacity results in the lack of technological improvements, so production can be characterised by increasingly obsolete technology; while on the other hand several producers are ousted from the market choosing sales from house or entirely giving up production. All these factors could further deepen our already existing competitive disadvantage against the Western-European competitors.

Common and defining problem of the dairies and the commercial sector is the inadequate level of milk and milk product consumption.

4. Questions related to this Chapter

1. How could you define milk?
2. Sum up the current situation of international dairy sector! Which are the most important tendencies?
3. Sum up the current situation of the Hungarian dairy sector! Which are the most important tendencies?
4. What are the advantages and disadvantages of milk production at corporate level?
5. Which factors have influence on the evolution of production value/production cost of milk production?
6. Give a brief overview on the major problems of the Hungarian dairy farms!

5. References


10. fejezet - 10. ECONOMICS of the CATTLE MEAT PRODUCTION

In this chapter, we will discuss the main trends and tendencies regarding to the cattle meat production economies. In the really beginning, we try to explain the basic definitions, which are essential to understand this sector. Later chapters will discuss the basic sectorial economics definitions as well.

The second part of the chapter concludes the main trends and gives some outlooks about the world and the European Union cattle industry. Thirdly, we introduce the main cattle farming assets to get a better understanding of the cattle farmer's business. At the end of this chapter, we will explain the important factors relating to the cattle meat economics and the main European beef farms performance indicators. At the end of this sector the reader has a better overview of this interesting sector and can understand the key driving force factors, what is crucial in the meat cattle economics.

1. 10.1. Main definitions

In our glossary, we mean by beef cattle as cattle raised for meat production as distinguished from dairy cattle, used for milk production. The meat of cattle is known as the beef. When raised in a feedlot cattle are known as feeder cattle. Many such feeder cattle are born in cow-calf operations. In this case, the goal of a cow-calf operation is to produce young beef cattle, which are usually sold, specifically designed to produce beef calves. While the principal use of beef cattle is meat production, other uses include leather, and products used in shampoo and cosmetics. Another important term is the: veal which is the meat of young cattle (calves), as opposed to beef from older cattle. Though veal can be produced from a calf of both sex and any breed, most veal comes from male calves (bull calves) of dairy cattle breeds.

2. 10.2. World cattle production and outlooks

The biggest cattle population grazed in India, South-Brazil, North-Argentina, Western European countries, and the USA as we can see in the Figure 10.1. This density map gives a good overview of this ruminant density on the world. Nevertheless there are dairy cows also including this dataset, but at least half of the cattle livestock in average is beef cattle in the world and the dairy cattle livestock also plays an important rule of the cattle meat production, thus the figures represent the cattle meat production quiet well.

10.1. ábra - Figure 10.1.: The world map of cattle density
As we mentioned before we have to distinguish three types of cattle breeds. First is the beef cattle breed, on Figure 10.2. the country's distribution represented depending on their cattle breeds type. Thus those countries which have more than 66% beef cows in their total cows livestock used to call as beef countries, like Canada, USA, Brazil, Argentina, China, Australia, etc. Countries which has less than 33% beef cows has in their total livestock called dairy countries, like The Netherlands, Germany, Sweden, Finland, Hungary, Russia, India, etc. Between these two basic category there are countries which beef cows livestock is in somewhere between 33-65% of the total cow livestock. The literature calls them, mix countries in this matter. These countries are for example: United Kingdom, France, Spain, or Turkey.

10.2. ábra - Figure 10.2.: Beef and dairy country distribution in the world
After discussing the number of cattle and their density in the world map, we have a good guest to estimate the world significant beef meat producer’s areas, which relates to each other. First, let us look at the beef production volumes tendencies in the world comparing with other meat products (Figure 10.3.).

10.3. ábra - Figure 10.3.: World meat production

Source: FAO, 2013

In the world, the pig and the poultry production increased quite dramatically over the last decade. Unfortunately the beef and veal production was remained almost the same during this period, like the sheep meat production. World production is forecast slightly higher for the second consecutive year. Strong expansion in India and to a lesser extent, Brazil and Argentina more than offsets lower production forecast for the United States and the EU (OECD 2013).

Examining the world cattle meat production share between different regions, it is significant that the biggest producer continent is the American continent, including North and South America. This continent gives almost the half of the world production. On the second place, Eastern Asia shares 11% and in fourths place Western
Europe shares 6% of the world total cattle meat production (Figure 10.4.). This tendency is the same as we have noticed before when we examined the cattle density in the world.

10.4. ábra - Figure 10.4.: World cattle meat production share in 2011.


The top producer in the world is the USA with 11.98 million tonnes cattle meat production, Brazil is on the second place with 9 million tonnes of production; China is on the third place with 6.18 million tonnes of cattle meat production. The world beef and veal production was around 66.192 million tonnes in 2011.

The beef and veal production volume has a strong correlation with the country size, climate, geographical environment, trade opportunities, and advantages and maybe the most important one is their citizen’s per capita beef and veal consumptions. Figure 2.5 represents this important indicator in some selected countries in the world. As we saw Argentina playing important role of the beef and veal production, but the Argentinean people beef and veal consumption is the biggest in the world. They consume in average 64.6 kg beef and veal meat per capita per year. Of course, other big beef producer countries’ citizens consume more than the average, like one USA citizens consume 40.2 kg beef and veal meat per year. However, the Brazilians, the Canadians or the Australians consumption’s are also beyond the average (Figure 10.5).

10.5. ábra - Figure 10.5.: Per capita beef consumption in selected countries (2009)
Generally, countries that are big producers of beef are also big consumers of beef. This is partly a reflection of the size and the absolute level of beef production and consumption roughly correlates to the size of the countries. Figure 2.6 demonstrates a FAOSTAT model, which represent the beef demand growth in the world until 2030. This is an obvious fact that the developing countries population growth is exponential, thus there needs to eat beef will be rising too. That means in some African, South and East Asian countries we have to count on a high beef demand growth in the near future, which can reach 1000 kg beef meat demand grows in one square kilometre.

10.6. ábra - Figure 2.6.: Growth in demand estimation for beef from 2000 to 2030
Regarding to the world cattle meat trade we can conclude, that there is a high concentration is in the market regarding not just the import marker but the export market as well. The biggest 4 importer countries (namely: Italy, the Netherlands, Russia, France) in quantity shares more than fifty percent of the total beef import in the world. The biggest 5 exporter countries (namely: Germany, Poland, France, the Netherlands, Belarus) in quantity give more than 50% of the total beef export of the world. It is weird that France and the Netherlands are a biggest exporter and importer country too. That can happen, if a country does some kind of change in the raw product, and process it, which means give high added value in the raw product. Thus, this product value can be higher in the market, so the exporter country's beef trade balance can be significantly positive.

Figure 2.7 gives a quick overview the world beef meat trade in values. This is quite different from the examining the trade tendencies in quantity. The different can be the extensive or intensive beef breeding technology, which determine the price of the beef and veal meat.

10.7. ábra - Figure 10.7.: Situation of the global cattle meat trade


3. 10.3. EU cattle production and outlooks

The EU produces beef about 7.7 Million metric tons (mmt) annually. This makes the EU the fourth-largest producer of beef in the world, behind the USA, Brazil, and China. However, in the past 10 years, EU beef production has declined nearly 15% due to decreased consumer demand – primarily because of animal disease issues.

In the European Union (EU-27), the biggest cattle meat producer is France, which gives 21% of the total EU production. The second biggest producer is Germany (16%) and Italy follows it in the third place with 14% shares of the total EU cattle production (Figure 10.8.).

10.8. ábra - Figure 10.8.: The European Union cattle meat production

10. ECONOMICS of the CATTLE MEAT PRODUCTION


Figure 10.9. represent the different kind of slaughtered cattle by animal category in 2011 in values. It is significant that the slaughtered bulls and cows volumes are the highest approximately 200-210 thousand tonnes. Lower share has the heifers, calves, bullocks, and young cattle.

10.9. ábra - Figure 10.9.: Cattle slaughtered by animal category in the EU, 2011 (in 1000 tonnes)


Among the 27 European Union member countries, there is a common agricultural policy, which regulates the beef and veal production among the member countries and the trade with the third countries. Briefly, the main aims of the Common Agricultural Policy (CAP) are to: stabilize EU markets; ensure a fair standard of living for farmers; restore levels of consumption of animal products; and make EU animal products more competitive on the world market.
Table 10.1. summarizes the main indicators of the European beef and veal economics. We can conclude that this sector is not a promising sector in the Union thus the indicators are slightly represented the decline of this sector.

10.10. ábra - Table 10.1.: EU 27 beef and veal balance sheet

<table>
<thead>
<tr>
<th></th>
<th>2009</th>
<th>2010</th>
<th>2011e</th>
<th>2012f</th>
<th>2013f</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gross Indigenous Production</td>
<td>7982</td>
<td>8239</td>
<td>8206</td>
<td>7831</td>
<td>7756</td>
</tr>
<tr>
<td>Live Imports</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Live Exports</td>
<td>61</td>
<td>116</td>
<td>156</td>
<td>170</td>
<td>130</td>
</tr>
<tr>
<td>Net Production</td>
<td>7923</td>
<td>8124</td>
<td>8050</td>
<td>7661</td>
<td>7626</td>
</tr>
<tr>
<td>of which EU-15</td>
<td>7098</td>
<td>7306</td>
<td>7246</td>
<td>6905</td>
<td>6868</td>
</tr>
<tr>
<td>of which EU-12</td>
<td>824</td>
<td>818</td>
<td>804</td>
<td>756</td>
<td>771</td>
</tr>
<tr>
<td>Meat Imports</td>
<td>359</td>
<td>320</td>
<td>287</td>
<td>266</td>
<td>290</td>
</tr>
<tr>
<td>Meat Exports</td>
<td>91</td>
<td>255</td>
<td>331</td>
<td>190</td>
<td>175</td>
</tr>
<tr>
<td>Stock changes (public)</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Consumption</td>
<td>8190</td>
<td>8188</td>
<td>8006</td>
<td>7740</td>
<td>7741</td>
</tr>
<tr>
<td>Population (mio)</td>
<td>500</td>
<td>502</td>
<td>503</td>
<td>504</td>
<td>506</td>
</tr>
<tr>
<td>Per Capita Consumption (kg)</td>
<td>16.4</td>
<td>16.3</td>
<td>15.9</td>
<td>15.3</td>
<td>15.3</td>
</tr>
</tbody>
</table>

Source: EUROPA.eu, 2013.

The beef price based on year 2000 has risen 32% in 2012, which is under the average meat price increasing trend line (Figure 10.10.). In the mean period the poultry prices increased 40% and the pork prices increased 50%. Unfortunately, the beef price cannot follow this price improvement in the examined period.

10.11. ábra - Figure 10.10.: EU agricultural meat market and consumer price developments (January 2000 until December 2012, Jan2000=100)

Source: EUROPA.eu, 2013.
4. 10.4. Cattle farming assets

In the cattle farming business, 60-70% of the total asset values are the livestock value (animals). The machinery and other equipment are given 20-25% of the total assets. Only 3-5% is the buildings and structures value of the total assets. This average numbers perfectly indicate that this sector is an extensive sector. 950-1100EUR per cow is the fixed assets per cow. The average current asset value per cow is between 270 and 500 EUR/cow. 20-35 percent of the total net asset value is current assets.

Picture 10.1 illustrates what is necessary to maintain a beef farm. We have a good grazing area, where we can achieve seasonal grazing. We need genetically good livestock, with a good bull. The good grazing machines like tractors, mover machines and grassland machines, water pumps and drinking troughs are essentials too. The most important chain in this chain line is the human resources; the well-educated farmer is the key of the farm success.

5. 10.5. Economics of the cattle meat production on farm level

Before we get into the deepest economic topics, we have to know some technical details regarding the beef cows production and beef meat process. In other word: the production line from calf to kitchen. This summary is based on a Kansas City Stars magazine MCT 2012 article.

Nowadays a typical cow is slaughtered about 14 months of age, but some cattle are slaughtered at 20 months or older. A calf is born on a ranch and it usually spends the first six months of its life in a pasture, eating grass. Six months later, the calf is weaned and moved to a pen; the now 272 kilogram calf will spend the next couple of months learning to eat from a trough and tasting corn; this step is called backgrounding (MCT 2012). At a year old, the cow is moved from the backgrounding pen to a feedlot; the cow is loaded onto a cattle hauler. At the
feedlot, the cow joins thousands of others in enclosed pens. Cows are transitioned to a dairy diet of mostly corn, alfalfa and silage, a fermented, moist feed made from field crops. They are often treated with hormones (in some countries) and antibiotics at this stage. The cow has grown to 545-635 kilogram and is ready for slaughter.

Cattle are taken to a packing plant, where they are herded into holding pens designed to keep them calm. Cattle are herded through a serpentine chute toward the knocking box; worker using a pneumatic gun shoots a steel bolt into the skull, rendering the animal unconscious. Next, a shackle attaches a chain around the cow’s back leg and hoists it up to a conveyor rail. Cow moves down the rail to a sticker who cuts the neck draining cow’s blood. Cow, now dead, makes contact with an electrical line used to improve tenderness. High pressure washer rinses the carcass of dirt, manure. During a critical step, a worker removes the animal’s bung, attempting to avoid spreading contamination. The De-hiding process begins; feet and head are removed; worker cuts the hide along the belly. Hide piling machines helps skin the animal; carcass moves down the line. An inspector examines the carcass, looking for signs of pathogens and BSE (bovine spongiform encephalopathy or Mad Cow disease). If contamination is found, the carcass is cleaned or removed. Large saw is used to split the carcass through the centre of the backbone; tail and spinal cord are removed. Just 15 minutes after cows are stunned, the split carcasses are washed and left to dry. Meanwhile, beef trim from other carcasses is prepared for ground beef production. Carcasses from 20 months old or younger are marked for export to foreign countries. Finally, the carcasses are broken into primal cuts, including steaks and roasts. Fresh beef is vacuum-packed or boxed for sale to wholesalers, retailers, hotels and restaurants.

In the beef farming economics, we are motivated to increase our production value. This value affected in three other values the yield (kg), the unit price (EUR) and other incomes (EUR). Figure 10.11. represents the different kind of factors affecting the value of production in the cattle farm.

10.13. ábra - Figure 10.11.: Factors affecting the value of production in cattle farm

![Diagram showing factors affecting the value of production in cattle farm](image)

Source: Kovács 2008.

The value of production in the beef farming is crucially and really important, but this is just one side of the coin. We have to maximize the production value to get a higher profit at the end of the production chain, but in the mean time, we have to minimize or at least stabilizes the production cost (or the cost of production).

The production cost affecting (Figure 10.12.) basically three factors as well, the expenditures, which are nominal values like kilogram, liter, peace, gram, tonnes etc.; this expenditure has a unit price like 1 liter antibacterial liquid cost 10 EUR/liter or 1 tonnes of feed premix cost 250 EUR etc. Third factor is the other increasing factors, which can increase the production cost and not related directly the production level, like bank loans, transaction costs, insurances etc.
10.14. ábra - Figure 10.12: Factors affecting the production cost in cattle farm

PRODUCTION COSTS

Expenditures
- Feeding level
- Labour hours
- Energy
- Input materials
- Machinery
- Veterinary
- Mortality
- Production Assets
- Other expenditure
- etc.

Exp. price
- Expenditure's price
- Expenditure's quality
- Expenditure's quantity
- Purchase place
- and period
- Relations
- etc.

Other cost increasing factors
- Interest
- Financial
- Transaction cost
- Insurance fees
- Membership dues
- Duty and taxes
- Other costs

Source: Kovács 2008.

6. 10.6. European beef farms performance indicators economics definitions

There are some basic equations regarding to the sectorial economic indicators:

\[
\text{REVENUE} = \text{Value of output} + \text{Coupled Direct Payments}
\]

**COST CATEGORIES:**

- **Operating costs** = specific + non-specific costs
  - Specific costs: feed, animal purchase, other (e.g. veterinary)
  - Non-specific costs: machinery and building upkeep, energy, contract work, taxes, and other direct costs (water, insurance of farm buildings)
- **Depreciation**
- **External factors**: rent, wages, interest paid
- **Own factors**: family labour cost and own capital cost
- **Total Economic cost** = Operating costs + depreciation + external factors + own factors

**MARGINS**

1. **Gross Margin** = Revenue – Operating costs
2. **Net Margin** = Revenue – Operating costs – Depreciation – External factors
3. **Net Econ. Margin** = Revenue – Operating costs – Depreciation – External factors

\[\text{All margins can be calculated/presented with or without Coupled Direct Payments.}\]
We can distinguish three kinds of beef farm in the European level: breeders, fatteners and the mixture of the two (B&F). Table 10.2. represents the European average beef farms parameters, like labor in annual work unit (AWU), beef specialization, average used agricultural area (UAA), stocking density (livestock unit (LU) /ha or number of cattle sold in a different farm category.

10.15. ábra - Table 10.2.: The European beef farms basic average parameters

<table>
<thead>
<tr>
<th></th>
<th>Breeders</th>
<th>B&amp;F</th>
<th>Fatteners</th>
</tr>
</thead>
<tbody>
<tr>
<td>Labour in AWU</td>
<td>1.33</td>
<td>1.28</td>
<td>1.31</td>
</tr>
<tr>
<td>Beef specialization % output</td>
<td>82%</td>
<td>78%</td>
<td>79%</td>
</tr>
<tr>
<td>Average UAA - ha</td>
<td>72,71</td>
<td>55,29</td>
<td>40,88</td>
</tr>
<tr>
<td>Forage crops - ha</td>
<td>63,71</td>
<td>49,41</td>
<td>23,3</td>
</tr>
<tr>
<td>Share of forage crops - ha</td>
<td>0.99</td>
<td>1.12</td>
<td>1.79</td>
</tr>
<tr>
<td>Stocking density - LU/ha</td>
<td>47</td>
<td>31</td>
<td>0</td>
</tr>
<tr>
<td>Number of suckler cows</td>
<td>27</td>
<td>32</td>
<td>105</td>
</tr>
</tbody>
</table>

Source: EU FADN - DG AGRI L3, EU Beef farms cost allocation model

Regarding to the European farmers gross margins (GM), we can emphasize some facts (Figure 10.13.): (1) GM is generally not high but they are positive; (2) comparable for breeders and B&F €310/cow and €297/cow respectively; (3) fatteners margin of €135/male not directly comparable (specific nature of the production expressed in the number of males fattened and sold per year); (4) the EU-10 margins were lower than the EU-15 for all three groups (smaller number of cows/cattle per farm and lower prices for beef).

10.16. ábra - Figure 10.13.: Beef production costs and gross margins in EU-15 and EU-10

Source: EU FADN - DG AGRI L3, EU Beef farms cost allocation model

Regarding to the net economic margins, we can summarize these indications are generally are negative (Figure 10.14.). Apart from some EU regions with favourable natural conditions and special types of product, even for a long time series. Family factors, especially labour, are underpaid. Negative net margin does not necessarily have to be a major impediment to beef production.

10.17. ábra - Figure 10.14.: Income per EU group and type

Source: EU FADN - DG AGRI L3, EU Beef farms cost allocation model
The reason for that can be poor economic performances. However, what is the reason why most farmers still stay on in the industry. There is one possible answer for this question: Leaving it would generally mean heavy losses and alternative forms of income are often limited. Therefore, their strategies to minimize production costs, underpaying family factors, subsidizing farm production from decoupled payments and other sources of income. However, farming includes difficult to measure the benefits (constant contact with nature, independence, housing often on the farm, limited distance between the house and the job, social activities, networking and public recognition and a feeling of the importance of producing food). Farmers adopt a long-term income strategy by increasing the farm's assets with a view to supplement their pensions after they retire (in some cases asset values increased by 200% between 2000 and 2007).

7. Questions related to this chapter

1. What are the main tendencies in the world cattle market?
2. What are the main tendencies in the European cattle market?
3. What kind of assets do you need for cattle farming?
4. Which factors do affect the production value in the cattle farming?
5. Which factors do affect the production cost in the cattle farming?
6. Evaluate the EUROPEAN BEEF FARMS economics performance.

8. References

3. EU FADN - DG AGRI L3, EU 2013.: Beef farms cost allocation model
5. EURPOPA.eu 2013.: http://ec.europa.eu


9. MCT 2012 Industry and union official’s, The Kansas City Star

11. fejezet - 11. ECONOMIC OF PIG PRODUCTION

First let us became familiar with the general situation of the pig-meat consumption and production.

1. 11.1. The global pig meat consumption

Pork is the most widely consumed meat in the world. People eat many different pork products, such as bacon, sausage, pork chops, and ham. Several valuable products or by-products, in addition to meat, come from swine. The projection for global meat consumption until 2025 shows in Figure 11.1.

11.1. ábra - Figure 11.1.: Global Meat Consumption

Although pork is not consumed by certain populations or in certain regions, it is one of the preferred meats in the world, the United States, and in EU ranking first in per capita meat consumption in the world and third in the United States. Both Islam and Judaism prohibit the consumption of pork, and Hindus do not eat beef/veal, so the countries where these religions are widespread rely on other types of meat, or eat little of it at all. In the other countries like Asian region are really enjoyed and consumed pig meat. Now the Chinese eat each an average 38 kg pork in a year. (I2) Sometimes vegetarian people refuse for eating pig meat. The average consumption in EU approx. 43 kg/cpita/year. The biggest consumers are Austria, Germany and Spain (Figure 11.2.).

Pork ranks third in annual U.S. meat consumption, behind beef and chicken, averaging 23, 1 kg per person.

11.2. ábra - Figure 11.2.: Meat consumption in selected EU Member States in 2012.
2. 11.2. Global pig meat production

Global meat production in 2011 was 297.2 million tonnes. It is forecast to grow by 1.6% to 302.0 million tonnes in 2012, and following with the progress will probably increase in the next period as well (Figure 11.3.).

11.3. ábra - Figure 11.3.: The global meat production (2000-2011)

Source: FAO-OECD, 2012

The largest producers in pork production are: 1. CHINA, 2. EU-27, 3. USA, see in Table 11.1.

11.4. ábra - Table 11.1.: World pork production in the last decade
The pig meat production in the World approximately 111 million tonnes was in 2011. The global production until 2018 will increase for a 120 million tonnes. Even the biggest producer is China, this county the same time the biggest importer as well. The World trade in pig meat was 7 million tonnes in 2011. The biggest importers were China, Japan and Russian Federations meanwhile the biggest exporters were USA, EU-27, and Canada. The forecast for the World market outlook can see in Figure 11.4.

11.5. ábra - Figure 11.4.: The World market outlook of pig meat

Source: FAO-OECD, 2012

Following the forecast of change in production of various meats (2012 over 2011) looks that pig meat production will increase approximately 2.6 percent by year of last period (Table 11.2.).

11.6. ábra - Table 11.2.: Forecast change of production of pig meat
In the Figure 11.5. we can recognised that biggest pig producer in the World is China. Following countries are belongs to EU and USA.

11.7. ábra - Figure 11.5.: Pig producers in the word

Meanwhile the EU 27 in the second stage in the pig production worldwide, within the EU there are a big differentiation (Figure 11.6.).

The biggest pig producer is Germany, than France Spain and Italy. Pig meat production in the EU-27 slowly increased from 2010 to 2011. The total pig meat production was 22.8 million tonnes in 2010 and then it was 23.2 million tonnes in 2011, but it is forecast to decrease to 22.9 million tonnes in 2012. Pig meat trade in the EU-27 in 2011 import was 19 thousand tonnes, and the export: 2242 thousand tonnes.

11.8. ábra - Figure 11.6.: Meat Production in EU
3. 11.3. Pig meat production, trade and consumption in Hungary

Pig meat production has a great tradition in Hungary. In the early 80’s there where almost 10 million pig in the country and capita per consumption was reached 43 kg/year. After 90’s both production and consumption are diminished (Figure 11.7.).

The production nowadays is approx. 300 thousand tonnes, export is 174 thousand tonnes, import is 136 thousand tonnes respectively. However, the consumption is diminished from the 90’s the pig meat is approx. 45% of the total meat consumption (Figure 11.8.). Pig meat is 45%, poultry is 43%, bovine 4% offal 5%.

11.9. ábra - Figure 11.7.: Pig meat production, trade, and consumption in Hungary

Source: FAO-OECD, 2012
The phases of pork production that take place on the farm to produce hogs ready for market are called: breeding-gestation, farrowing, nursery and grow-finish.

4.1. 11.4.1. Breeding-gestation

Swine production can be logically separated into a number of phases, beginning with the sow being bred. Historically, this has been done by placing a number of sows in a pen with one or more boars. In confinement buildings, boars are often rotated between sow pens to make sure that all sows are bred while they were in heat. Sows in enclosed shelters come into estrous, 3 until 5 days after their pigs are weaned. The estrous period, or standing heat, is the period when the sow can be bred. Estrous only lasts a short time, so it is critical that the sow is bred at this time. During estrous, the sow shows outward signs of being willing to accept the boar, such as standing still when the producer applies downward pressure on her back or holding her ears erect. If the sow is not bred during this period, she normally returns to estrous about 21 days later. These two periods are known as "first heat breeding" and "second heat breeding". The non-pregnant sow is considered "unproductive" during this 3-week period, since she still must be fed and housed. Most modern operations have sows bred only on first
heat. Sows that fail to breed during this estrous are often sent to market and replaced in the sow herd by gilts, or young females that are removed from the grow-finish group of pigs. After breeding, the sow "gestates" her "litter" for 113 to 116 days before the pigs are born or "farrowed.” A good way to remember gestation length for swine is that it is approximately "3 months, 3 weeks and 3 days”.

4.2. 11.4.2. Farrowing

Just before giving birth, called farrowing, sows are normally moved into a "farrowing room.” Most confinement operations place the sow in a temperature-controlled environment and usually in a farrowing pen or crate which restricts her movement to protect her baby pigs. The baby pigs spend most of their time in a "creep area on one or both sides of the crate where they have ready access to their mother, but are protected from crushing when she lies down. An average sow will raise three to five litters of pigs in her lifetime. Sows may be culled and sent to market, because of age, health problems, failure to conceive, or if they are able to raise only a low number of pigs per litter.

4.3. 11.4.3. Nursery pigs

After weaning, pigs are normally placed in a "nursery” where they are kept in a temperature-controlled environment, usually on slotted floors. The floors in a nursery are usually constructed from plastic or plastic covered steel instead of concrete to provide additional comfort for the small pigs. Pigs are provided with ready access to water and feed. Immediately after weaning, the temperature in the nursery may be as much as 30 C degrees, and then dropped gradually to about 21 degrees as the pigs grow. Pigs are normally removed from the nursery at about 6 to 10 weeks of age and placed in a "grow-finishing” building. Nursery rooms are usually heated with furnaces and ventilated with mechanical fans, controlled by a thermostat, in order to keep the pigs warm and dry throughout the year.

4.4. 11.4.4. Grow-finishing

This phase is where pigs are fed as much as they wish to eat until they reach market weight of 110 to 130 kg and provided around 0.8 sq. m² of space per pig. Marketing normally occurs at five to six months of age, depending on genetics and any disease problems encountered. Some gilt are returned from the grow-finish phase to the sow herd for breeding purposes, to replace older sows that are culled. Animals in a grow-finish operation are larger and produce a great deal of body heat. Ventilation to keep the animals cool is usually more of a concern than providing heat in winter. Animals at this age grow best at around 18-21 degrees. In winter, they are protected from winter winds in a moderately well insulated building. Enough ventilation must be provided to remove moisture and to provide fresh air for the animals. In summer, large sidewall vents are opened or large ventilation fans are operated to keep the animals comfortable. This is referred to, respectively, as naturally ventilated (air change due to the wind) or mechanically ventilated (where air is drawn into the buildings through vents due to a negative pressure created with wall fans that exhaust inside air.” (I,4)

An overview of the pig production cycle. In the Figure 11.9 we can follow the pig production cycle.

11.11. ábra - Figure 11.9.: Pig production cycle
5. 11.5. Advantages and disadvantages of pig growing

The keeping of pigs-breeding enterprise, business economics perspective has certain advantages and disadvantages which should be considered before we get started in the company. The main advantages and disadvantages are summarized below:

5.1. 11.5.1. Advantages

The pig genetic bases of high and low reproductive characteristics, which allows for quick change type, the relatively rapid deployment of resources, thus generating a relatively short time is able to adapt to the constantly changing market conditions.

Mature and consolidated technology, and advanced integration options are available to the farmers. The integrator sometimes advances a portion of the cost of the raw material and the fattening animal feed, hand over the technology it represents. Provide ongoing consultation and advisory opportunities. The final product of accounting, saving the producers of short-term working capital loans gain. The sales contract also means a certain outlet, though the latter's disadvantage is sometimes reported in the pre-contracted prices.

Most prevalent in our country are well equipped for large-scale technology, so a relatively small sector of the labor needs. The pig provides continuous employment throughout the year.

Form of small-scale pig-well-known exploits. The "backyard farms" in the past and still is a key role in, or get in pig farming. Widespread practice of large-scale village average of lower quality pig called. "Slaughter house" and circle of acquaintances sale, which delivers significant supplementary income for small farmers.

Throughout the year, relatively recurring cash income, decrease in other sectors too often candidates for liquidity.

Return on invested capital is relatively good question, but we can talk about a better rate for the production of poultry meat compared to other livestock sectors.

Cannot be neglected by the fact that the pig meat production is of strategic importance for national economy, such as government subsidies usually some form of "enjoying" the industry.

5.2. 11.5.2. Disadvantages
The modern varieties/hybrids are more demanding in the diet, technology, etc...contrast, which requires greater expenditure levels. Due to the high concentration and the other, 'the problems mentioned in the pig fattening livestock farming risky for most industry sectors.

The production is a major concern should be given to animal health and preventive in nature (triple-free), which is a considerable additional expense represents the growers. The occasional epidemic of viral flaring foot and mouth disease induces severe market disruption.

Large-scale technologies in our country the majority of serious concern for the pig slurry environmentally friendly place. A satisfactory solution is known. Unproductive investments require the contractors to substantially worsen the already poor return on capital employed of.

The company duly carried out principally engaged in pig farming high-level professional (technical and marketing skills), preparedness and "good relations" would the producers. In the current economic conditions, remain stable with only the best on the market.

One of the most important inputs of feed, which means the cereals, such as relatively high reliance on the grain market concerned.

The actual purchase prices within a year can be extremely volatile ("unpredictable markets"), so the available income and interest repayments difficult to plan, banks are reluctant to provide loans to the farmers. The so-called -market inefficiencies - regularly hit the pork market.

The pig farming, pig production based on the profit-making ability of the average conditions of magnitude lower than the current interest charges. The goods-producing farms, cooperatives, private and small farmers do not generally have sufficient working capital and short-term loans at high interest rates only access.

The sector is relatively large working capital requirements, which the majority of small farmers cannot finance their own resources. The processors are not always able to (you know, want to) solve the pre-financing.

General Fund deficit of producers currently perceived as the only producer able to bridge financing integrators. This is a long process to judge the changes that ultimately will result in accumulation of private producers and growth lead.

6. 11.6. The effectiveness of Hungarian pork production

The 11.3. Table current natural efficiency level and the level of available genetically present the Hungarian pig production sites. Our backlog for each of the indicators is significant, varies between 15-50%. "At this expense into account the differences in the world market, one cannot understand / recognize" (Szabo et al., 2009).

11.1. táblázat - Table 11.3.: Production level in Hungarian pig-farms

<table>
<thead>
<tr>
<th>Name</th>
<th>Unit</th>
<th>Actual average</th>
<th>Genetically available</th>
<th>Backlog (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prolificacy</td>
<td>piece/perinatal</td>
<td>10</td>
<td>12-13</td>
<td>15-20</td>
</tr>
<tr>
<td>Mortality</td>
<td>%</td>
<td>15-20</td>
<td>6-10</td>
<td>40-50</td>
</tr>
<tr>
<td>Weight gain</td>
<td>gramm/day</td>
<td>600-650</td>
<td>800-850</td>
<td>20-25</td>
</tr>
<tr>
<td>Feed conversion seat</td>
<td>Kg/kg</td>
<td>3,5-4</td>
<td>2,5-2,8</td>
<td>25-30</td>
</tr>
<tr>
<td>Sales after a sow</td>
<td>piece</td>
<td>16-18</td>
<td>28-31</td>
<td>45-50</td>
</tr>
</tbody>
</table>

"The effectiveness of the slaughter pig production, genetic background influenced by many factors. The outdated and worn-keeping technology, in many cases incomplete composition feed the animals is far from optimal placement, poor sanitary conditions, lack of infection chain interruptions, inadequate stable climate, the cultivation and production organization anomalies, labour, inadequate training and work discipline, asset protection weaknesses and burdens that every day the production control managers passed on" (Szabo et al., 2009).

Outdated and in need of refurbishment technology and other environmental and sanitary and veterinary deficiencies serious adverse effects in swine reproduction, rearing and fattening performance. When these errors occur, the results in 20-30% higher feed consumption, profitability, and reduce by 10-20% (Szabo et al., 2009).

7. 11.7. Domestic pork production expenses and cost conditions

The annual cost of production size, different and fluctuating over the years to the composition of the economy to another, which depend on: the technology used in the production of quality and intensity of the local situation, the economic capital assets of, equipment of, the labour supply of the inputs, input prices of the human and other factors. The production cost components should also be approached from three sides. One of the natural inputs in conjunction with the other unit costs in relation to these charges, and the third is the increasing cost of production expenses other side (these are costs that can only be expressed in terms of money and there is no natural inputs content) in their approach.

7.1. 11.7.1. Factors affecting the production costs of pig production

Necessary in the examination of the production cost of the fixed and variable costs of separation, this in many cases is not an easy task. The size of the fixed costs per unit of product, production volumes decreased with increasing. Total variable and fixed costs per unit of production costs, which total cost per one unit of product. The cost of essential goods sector and the operating result regarding. The cost is characterized by the magnitude of the cost spent on the various products live and materialized labour.

Cost-sex structure of the domestic pork production is dominant cost item in the cost of materials, with a share of between 70-80%. The second most important item of general expense and salary.

Like other livestock sectors, the largest share of the costs, raw material costs make up (75-80%). The cost of materials used in the production of raw and auxiliary materials, and total price of the energy used. This includes feed, feed supplements, bedding, veterinary drugs, etc... costs. The materials used in slaughter pig production partly purchased and partly in goods produced in the economy. Purchased products are valued at the purchase price the cost of computation, but the self-manufactured products accounted for is no longer that simple. The literature of these products to the public at a purchase price and the cost of settlement deal as well. In fact, both the calculation method can be justified. May be appropriate in cases where the bulk of the feed of farm produce for their own use, examines how the influence of animal feed production cost of product development costs. However, in view of the fact that feed commodities used in slaughter pig production requirements can be assessed, the economy as a company primarily must have an answer as to how you should sell the produced fodder: directly in the market or feed by pigs. This will only know if the self-produced cereals also account for buying, i.e. at market prices, the costs of slaughter pig production. Knowledge of the domestic pig feed base, keeping in mind the characteristics of not only the general economic policy needs, but also business management, direct economic point of view is important. Domestic pigs fed based on the homegrown cereals (mostly maize). Unfortunately, the production of protein feed for domestic and production volumes increased with no means of recovery in cereal production. The lack of protein must be purchased abroad. Be added to the imported protein feed us much food for thought tonnes to 5 tonnes times the grain grow in our country. Today, we are there to feed protein in the pig feed supply 70% of the import. Must therefore be regarded as an important task of the domestic sources of protein as soon as possible the full use and considerable expansion. Into coming here, "carrier protein" fodder production, animal feed proteins used in industrial microbiology, etc... Preparation and utilization of a variety of products. Primary concern here - as everywhere - in the economy, but if it is satisfied, then it is appropriate to comply with the necessary requirements dictated that there is a negligible source of protein.
Finally, we need to increase the efficiency of pigs generally improved feed utilization. This would primarily
feed issue, but it would be very bad if it underestimates the culture and the importance of maintenance problems.
We consider that today the nationwide housing conditions "limit the 'swine performance. Large-scale, but even
more so in industrial animal husbandry brought to life in a new industry, the feed industry. These necessitated
far-reaching economic and ecological changes, the most important elements are:

- The so-called specialized farms are inefficient nature of the environment in pigs. The fresh air, the sun
  moving, grazing offered biologically beneficial effects fall short here.

- A concentrated (so many animals in one place), domestic pig farming scheme has evolved to feed solely
  based on figures.

- Architectural, engineering purposes - the vast majority of the settlements - in the form of fodder fed dry meal.

Shall contain all the nutritive and biologically active substances, such feed the conditions that the animals
needed for growth, reproduction, health and survival, in a word, the economical production.

Such, very diverse needs, with in-modern feed necessary for the compilation of in-depth professional
knowledge, which is the acquisition of the holding itself Specialist hardly undertake - especially as another way
use, Allocation of farming conditions difficult meeting rising rapidly, while the feed knowledge is significantly
expanding day by day, which kept pace with the feed mill specifically with professionals highly anticipated not
an easy task.

Makes it difficult to work to feed the mixture components are themselves constantly changing. This includes the
forage yield of soaring, their composition is altered, reduced potency, and that because of high doses of
fertilizers for plants microelements into poverty.

The cost of production is about 3-4% of the total personnel costs. However, it is very important to note that
these costs are relatively the same time is continuous. Personnel costs for companies enlisted in permanent cost
behaviour. Pig farms method of construction, technology, determines the required number of employees,
structure and work organization.

The costs of auxiliary services (1-2%) largely depend on the operation of capital assets. Major cost items are the
costs of transportation and materials handling. The transportation services incurred during the year mainly in
association with the feed and manure.

The amortization costs - thanks to the extraordinary obsolescence of the home sites - are not very significant (1-
5%), but this is a no cost as a proportion of 10% is exceeded in the case of new plants. The maintenance costs
would also be important for this, but in practice this works dating back several decades lagged behind, thus, its
value is only 0.5-1%. Of course, some of these works shall be carried out only in certain years, so you should
keep for establishing reserves.

Other direct costs are not significant in the total cost. These include interest rates, different system of
membership fees, expert-advisory fees, insurance premiums, as well as a variety of charges.

The overall costs include material and personnel costs related to the plant management. They are part of the
overall management of the company, partly related to the operation of the sector. A costing exercise of
allocating the overall cost of products several methods used, but none is perfect. It is known based on the
turnover and distribution of the products charged to direct costs, direct labour and an appropriate cost.
Whichever method is used, the degree of distortion necessarily expected. The distortion can best be mitigated if
the costs - direct costs accounted for - as far as possible.

It is important to stress once more that the whole sector, the dominant cost element of the material, and is not
visible in this, is to feed the dominant, and therefore the largest reserves are also possible. In this study, we draw
the honourable reader, a specialist's attention to: job does not pay the 4-7% magnitude of savings amounting to
try efficient the sector, avoid layoffs, but rather to think about an appropriate professional recording. Add a
professional who has 70-80% of feed cost by 10% reduces the quality and increasing the reproductive,
reproductive options can be used. Believe us, it is the largest reserve in the pig.

As has been said can be backed up? Only options presented in the study of return began in. The daily weight
gain and feed per kg of live weight indicators used to indicate that the average out time is significantly different
pigs. A small weight gain is also characterized by a longer time out, which is the excess feed consumption, but
excess energy, labor wages, cost of service, etc... combined. The 20-25 days longer time out, the cost can increase by 5-10%. The works specific food consumption indicators - as demonstrated above - there kilograms differences in our country. It is not difficult to calculate what it might mean for example. In the case of an issuer of a colony of 10,000 kg of production pigs difference. Up to 40 million forints. Just the fact that we can create a waste-free feeding is likely to lower investment costs than the expected savings for us there is no question that you invest in the "best practice" given opportunities to adapt. You do not want the cost elements addressed in detail due to space limits of the study, but it should be noted that there might be reserves show a similar magnitude as in price or yield of the presentation did.

The net income, i.e. the profit has a special role because it shows the effectiveness of the activity and thus determines the behaviour of producers. By the producer to achieve expected net income, or exceeded, indicating the success of the activity and additional work or improvement anyway. The low level of net income or loss and presented the idea to its development, reduction of activity raises the failure. The final decision, of course, other factors also influence the long-term losses but definitely forces the producers of the elimination of the activity.

Hungary has continued to deteriorate over the past year, the profitability of the sector, fell sharply to support the production, which was only partially compensated by grants may be awarded to the tender offer. Domestic slaughter pig market demand nature, which, however, did not result in greater price increase on the evolution of EU prices. The home represents a world-class breeding stock, but keeping technology backward compared to EU competitors. The 80% of the pig farms should be renewed.

7.2. 11.7.2. Factors affecting the value of production of pig

The production value in most cases equal to the revenue that the yield of products sold multiplied by the price per unit of product. The yields have been dealt with above, however, the prices are only tangentially. In the value of production factors, perhaps the most important development of the actual selling price. The pork prices fluctuate depending on supply and demand and seasonal and area also has high deviation.

A fundamental interest of the producers to achieve higher sales, but the processing of interest is the opposite. The slaughter pig production sector in the final product, while the manufacturing sector appears as a raw material. For the pig for slaughter for the industry demand, while the producers supply can be characterized. If you look at the price developments for a number of years, certain regularities can be detected. The purchase price of slaughter pigs during the summer is always lower in the winter and higher, and the monthly transition continuously.

The world pork market in 2010 was characterized by moderate supply side, but growth. This was accompanied by the recovery of world trade as well. Despite the recovery were less than the global pork exports and imports of the level before the economic crisis. The prices of pigs from overseas (USA and Brazil) reached a record high. The EU, the price of pigs slightly but decreased contrast. In this context, it can be stated that the EU has improved the competitiveness of pork. There has also contributed to the weakening of the euro (Módos 2011).

7.3. 11.7.3. Domestic pork production income conditions

Production cost varied 80 000- to 85 000 HUF (270-280 EUR) animal. The cost/unit was according to the different categories around 239.9 - 288.24 - 337.04 HUF/kg. The profitability of the pig sector is varied year-by-year, moth-by-month. The prime indicator of the profitability is the price.

11.12. ábra - Figure 11.10.:Prices for pig carcasses (grade E) in EU countries
Pig industry is one of the fastest growing segments of animal sector. This business has several advantages, but of course it has some disadvantages as well. Many factors influence the success of pork-meat production. Feed costs are significant, but nowadays animal welfare is instrumental in production mainly in the EU.

8. References


12. fejezet - 12. ECONOMICS IN POULTRY MEAT AND EGG PRODUCTION

This chapter introduces the actual issues and trends of world animal production, main figures, and trends of poultry sector. Then it deals with the importance, advantages and disadvantages of poultry production, main questions of broiler and layer management. After that economic questions of broiler production and eggs production (input/output prices, physical and economic efficiency, production costs, profitability) are demonstrated. Objective this chapter is to introduce actual issues of animal production, main figures and trends of poultry industry, importance, advantages and disadvantages of poultry production, to highlight main questions of broiler and layer management and to overview economic issues (input/output prices, physical and economic efficiency, production costs, profitability) of broiler and eggs production.

1. 12.1. Importance of poultry industry

Rapid growth of world population and economic development raised animal products and made production more efficient the last few decades. Full animal product output is 1 200 million tons. It contains 60% milk and dairy products, 5,6% egg, 6,7% poultry meat, 8,8% pork, 6,4% beef and sheep meat and the rest is 12,4% fish consumption (Zoltán, 2011).

Population and income growth are increasing the consumption of animal proteins in general, and especially in developing countries. Therefore it is crucial that food particularly meat is produced as efficiently and sustainably as possible. For human daily animal protein intake can be supported the most economically by eggs (1,06 $), milk (1,52 $), poultry meat (1,79-1,91 $) and fish (2,23-2,97 $). This nutrition substituted with pork would be the same amount as fish (2,56 $), with beef more than 4,0 $. Energy input on production of 1 ton meat (20 000 eggs, 1 m3 milk) is the lowest at production of poultry and eggs (12-14 GJ), of pork (17 GJ), of beef and sheep meat and milk it is much higher (23-28 GJ). Considering environmental aspects (pollution, glasshouse effect, eutrofization, acidification of atmosphere, residue of pesticides and demand for agricultural land) also production of poultry and eggs is the most favourable overtaking pork, milk, beef and sheep meat production (Zoltán, 2011).

Poultry are very efficient converters of vegetable protein into live weight compared to ruminants and other mammalian livestock. While cattle need some 5 kg of feed to produce 1 kg of meat and a pigs some 3 kg, chickens eat less than 2 kg, in fact 1,7 kg, to achieve the same 1 kg of live weight. Additionally, according to the World Bank, producing 1 kg of chicken meat requires, in total, 3 900 litres of water, while for pork the volume is 4 800 litres and for beef 15 500 litres (AVEC, 2012).

Ignacio and Cos (2011) also highlights the water availability, because it is one of the main instability factor in the future. In some areas, the problem will be higher. We need to select productions with lower water consumption and to orientate invest in water use reduction and efficiency. The role of cleaning and disinfection will be higher in the future.

Sum up the importance of poultry industry is resulted by the following items:

• the poultry industry is one of the fastest growing segments of animal sector;

• worldwide consumption of poultry is increasing;

• poultry products (meat and eggs) are generally accepted in most cultures;

• it is one of the most effective animal protein productions.

The poultry industry can be described by the size of poultry enterprises. It can be small farm flocks and large commercial operations. Important factors for success in poultry are resulted by proper feeding, good management and sanitation. General types of chicken enterprise: egg production (laying hens are kept to produce table eggs), broiler production (raising chicken for meat) and raising replacement pullets.
Worldwide competitiveness of poultry industry is being basically influenced by feed raw material, access and cost of labour. Other factors influencing production efficiency and direct cost are climate, geographical and environmental possibilities of expansion, cost of investments, structure, and advancement of poultry industry, quality of production all do a part in development of poultry meat production and trade (Zoltán, 2011).

2. 12.2. Poultry meat (broiler) production

In 2011 the intensive world meat production was 241 million tons of which pork shared 43%, poultry 34%, beef and veal 23% (Figure 12.1.). From 2005, it shows 10% growth. This development will continue in future. Poultry meat has significance in this. Figure 12.2. shows progress of broiler and turkey meat production between 2006 and 2011; moreover, it illustrates the role of main regions/countries. In 2011 poultry meat production was 81.2 million tons, mainly broiler (94%). According to FAO prognosis world poultry production will be growing 29% during the next decade.

12.1. ábra - Figure 12.1: World meat production (2005-2011) (million tons)

Source: USDA In.: Zoltán, 2011

12.2. ábra - Figure 12.2: World broiler and turkey meat production (2006-2011) (million tons)
The following five factors are believed to have contributed to the increasing popularity of chicken meat: value/price compared with other foods; good nutritional profile/low in fat; convenience/ease of preparation; versatility; and well suited for quick-service and casual dining menus (FAO, 2010).

Table 12.1 gives an overview of the global poultry meat production, trade and consumption and shows a prospect on 2020. Ignacio and Cos (2011) emphasize trade importance. The increase in international interchange means an increase in meat availability and a reduction in price. Of course, it also means an increase in sanitary risks for animals and persons. In the future, the growth of poultry meat consumption will be not important in the developed countries (the people now eat), but in the developing countries (the people now do not eat). Due to this, probably the growth of production will be lower in the future. Developed countries are close to saturation, more focused in qualitative aspect of food (Ignacio and Cos, 2011).

### 12.3. ábra - Table 12.1: Global picture of the poultry meat sector
The production in the poultry meat sector is organized within a production chain. Figure 12.3. gives an overview of this production chain. It starts with the breeding company at which from pure line grandparent stock is produced. Worldwide there are only a limited number of breeding organizations. Two companies, Aviagen and Cobb, have a leading position with a market share of more than 85% of the commercial broilers produced within the EU. From breeding company day old chicks are sold to rearing farms (pullets growing) for the production of broiler breeders. The next steps are broiler breeder farms (parent breeders), hatcheries, broiler farms and slaughterhouses. In the final stage, poultry meat is distributed to retail (supermarkets), food service (restaurants, catering, institutions) and food industry (further processing into convenience consumer products) (van Horne, 2007).

12.4. ábra - Figure 12.3: Overview of the broiler production chain
According to relation between participants of chain there are two organization models used within Europe:

a. Independent ulinks: In this model, the different ulinks in the production column are independent companies. The hatchery, the feed mill and the processing plant are each independent firms with trade through an open market. Breeder and broiler farmers buy birds and feed at their “own risk” and sell the hatching eggs and broilers to the next ulink in the production chain. The farmer is the owner of the birds.

b. Integrated production: Through vertical integration, all ulinks within the production chain are under control of one company. The hatchery, feed mill and processing plant are owned and controlled by the integrating firm. In addition, broiler or breeder farms can be owned by the integrator. However, many integrators work with contracts to ulink the broiler or breeder farm to the integrator. The integrator provides the day old chicks and the feed and owns the birds at any time. The farmers are paid a set rate for their input through labour, providing the poultry housing and for the variable costs (van Horne, 2007).

Vertical integration: Two or more steps of production, marketing and processing are ulinked together. Usually set up by feed manufacturers or poultry processors. They provide the financing needed and have most of the control of management decisions that are made in the production process. Advantages of a product chain operating with capital uniformity are summarized as follows:

- The proper profit distribution and the optimal recovery of investments between the certain phases may be ensured without conflicts.
- The profitability and competitiveness of the whole product chain depend on the final products.
- The quality control, food safety, keeping animal sanitary guidelines and traceability becomes more effective along the product chain.
- The owner has unlimited attention to the product chain led by him thus the owner is able to organize and schedule the production of the product chain according to the all-time market requirements.
- Greater bargain position may be reached at both input (feed raw material) and output (chicken meat) sides of the product chain.
- The international tendency shows it is working.
- More effective research – development – innovation activity.
- Logistic and storing costs may be reduced and organizing the production may be made optimal.
- The management of the product chain concentrates and the overhead cost decreases thanked to the size economy.
- Establishing the optimal size (enterprise, farm and house) as well as harmonizing certain phases and solving size economic issues become possible.
- Certain activities (such as cleaning and disinfection) may be more easily organized in order to improve efficiency (Szőllősi, 2008).

Production of world animal products is getting more concentrated in developed, market leader and developing countries. The role of large players and vertically integrated companies is getting bigger and bigger. Leading EU poultry producers (Figure 12.4) have an output of 300 000-450 000 tons a year. Still worldwide the largest companies of the USA and Thailand dominate (Figure 12.5).

**12.5. ábra - Figure 12.4: Europe’s 11 largest poultry processing companies**
The advantages of poultry production over other animals are:

- High feed efficiency;
- Fast return on investment, good liquidity;
- Spreading income throughout the year;
- High return compared to feed cost;
- Low land requirement;
• Adaptability to small part time enterprise and large commercial enterprise;
• Modern, industrial technology;
• The operation can be highly mechanized with high output per hour of labour.

In contrary of advantages poultry production have some disadvantages also:
• Problems with diseases and parasites;
• Need for high level of management ability, mainly for large flocks;
• Need for large amount of capital for large enterprise;
• Limitations of zoning on the location of flocks;
• High volume is needed for economical enterprise;
• Problems of waste disposal and odour;
• Careful marketing is required;
• Quality of product must be carefully controlled.

Broilers are generally grown for a specific number of days and until they reach a specific weight. In North America, seven-week-old chickens are classified as broilers or fryers and fourteen-week-old chickens are classified as roasters (FAO, 2010).

Nowadays in practice, the average growth cycle is about six weeks for a broiler. The length of the cycle is influenced by the degree to which the feeding diet is balanced and considers the cost of feed per 1 kg of meat produced, the feed-to-meat conversion ratio and the sale price of boiler meat. Feed quality, heat regulation, veterinary/sanitary control and animal density within breeding houses are the most important factors affecting growth. After six weeks, broilers reach an average weight of 2.5 kg. They are then gathered into cages and sold to processors for slaughtering (FAO, 2010).

Broiler production has a number of specific management questions that we need to consider. These questions are: reliable sales contracts, establishment of new plant, cost of investment, sizing of buildings (1 000 – 1 800 m²), stock change, shift/cycle numbers per year, growing period (39-47 nap), cleaning out, house preparation, day old chick placement – stocking density (15-18 db/m²) – optimization (economics, animal welfare, performance, quality, mortality), housing system (usually barn), feeding, watering, lighting, heating, ventilation, litter etc. Dealing with these management questions is needed to realize the objected natural (growth, feed intake, mortality) and economical (feed costs, production costs, net income) performance.

The top genetic background is available every farmers, but achievement of the genetic potential inherent in the birds depends upon:
• An environment that is managed to provide birds with all their requirements for ventilation, air quality, temperature and space.
• The prevention, detection, and treatment of ill health.
• The provision of nutrient requirements through the compounding of appropriate feed ingredients, and the proper management of the provision of feed and water.
• Attention to bird welfare throughout, especially prior to processing (AVIAGEN, 2009).

All of these are interdependent. If any one element is sub-optimal, then broiler performance overall will suffer (Figure 12.6).

12.7. ábra - Figure 12.6: Limits to broiler growth and quality
Economic and commercial issues continually influence the way broilers are managed:

- An increasing consumer demand for product quality and food safety.
- The need for flocks of broilers which can be grown to ever more predictable and pre-defined specifications.
- A requirement to minimise variability within flocks and hence variability of the final product.
- The demand for bird welfare enhancement.
- Full utilisation of the genetic potential available in the bird for FCR, growth rate and meat yield.
- Minimisation of avoidable diseases such as ascites and leg weaknesses (AVIAGEN, 2009).

As broiler production systems become more sophisticated, their management requires ever higher levels of responsiveness and the availability of ever better information.

The objective of the broiler manager should be to achieve the required flock performance in terms of live weight, feed conversion, uniformity and meat yield (Table 12.2).

### Table 12.2: ROSS 308 broiler performance objectives (2012)

<table>
<thead>
<tr>
<th>Day</th>
<th>Body weight (kg)</th>
<th>FCR (kg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>39</td>
<td>2.49</td>
<td>1.66</td>
</tr>
<tr>
<td>42</td>
<td>2.77</td>
<td>1.72</td>
</tr>
</tbody>
</table>

Source: AVIAGEN, 2012

According to AVIAGEN (2009), the broiler management objectives are the following:

- **Chick**: To promote early development of feeding and drinking behaviour, that will allow the target body-weight profile to be achieved with maximum uniformity and good welfare.

- **Feed and water**: To provide a defined feeding programme to supply a range of balanced diets which satisfy the nutrient requirements of broilers at all stages of their development and which optimise efficiency and profitability without compromising bird welfare or the environment. The drinking and feeding systems
employed, together with the management of those systems, will affect upon feed and water intake, and thereby on bird performance and efficiency.

- **Health and biosecurity:** To maximise flock performance by minimising or preventing poultry diseases and infections of public health concern through good husbandry, biosecurity and welfare practices.

- **Housing and environment:** To provide an environment that permits the bird to achieve optimum performance in growth rate, uniformity, feed efficiency and yield, while ensuring that the health and welfare of the bird are not compromised.

- **Monitoring live weight and uniformity of performance:** To assess live flock performance against targets and to ensure that defined end product specifications are as closely met as possible.

- **Pre-processing:** To manage the final phase of the production process so that broilers are transferred to the processor in optimum condition, ensuring that the processing requirements are met and high standards of welfare are maintained.

Poultry prices may vary significantly, influenced by seasonal patterns, input costs and relative costs of competing meats. Production costs are very volatile. They greatly depend on the desired characteristics of the final product (whether chicken of a brand name or of low quality) and on feed prices (mainly grain prices), climatic conditions and the genetic lines used. Therefore, they vary considerably from one region to another region (Figure 12.7) (FAO, 2010).

### 12.8. ábra - Figure 12.7: Producer prices of chicken meat (USD/ton of live weight) (2007)

![Graph showing producer prices of chicken meat](source)

Source: FAO, 2010

Figure 12.8. and 12.9. show evaluation of broiler prices in the EU in 2010-2012.

### 12.9. ábra - Figure 12.8.: Broiler live weight prices in the EU (producer prices of slaughter chicken)
Some cost aspects: The production cost is related to price of raw materials (feed cost), invest needs (higher in environmental controlled farms), hand labour cost (depends of each country), energy cost (it depends on energy needs (climate and building quality) and energy price) and regional regulations (welfare, antibiotics ban, human health etc.).

Figure 12.10. compares production costs in several EU countries with those in the USA and Brazil. In 2007, the production costs of broiler meat in the USA were 36% lower than in the Netherlands; in Brazil, the production costs were more than 40% lower. The lower production costs were mostly because the lower price of feed (local supplies of feed raw materials) and other favourable conditions. Production is carried out by means of efficiently organized integration. The broilers are kept in relatively simple and cheap poultry houses. In addition, production costs are lower in both countries because of lower levels of legislation and regulation. Both the US and Brazil are permitted to use meat-and-bone meal in feed whereas this has been prohibited in the EU (van Horne and Achterbosch, 2008; AVEC 2010).

12.11. ábra - Figure 12.10: Production cost for broilers (2007)
Regulations in the EU cause handicap in competitiveness. These regulations join to animal welfare (lower stocking density/mortality, foot pad lessons), environment (reduce ammonia emission, reduce fine dust) and food safety (salmonella control, reduction in use antibiotics, no meat and bone meal, ban on growth promoters, GMO free/approved feed ingredients) (Horne, 2010).

Ignacio and Cos (2011) summarize factors for success of poultry production: population of country (meat consumption and available “per capita” rent), country surface (waste disposal and relation country population/densities), water availability, raw material availability and price, production cost (rent of workers and cost of energy), and regulations and public opinion pressure. Challenges nowadays: animal and public health, cereal availability (related with biodiesel, learn to produce with low concentration diets and look for alternatives), soya (world production and consumption, protein quality), hand labour cost (as the rent of countries increases, as the labour cost will be also increasing) and energy cost (optimizing energy efficiency of farms and density of animals will modify the energy cost).

3. 12.3. Egg production

Global egg production has rapidly grown in recent years. Facts are illustrated in Figure 12.11. and Figure 12.12.

12.12. ábra - Figure 12.11.: World egg production (2000-2009)
The production in the egg sector is organized within a production chain. Worldwide, there is only a limited number of breeding organizations. There are two main global players: the Erich Wesjohann group and ISA. The main subsidiaries of Erich Wesjohann group, Hy-Line International, Lohmann Tierzucht and H&N are producing the breeds Hy Line, Lohmann white and brown and H&N. ISA is part of the Hendrix Genetics company. The two companies supply more than 90% of the layer stock in Europe. The eggs sector in most European countries is working with independent layer farms. The farmers buy the pullets and sell the eggs to a packing station. In some countries, part of the layer farms works with contracts with an integrator. The integrator provides the pullets and the feed and collects the eggs. The integrator owns the packing station, the feed mill and often an egg processing plant. In several countries, egg production is also organized in vertically integrated companies (van Horne, 2007).

Egg production has a number of specific management questions that we need to consider. These questions are: hatchery egg or table egg production, speciality of hatchery egg production, speciality of hatching, small farm or large enterprise, decision connecting production system (technology, investment needs, feeding system, manure disposal) that effect space utilization, logistic, productivity, efficiency and operating costs, genetic background of layers (colour of eggs shell, feed intake (live weight, production, temperament), rearing and breading issues), feeding (technology, own feed raw production/purchasing), environmental conditions (lighting, temperature, moisture, CO2), measures of production (eggs/hen, production rate (%), producing period (days)).

Hens start laying regularly at around 18-20 weeks of age and in commercial systems, they typically lay for about a year before being sent for slaughter. Producers begin to photostimulate (regulate the light and its intensity) and adjust the diet around 18 weeks of age in order to support egg production (FAO, 2010).

The majority of all commercial layers in the world are kept in closed housing systems with light control, power ventilation and mechanical feeding. The space per hen in conventional cages is very limited. To accommodate societal concerns about animal welfare, in Europe alternative housing systems have been developed to improve the welfare for the layers. In general, egg producers can choose from three main housing systems:

- **Cages:** Conventional cages are small enclosures with welded wire mesh sloping floor; enriched cages are larger and equipped with perches, nest boxes and litter.

- **Barn systems:** Large enclosures (barns) with litter on the floor and freedom of movement for the birds within the poultry house.

- **Free range systems:** Similar to barn systems, but with access to an outdoor run (van Horne, 2007).

Production value depends on where and how the eggs are sold (in a local market, in some supermarkets), with an own brand or not, as shell eggs or for a processor etc., the size of the farm and its geographical situation, the own means for distribution and marketing and the possibility to associate with other producers (Castelló, 2011). Figure 12.13. shows the average producer prices of hen eggs in selected countries.
12.14. ábra - Figure 12.13.: Average producer prices of hen eggs (thousand tons and USD/ton) (2007)

Source: FAO, 2010

Figure 12.14. and 12.15. show evaluation of broiler prices in the EU in 2010-2012.

At EU the Directive 1999/743/CE allows 4 systems (Table 12.3). Therefore, if we have decided to produce commercial eggs, if the legal regulations allow us to choose among these systems, if our aim is to earn as much as possible, the logical way would be to choose the best system for optimizing the difference between the income and the cost of production (Castelló, 2011).

12.15. ábra - Figure 12.14.: Table eggs (size M+L) prices at packaging station in the EU(2011-2012)

12.16. ábra - Figure 12.15.: Table eggs (size M+L) prices at packaging station in some EU countries (2011-2012)


12.17. ábra - Table 12.3.: Systems for producing eggs

<table>
<thead>
<tr>
<th>System of production</th>
<th>Code of the egg</th>
<th>Stocking Rate</th>
<th>Type of feeding</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cages</td>
<td>3</td>
<td>760 cm²/ave</td>
<td>Not applied</td>
</tr>
<tr>
<td>Floor (#)</td>
<td>2</td>
<td>9 birds/m²</td>
<td>Not applied</td>
</tr>
<tr>
<td>Free range</td>
<td>1</td>
<td>9 birds/m²</td>
<td>4 m²/bird</td>
</tr>
<tr>
<td>Biological (&amp;)</td>
<td>0</td>
<td>6 birds/m²</td>
<td>4 m²/bird</td>
</tr>
</tbody>
</table>

Source: Castelló, 2011

In general, there is a significant relationship between production costs and the space standard for laying hens. Therefore animal welfare effects production costs directly. Figure 12.16. shows that the production costs of eggs increase when the area per bird in cage housing is increased from the world level (350 cm²) to the standard in the USA (430 cm²) and to the current EU level (enriched cages 750 cm²) and barn systems (1 100 cm²).

12.18. ábra - Figure 12.16.: Relationship between costs for animal welfare and the area per laying hen
Moreover, production cost depends on the size of the farm, the type of equipment (on floor, aviary, cages etc.), the type of egg production according to the source (codes 0, 1, 2 or 3, at EU) and the climate of the site (prevention from cold and/or summer heat) (Castelló, 2011).

Van Horne and Achterbosch (2008) analyzed the differences in production costs for egg production across countries. In 2008, the production costs of eggs in the USA and Brazil were 30 percent lower than in the Netherlands. Figure 12.17 gives a breakdown of the cost components. The lower production costs in the USA and Brazil were largely due to the lower feed price (local supplies of feed raw materials) and the favourable climatic conditions. In addition, production costs in both countries are lower due to lower levels of legislation and regulation, more specifically relating to the absence of legislation on housing requirements, the absence of a ban on the use of meat-and-bone meal and the absence of legislation on beak trimming. At this point we need to highlight animal welfare in poultry production systems is given more legislative attention in the EU than in many other regions.

12.19. ábra - Figure 12.17.: Production costs for eggs (2008)
Poultry industry is one of the fastest growing segments of animal sector. This business has several advantages, but of course, it has some disadvantages as well. Many factors influence the success of broiler and egg production. Feed costs are significant, but nowadays animal welfare is instrumental in production mainly in the EU.

4. Questions related to this Chapter

1. Introduce actual situation and trends of poultry meat and egg production!

2. Introduce importance, advantages and disadvantages of poultry production!

3. Introduce main questions of broiler management!

4. What measures of physical and economical efficiency connecting broiler production do you know?

5. Describe costs and profit of broiler production!

6. Introduce main questions of layer management!

7. What measures of physical and economical efficiency connecting egg production do you know?

8. Describe costs and profit of egg production!

5. References


Sheep were among the first animals to be domesticated by human. Sheep farming is primarily based on raising lambs for meat, or raising sheep for wool. Sheep may also be raised for milk. According to historical sources sheep were domesticated 10,000 years ago in Central Asia, but it was not until 3,500 B.C. that man learned to spin wool. There are also many references to sheep in the Bible. Sheep production is man's oldest organized industry. Wool was the first commodity of sufficient value to warrant international trade, but from the 2nd World War meat and milk are the main products of sheep production. The domestic goat was domesticated as a subspecies of the wild goat of southwest Asia and Eastern Europe. The goat is closely related to the sheep as both are in the goat-antelope subfamily Caprinae and a member of the family Bovidae. More than 300 distinct breeds of goats are known nowadays. Goats are one of the oldest domesticated species, and have been used for their milk, meat, hair, and skins over much of the world.

SHEEP * What are the main characteristics? * GOATS

both are small ruminants, cud, chewing (4 compartment stomach)semi/multiparamulti-purpose animals.

1. 13.1. What are they good for?

Sheep and goats are multi-purpose animals, raised for their meat, milk, wool, hides, and skins. HOWEVER, there are many reasons to raise and keep them, which were changed over the last centuries. There are different reasons to keep them according the historical, geographic, climatic, economic and other endowments. In addition, the varieties are differs from each other according to the above endowments.

The main reasons to keep these small ruminants: (1) economic (profit, additional farm-income); (2) environmental (landscape management, rural subsidies); (3) self-sufficiency (own food and fibre); (4) lifestyle - agrotourism (quality of life, tradition) and (5) other (show, R+D+I, special food).

1.1. 13.1.1. Advantages of Sheep and Goat Farming

• Multi-purpose production: meat, milk, wool, skin, manure, and by-product as bone, offal, intestines.
• The production of meat, milk, wool and manure provides three different sources of income during the year.
• Mutton and goat meat is one kind of meat towards which there is no prejudice by any community.
• Most suitable of the small ruminants to utilize the sparse vegetation and by-product.
• Unlike goats, sheep hardly damage the vegetation.
• Better adapted to arid and semi-arid tropics with marginal and sub-marginal lands.
Since they eat more different type of plants than any other kind of livestock, they can turn waste into profit and at the same time improve the appearance of lands (i.e. excellent weed destroyer).

Their dung is a valuable fertilizer, and since they are grazed on sub-marginal lands.

Strong herd instincts of sheep make them excellent ranch animals and easily managed flocks.

Less prone to extreme weather conditions, ectoparasites as well as other diseases.

Sheep and goats do not need expensive buildings to house them.

They require less labour, than other kinds of livestock.

Goat and sheep milk is more valuable even the cow milk.

1.2. 13.1.2. Disadvantages of Sheep and Goat Farming

- In accordance with income - slow return on investment.
- Unfavourable conditions for workers.
- Difficult to reach the profitable economies of scale.
- Seasonality of production and market prices.
- High exposure to predators and thieving.
- Goats are difficult to control than other species.
- Food preferences and dental set-up makes goats capable of inducing severe damage to vegetation (trees and brush) compared to other ruminant species.
- Old farmers – farming is not so popular for young people.

1.3. 13.1.3. How to Decide About the Production Purpose - Meat, Milk, Wool or Other – What to Produce?

- One of the first and most important decisions a shepherd must make is to decide which aspect(s) of production to focus on. While most sheep and goat breeds are multi-purpose, most are best suited to either meat, milk, or wool/hair production - seldom all three.
- Production practices tend to vary according to the purpose of the flock, traditions and especially the economic, market and environment conditions.
- Meat and wool/hair is absolute product (by-product in some cases).
- Intensive/profitable production requires special, high performance variety, which are more sensitive for the environment and feed conditions and more assets.
- Within the EU, small ruminants are the tools of environmentally friendly agricultural production, which generally means extensive practices and compensation for lower yields and return (subsidies, e.g.: Natura 2000, Agri-environment Programs, LFA,....).

Main Aspects of Choosing the Right Variety:

- Production or other purpose (meat, milk, wool, other);
- Use (sire or dam);
- Wool or coat type (fine, medium, long, carpet or hair (shedding);
- Other (tail, prolificacy, minor, rare, heritage, circumstances, research, show...).
In Hungary there are 22 sheep, and 5 registered and suggested goat variety for different purposes. In the world, there are more than 200 distinct breeds of sheep and more than 300 distinct goat varieties.

1.4. 13.1.4. How to Make Money by Raising Sheep and Goats (in Hungary)?

- Collect the reliable and actual information and skill;
- Make a valid and profitable plan (production and business);
- Develop a production system based on your resources and facilities (products, intensity, variety, specialisation, value added…);
- Start with right animals, labour and dealer;
- Try to join to a production group or co-op;
- Manage factors affecting incomes and profitability;
  - feed cost and feed quality (more than 60% of total cost),
  - productivity, fertility, survival (milk production, litter size, seasonality, AI, animal health and welfare,…),
  - market prices and time of selling (variable prices during the year),
  - labour (performance, quality, number),
  - alternative income sources, (subsidies).

1.5. 13.1.5. What do you need to raise sheep and goats? How to develop an enterprise?

1. Land (to produce feeding stuffs, pasture). Own or rented?
2. Feed (produce or buy).
3. Proper animals (according to the production purpose).
4. Housing, equipment (feeders, watering system, fencing, milking).
5. Labour.

1. Land and pasture requirement:
   - You can provide most of the require feed stuffs from your own sources (arable land and pastures).
   - You can buy (as an investment) or rent arable land for production, the size of the land depends on the quality of land and feed requirement of the flock (based on production system).

13.1. ábra - Table 13.1.: An example of the average land requirement (in Hungary for a ewe and her lambs for one production year)
2. *How to control and minimize feed cost:*
   
   • Try to produce your own feeding stuffs and pasture;
   • Consider alternative feeds or by-products;
   • Store feed properly (try to store them in store buildings);
   • Minimize feed wastage;
   • Sell or cull unproductive animals.

3. *Proper - Productive Animals:*
   
   • Choose the variety (intensive, extensive, prolific, milk, meat, wool…)
   • Maximize litter size according to your variety, production sources and environment
   • Seasonality (highest fertility in fall –spring lambing/kidding or AI, utilize unfertile seasons)
   • Age (most fertile and productive animals 3-6 years)
   • Genetics (within breed, between breeds)

4. *Housing, shelter and equipment:*
   
   Cost of investment varies according to the purpose of production, intensity, requirement of your variety and the environment. (Slow return!)

5. *Labour requirement:*
   
   Tasks and routine:
   • Daily care of different animals (house (litter) and feed them, shepherd and guard them at the pasture);
   • Daily milking (twice a day);
   • Lambing and kidding;
   • Annual shearing;
   • Parasite control;
   • Hoof trimming;
   • Dig manure (once or twice a year).
Number of workers varies according to production system. To control labour cost employ skilled and responsible workers, in a right number and inspire them by premiums.

1.6. 13.1.6. Develop your production and marketing system

You have developed your enterprise (farm) — at the same time you have to develop your clever market and marketing. Now we are focusing on the sheep and meat as the main products of sheep and goat farms in the EU.

For the profitability, you have to control:

- the demand for different meat especially sheep and goat product: production (Fig. 13.2.) consumption and consumer (Fig. 13.1.);
- the supply and competition (Fig 13.3. and 13.4.);
- market places;
- prices (Fig 13.5. and 13.6.);
- seasonality and variability of prices: Easter and Christmas are traditionally the higher-price seasons, and August in Italy;
- quotas (CMO, CAP) Import quotas are still valid, but because of low self-sufficiency import necessary to meet the demand in the EU;
- rules animal health and animal welfare;
- marking and traceability.

13.2. ábra - Figure 13.1.: Meat Consumption in the EU

Source: http://www.medicavet.com

The European Union is far from being self-sufficient in the sheep meat and goat meat sector and imports considerable quantities, mainly from New Zealand and Australia. Sheep meat and goat meat belong to the products covered by the Single Common Market Organization.

Now the UK (Scotland leading) and Spain are the main producing Member States. These two Member States represent together already 46% of the EU's total production. Greece, France, Romania, Ireland, Germany and Italy count for another 44%, which leaves a small 10% for the remaining 19 Member States. The EU has a self
sufficiency of 84% and exports a negligible part of its total production, while imports account for around 221,000 tons mainly from New Zealand and Australia.

13.3. ábra - Figure 13.2.: Sheep and Goat Population in the EU

The sheep industry in Hungary is giving about 2% of the total animal production, while their share reached only 1% within the total agricultural production. According to the latest statistics, there were 1,168,000 sheep, 839,000 ewes in the country and they were kept on 7,343 sheep farms. More than 500 farms disappeared during the last couple of years. The goat sector is much smaller, less than 10% of the sheep sector. There are about 6,500 goat keepers in the country (some 4-500 ones disappeared during the last three years), and the 80% of them keep less than 10 heads. A big part of these animals is run on some 4,000 sheep farms. Most of the sheep and goats kept in the East regions of the country followed by the South middle region. The least animals were kept in the West and South-West regions. Dominant part (above 80%) of the sheep bred are belonging to Merino type of breed, and the ratio of indigenous sheep breeds are limited (five breeds, about 45,000 heads). The others are belonging to various kinds of meat breeds. The number of milk sheep is limited now, and a good number of Merino ewes are milked. In the case of goats 10% of the animals have exotic origins.

13.4. ábra - Figure 13.3.: Sheep and Goat meet supply in the EU
13. Economic Aspects of Sheep, Goat and Wool production

13.5. ábra - Figure 13.4.: EU Sheep and Goat Meat Balance

Source: DG-AGRI, 2012

13.6. ábra - Figure 13.5.: Light lamb Prices in the EU

Source: DG-AGRI, 2012
13. Economic Aspects of Sheep, Goat and Wool production

13.7. ábra - Figure 13.6.: Light Lamb Prices in the EU

Source: DG-AGRI, 2012

2. 13.2. The future - trends of producer prices for animal products, feedstuff prices and farm income

Due to the higher prices of feedstuffs and lower prices of animal product (Fig. 13.7.) and altogether decreasing farm incomes on ruminant sector (Fig 13.8.) among other direct and indirect factors result higher risk of sheep and goat farms. It has been resulted in reduced production, which means high risk of shortage of beef and sheep meat in the coming years.
13.8. ábra - Figure 13.7.: Comparison between producer prices for animal products and feedstuff prices (Nominal Index 1995=100%)

Source: FEFAC, 2011

13.9. ábra - Figure 13.8.: EBT per non-salaried AWU (kEuro/AWU)


The reason is that livestock numbers both for cattle and sheep species have dramatically fallen because of combined factors, such as:

- poor return (the income of the cattle and sheep breeders are among the lowest; the gross margin of the EU fresh meat industry is tight)
- crisis due to diseases (BSE, FMD, Blue Tongue)
- decoupling of premium under CAP
• the age of livestock farmers issue / no successors

To increase number of small ruminants and ensure global food security, there is an urgent need to reduce risk, to increase livestock production also intensive, sustainable and alternative ways. Climate change is also expected to introduce alternative livestock systems and to reinforce existing factors that simultaneously challenge livestock production such as rapid population and economic growth, increased demand for food and products, and increased conflicts over scarce resources such as shortage of land, water, and higher feed prices. It is a challenge for the EU to provide proper incomes for farmers and real prices for agricultural products. It is also a task for researchers to improve livestock productivity and to produce safe and traceable meat and milk under present and future constraints.

3. References

1. http://www.medicavet.com
2. EU SHEEP and GOAT Meat Market Situation DG-AGRI Agricultural Report 2012
3. AKI, PAIR, 2012
5. FEFAC, Newsletter 2011
14. fejezet - 14. THE ECONOMICS OF FISHERIES AND AQUACULTURE PRODUCTION

1. 14.1. Importance in the world economy

The world is facing multiple and interlinked challenges ranging from the impacts of the ongoing financial and economic crisis to greater climate change vulnerabilities. At the same time, it must meet the food and nutrition needs of an expanding population. The fisheries and aquaculture sector offers opportunities to increase food and nutrition security, alleviate poverty, generate economic growth and ensure improved use of resources.

1.1. 14.1.1. Production and supply of fish and fishery products

Capture fisheries and aquaculture supplied the world with about 148 million tonnes of fish in 2010 (with a total value of US$217.5 billion), of which about 128 million tonnes was utilized as food for people, and for 2011 indicate increased production of 154 million tonnes, of which 131 million tonnes was destined as food and aquaculture is set to top 60 percent of production. Wild capture was 90.4 million tons in 2011, up 2 percent from 2010. Aquaculture, in contrast, has been expanding steadily for the last 25 years and saw a rise of 6.2 percent in 2011 (Table 14.1. and Figure 14.1.) (FAO, 2012.).

14.1. ábra - Table 14.1.: Global production of fish and fisheries products

<table>
<thead>
<tr>
<th>Year</th>
<th>Production (Million tonnes)</th>
<th>Utilization (Million tonnes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2006</td>
<td>9.8</td>
<td>114.3</td>
</tr>
<tr>
<td>2007</td>
<td>10.0</td>
<td>117.3</td>
</tr>
<tr>
<td>2008</td>
<td>10.2</td>
<td>119.7</td>
</tr>
<tr>
<td>2009</td>
<td>10.4</td>
<td>123.6</td>
</tr>
<tr>
<td>2010</td>
<td>11.2</td>
<td>128.3</td>
</tr>
<tr>
<td>2011</td>
<td>11.5</td>
<td>130.8</td>
</tr>
</tbody>
</table>

Source: FAO, 2012

14.2. ábra - Figure 14.1.: Global production of capture fisheries and aquaculture
Overall global capture fisheries production continues to remain stable at about 90 million tonnes although there have been some marked changes in catch trends by country, fishing area and species. In the last seven years (2004–2010), landings of all marine species except anchoveta only ranged between 72.1 million and 73.3 million tonnes. In contrast, the most dramatic changes, as usual, have been for anchoveta catches in the Southeast Pacific, which decreased from 10.7 million tonnes in 2004 to 4.2 million tonnes in 2010. Inland water capture production continued to grow continuously, with an overall increase of 2.6 million tonnes in the period 2004–2010.

In the last three decades (1980–2010), world food fish production of aquaculture has expanded by almost 12 times, at an average annual rate of 8.8 percent. Global aquaculture production has continued to grow, albeit more slowly than in the 1980s and 1990s. In the course of half a century or so, aquaculture has expanded from being almost negligible to fully comparable with capture production in terms of feeding people in the world. World aquaculture production attained another all-time high in 2010, at 60 million tonnes (excluding aquatic plants and non-food products), with an estimated total value of US$119 billion. When farmed aquatic plants and non-food products are included, world aquaculture production in 2010 was 79 million tonnes, worth US$125 billion. The reported grow-out production from aquaculture is almost entirely destined for human consumption. About 600 aquatic species are raised in captivity in about 190 countries for production in farming systems of varying input intensities and technological sophistication. These include hatcheries producing seeds for stocking to the wild, particularly in inland waters.

The global distribution of aquaculture production across the regions and countries of different economic development levels remains imbalanced. In 2010, the top ten producing countries accounted for 87.6 percent by quantity and 81.9 percent by value of the world’s farmed food fish. Asia accounted for 89 percent of world aquaculture production by volume in 2010, and this was dominated by the contribution of China, which accounted for more than 60 percent of global aquaculture production volume in 2010. Other major producers in Asia are India, Vietnam, Indonesia, Bangladesh, Thailand, Myanmar, the Philippines and Japan. In Asia, the share of freshwater aquaculture has been gradually increasing, up to 65.6 percent in 2010 from around 60 percent in the 1990s. In terms of volume, Asian aquaculture is dominated by finfishes (64.6 percent), followed by molluscs (24.2 percent), crustaceans (9.7 percent) and miscellaneous species (1.5 percent). The share of non-fed species farmed in Asia was 35 percent (18.6 million tonnes) in 2010 compared with 50 percent in 1980.

1Farmed food fish include finfishes, crustaceans, molluscs, amphibians (frogs), aquatic reptiles (except crocodiles) and other aquatic animals (such as sea cucumbers, sea urchins, sea squirts and jellyfishes), which are indicated as fish.
Stimulated by higher demand for fish, world fisheries and aquaculture production is projected to reach about 172 million tonnes in 2021, with most of the growth coming from aquaculture. Aquaculture will remain one of the fastest-growing animal food-producing sectors.

The world’s marine fisheries increased markedly from 16.8 million tonnes in 1950 to a peak of 86.4 million tonnes in 1996, and then declined before stabilizing at about 80 million tonnes. Global recorded production was 77.4 million tonnes in 2010. The Northwest Pacific had the highest production with 20.9 million tonnes (27 percent of the global marine catch) in 2010, followed by the Western Central Pacific with 11.7 million tonnes (15 percent), the Northeast Atlantic with 8.7 million tons (11 percent), and the Southeast Pacific, with a total catch of 7.8 million tonnes (10 percent). The declining global marine catch over the last few years together with the increased percentage of overexploited fish stocks and the decreased proportion of non-fully exploited species around the world convey the strong message that the state of world marine fisheries is worsening and has had a negative impact on fishery production. Overexploitation not only causes negative ecological consequences, but it also reduces fish production, which further leads to negative social and economic consequences (FAO, 2012.).

Fisheries and aquaculture provided livelihoods and income for an estimated 54.8 million people engaged in the primary sector of fish production in 2010, of which an estimated 7 million were occasional fishers and fish farmers. Asia accounts for more than 87 percent of the world total with China alone having almost 14 million people (26 percent of the world total) engaged as fishers and fish farmers. Overall, production per person is lower in capture fisheries than in aquaculture, with global outputs of 2.3 and 3.6 tonnes per person per year respectively, reflecting the huge numbers of fishers engaged in small-scale fisheries. Apart from the primary production sector, fisheries and aquaculture provide numerous jobs in ancillary activities such as processing, packaging, marketing and distribution, manufacturing of fish-processing equipment, net and gear making, ice production and supply, boat construction and maintenance, research and administration. All of this employment, together with dependants, is estimated to support the livelihoods of 660–820 million people, or about 10-12 percent of the world’s population (FAO, 2012.).

In 2010, people consumed about 128 million tonnes of fish. In the last five decades, world fish food supply has outpaced global population growth, and today fish provides more than 4.3 billion people with about 15 percent of their intake of animal protein.

1.2. 14.1.2. Fish processing and trade

Concerning utilization of the world’s fish production, 40.5 percent (60.2 million tonnes) was marketed in live, fresh or chilled forms, 45.9 percent (68.1 million tonnes) was processed in frozen, cured or otherwise prepared forms for direct human consumption, and 13.6 percent destined for non-food uses (mainly fishmeal and fish oil) in 2010. Since the early 1990s, there has been an increasing trend in the proportion of fisheries production used for direct human consumption rather than for other purposes. Whereas in the 1980s about 68 percent of the fish produced was destined for human consumption, this share increased to more than 86 percent in 2010, equalling 128.3 million tonnes. In 2010, 20.2 million tonnes was destined to non-food purposes, of which 75 percent (15 million tonnes) was reduced to fishmeal and fish oil; the remaining 5.1 million tonnes was largely utilized as fish for ornamental purposes, for culture (fingerlings, fry, etc.), for bait, for pharmaceutical uses as well as for direct feeding in aquaculture, for livestock and for fur animals. Of the fish destined for direct human consumption, the most important product form was live, fresh or chilled fish, with a share of 46.9 percent in 2010, followed by frozen fish (29.3 percent), prepared or preserved fish (14.0 percent) and cured fish (9.8 percent). Freezing represents the main method of processing fish for human consumption, and it accounted for 55.2 percent of total processed fish for human consumption and 25.3 percent of total fish production in 2010 (Table 14.2.) (FAO, 2012.).

14.3. ábra - Figure 14.2.: Global fish utilisation and supply
Technological development in food processing and packaging is progressing rapidly. Processors of traditional products have been losing market share because of long-term shifts in consumer preferences as well as in processing and in the general fisheries industry. Processing is becoming more intensive, geographically concentrated, vertically integrated and linked with global supply chains. These changes reflect the increasing globalization of the fisheries value chain, with large retailers controlling the growth of international distribution channels. The increasing practice of outsourcing processing at the regional and world levels is very significant, but further outsourcing of production to developing countries might be restricted by sanitary and hygiene requirements that are difficult to meet as well as by growing labour costs. At the same time, processors are frequently becoming more integrated with producers, especially for ground fish, where large processors in Asia, in part, rely on their own fleet of fishing vessels. In aquaculture, large producers of farmed salmon, catfish and shrimp have established advanced centralized processing plants. Processors that operate without the purchasing or sourcing power of strong brands are also experiencing increasing problems linked to the scarcity of domestic raw material, and they are being forced to import fish for their business.

Fish and fishery products continue to be among the most-traded food commodities worldwide. Following a drop in 2009, world trade in fish and fishery products has resumed its upward trend driven by sustained demand, trade liberalization policies, globalization of food systems and technological innovations. Estimates for 2011 indicate that exports of fish and fishery products exceeded US$125 billion, with average prices increasing by more than 12 percent.

As for trade, fish prices also contracted in 2009 but have since rebounded. The FAO Fish Price Index (base year 2002–04 = 100) indicates that average prices in 2009 declined by 7 percent compared with 2008, then increased by 9 percent in 2010 and by more than 12 percent in 2011. Prices for species from capture fisheries increased by more than those for farmed species because of the larger impact from higher energy prices on fishing vessel operations than on farmed species (FAO, 2012.).

Since 2002, China has been by far the leading fish exporter, contributing almost 12 percent of 2010 world exports of fish and fishery products, or about US$13.3 billion, and increasing further to US$17.1 billion in 2011. A growing share of fishery exports consists of reprocessed imported raw material. Thailand has established itself as a processing centre of excellence largely dependent on imported raw material, while Vietnam has a growing domestic resource base and imports only limited, albeit growing, volumes of raw material. Vietnam has experienced significant growth in its exports of fish and fish products, up from US$1.5 billion in 2000 to US$5.1 billion in 2010, when it became the fourth-largest exporter in the world. In 2011, its exports rose further to US$6.2 billion, linked mainly to its flourishing aquaculture industry. In 2010, developing countries confirmed their fundamental importance as suppliers to world markets with more than 50 percent of all fishery
exports in value terms and more than 60 percent in quantity (live weight). In 2010, in value terms, 39 percent of the imports of fish and fishery products by developing countries originated from developed countries. Net export revenues amounted to US$4.7 billion in 2010, compared with US$2.0 billion in 1990 (FAO, 2012.).

World imports of fish and fish products set a new record at US$111.8 billion in 2010, up 12 percent on the previous year and up 86 percent with respect to 2000. Preliminary data for 2011 point to further growth, with a 15 percent increase. The United States of America and Japan are the major importers of fish and fishery products and are highly dependent on imports for about 60 percent and 54 percent, respectively, of their fishery consumption. China, the world’s largest fish producer and exporter, has significantly increased its fishery imports, partly a result of outsourcing, as Chinese processors import raw material from all major regions, including South and North America and Europe, for re-processing and export. Imports are also being fuelled by robust domestic demand for species not available from local sources, and, in 2011, China became the third-largest importer in the world. The European Union is by far the largest single market for imported fish and fishery products owing to its growing domestic consumption. However, it is extremely heterogeneous, with markedly different conditions from country to country. European Union fishery imports reached US$44.6 billion in 2010, up 10 percent from 2009, and representing 40 percent of total world imports. However, if intraregional trade is excluded, the European Union imported fish and fishery products worth US$23.7 billion from suppliers outside the European Union, an increase of 11 percent from 2009. In addition to the major importing countries, a number of emerging markets have become of growing importance to the world’s exporters. Prominent among these there are Brazil, Mexico, the Russian Federation, Egypt, Asia and the Near East in general. In 2010, developed countries were responsible for 76 percent of the total import value of fish and fishery products. Owing to the high perishability of fish and fishery products, 90 percent of trade in fish and fishery products in quantity terms (live weight equivalent) consists of processed products.

1.3. 14.1.3. Fish and fishery products consumption

Fish and fishery products represent a very valuable source of protein and essential micronutrients for balanced nutrition and good health. In 2009, fish accounted for 16.6 percent of the world population’s intake of animal protein and 6.5 percent of all protein consumed. Globally, fish provides about 3.0 billion people with almost 20 percent of their intake of animal protein, and 4.3 billion people with about 15 percent of such protein. Differences among developed and developing countries are apparent in the contribution of fish to animal protein intake. However, in both developing and developed countries, this share has declined slightly in recent years as consumption of other animal proteins has grown more rapidly (FAO, 2012.).

With sustained growth in fish production and improved distribution channels, world fish food supply has grown dramatically in the last five decades, with an average growth rate of 3.2 percent per year in the period 1961–2009. World per capita food fish supply increased from an average of 9.9 kg (live weight equivalent) in the 1960s to 18.6 kg in 2010. 126 million tonnes fish and fisheries products are available for human consumption in 2009, fish consumption was lowest in Africa (9.1 million tonnes, with 9.1 kg per capita), while Asia accounted for two-thirds of total consumption, with 85.4 million tonnes (20.7 kg per capita), of which 42.8 million tonnes was consumed outside China (15.4 kg per capita). The corresponding per capita fish consumption figures 31.9 kg in 2009, with an average annual rate of 6.0 percent in the period 1990–2009. If China is excluded, annual fish supply to the rest of the world in 2009 was about 15.4 kg per person, higher than the average values of the 1960s (11.5 kg), 1970s (13.5 kg), 1980s (14.1 kg) and 1990s (13.5 kg). Of the 126 million tonnes available for human consumption in 2009, fish consumption was lowest in Africa (9.1 million tonnes, with 9.1 kg per capita), while Asia accounted for two-thirds of total consumption, with 85.4 million tonnes (20.7 kg per capita), of which 42.8 million tonnes was consumed outside China (15.4 kg per capita). The corresponding per capita fish consumption figures for Oceania, North America, Europe, and Latin America and the Caribbean were 24.6 kg, 24.1 kg, 22.0 kg and 9.9 kg respectively (FAO, 2012.).

14.4. ábra - Figure 14.3.: Consumption of fishery and aquaculture products (2007)

---

1. China has been responsible for most of the increase in world per capita fish consumption, owing to the substantial increase in its fish production, in particular from aquaculture.
2. Quantity in live weight: kg/capita/year
2. 14.2. Importance in the EU economy

The European Union represents about 4.4% of global fisheries and aquaculture production, which makes it the fifth producer worldwide. As has been the case each year for the last 20 years total European Union production decreased slightly compared to previous years. Within the EU, the three largest producers in terms of volume are Spain, Denmark and the United Kingdom.

14.5. ábra - Figure 14.4.: Production (catches and aquaculture) by Member State (2009)


The European Union accounts for just fewer than 6% of total fisheries production worldwide, with a reduction in volume compared to previous years. Although the European fleet operates worldwide, EU catches are taken primarily in the Eastern Atlantic and the Mediterranean. They are mainly made up of sprat, herring, mackerel and sand eels. The leading fishing countries are Denmark, Spain, the United Kingdom and France, which together account for around half the catches.

Aquaculture is a major activity in many European regions. Aquaculture production in the European Union is in the region of 1.3 million tonnes, while its value amounts to € 3.2 billion. This represents 20.4% of the total

*Volumes in tonnes live weight and percentage of total
volume of EU fisheries production. Its share of total world aquaculture production is 2.3% in terms of volume and 4% in terms of value.

14.6. ábra - Table 14.2.: Total aquaculture production in the EU27 (2009)  

<table>
<thead>
<tr>
<th>Volume in tonnes live weight</th>
<th>Value in thousands of EUR</th>
<th>Percentage of total</th>
</tr>
</thead>
<tbody>
<tr>
<td>BE</td>
<td>576</td>
<td>0.04%</td>
</tr>
<tr>
<td>BG</td>
<td>7 912</td>
<td>0.61%</td>
</tr>
<tr>
<td>CZ</td>
<td>20 071</td>
<td>1.54%</td>
</tr>
<tr>
<td>DK</td>
<td>34 131</td>
<td>2.62%</td>
</tr>
<tr>
<td>DE</td>
<td>39 957</td>
<td>3.07%</td>
</tr>
<tr>
<td>EE</td>
<td>654</td>
<td>0.05%</td>
</tr>
<tr>
<td>IE</td>
<td>47 212</td>
<td>3.63%</td>
</tr>
<tr>
<td>EL</td>
<td>121 971</td>
<td>9.37%</td>
</tr>
<tr>
<td>ES</td>
<td>268 565</td>
<td>20.63%</td>
</tr>
<tr>
<td>FR</td>
<td>236 438</td>
<td>18.16%</td>
</tr>
<tr>
<td>IT</td>
<td>162 325</td>
<td>12.47%</td>
</tr>
<tr>
<td>CY</td>
<td>3 356</td>
<td>0.26%</td>
</tr>
<tr>
<td>LV</td>
<td>517</td>
<td>0.04%</td>
</tr>
<tr>
<td>LT</td>
<td>3 426</td>
<td>0.26%</td>
</tr>
<tr>
<td>HU</td>
<td>14 171</td>
<td>1.09%</td>
</tr>
<tr>
<td>MT</td>
<td>5 619</td>
<td>0.43%</td>
</tr>
<tr>
<td>NL</td>
<td>55 561</td>
<td>4.27%</td>
</tr>
<tr>
<td>AT</td>
<td>2 141</td>
<td>0.16%</td>
</tr>
<tr>
<td>PL</td>
<td>36 503</td>
<td>2.80%</td>
</tr>
<tr>
<td>PT</td>
<td>6 727</td>
<td>0.52%</td>
</tr>
<tr>
<td>RO</td>
<td>13 151</td>
<td>1.01%</td>
</tr>
<tr>
<td>SI</td>
<td>1 308</td>
<td>0.10%</td>
</tr>
<tr>
<td>SK</td>
<td>823</td>
<td>0.06%</td>
</tr>
<tr>
<td>FI</td>
<td>13 627</td>
<td>1.05%</td>
</tr>
<tr>
<td>SE</td>
<td>8 540</td>
<td>0.66%</td>
</tr>
<tr>
<td>UK</td>
<td>196 603</td>
<td>15.10%</td>
</tr>
</tbody>
</table>


14.7. ábra - Figure 14.5.: Share of EU aquaculture production per product type (2009)


The overall value of the output of the processing industry amounts to around EUR 20 billion. Spain, the United Kingdom, France, Germany and Italy are the leading countries in terms of production. This sector consists of nearly 3 700 companies for total employment of around 120 000 persons. The mainstay of European production is conserves and preparations of fish, crustaceans and molluscs.

Along with Japan and the United States, the European Union is one of the world’s top three importers of fishery and aquaculture products. Norway, China, Iceland and Vietnam are the EU’s main suppliers. Intra-EU trade is also significant. Taking into account all trade, both intra-EU and with third countries, Spain, France and Italy are

---

5Volume in tonnes live weight and value thousands of EUR and percentage of total.
the leading importing Member States. Denmark, the Netherlands and Spain are the leading exporting Member States.

14.8. ábra - Figure 14.6.: Trade of fisheries and aquaculture products between EU and third countries in 2010 (volume in tonnes and value in 1000 EUR)


Fishery and aquaculture products play a significant role in human diet, both in Europe and worldwide, as a source of protein-rich healthy food. Worldwide, the consumption of these products represents 17.8 kg/person/year or 15.7 % of animal protein intake. Within the European Union, the average consumption of fish is 23.3 kg/person/year. Consumption varies from 4.6 kg/person/year in Bulgaria to 61.6 kg/person/year in Portugal. The consumption of fishery and aquaculture products varies from one Member State to the next within the European Union. The table opposite shows the main species consumed (in live weight) for a selection of Member States.

14.9. ábra - Figure 14.7.: Consumption of fisheries and aquaculture products in 2007 (quantity in live weight: kg/capita/year)

Structural policy in the fisheries sector contributes to the objectives of the Common Fisheries Policy (CFP) while strengthening economic and social cohesion. The European Fisheries Fund (EFF), in operation since 1 January 2007, is the financial instrument of this policy. With a budget of around EUR 4 305 billion for 2007-2013, including 75 % for regions whose development is lagging behind, the EFF helps to finance projects presented by companies, public authorities, or representative bodies. The EFF’s strategic objectives and priority axes are defined by the Council.

14.1. táblázat - Table 14.3.: Community aid by axis (CFP 2007-2013)

| Axis 1 | Adaptation of the Community fishing fleet to the available resources  
(aid for permanent or temporary cessation, for small-scale coastal fishing, for investments on board fishing boats, etc.) |
|--------|----------------------------------------------------------------------------------------------------------------------------------|
| Axis 2 | Aquaculture, inland fishing, processing and marketing of fishery and aquaculture products  
(measures for productive investments in aquaculture, aqua-environmental measures, public health measures, etc.) |
| Axis 3 | Measures of common interest  
(protection and development of aquatic fauna and flora, promotional campaigns, transformation of fishing vessels for a different use, etc.) |
| Axis 4 | Sustainable development of fishing areas  
(local projects for sustainable development, diversification of economic activities, etc.) |
| Axis 5 | Technical assistance intended to facilitate the implementation of aid from the EFF  
(financing the work of public services that manage the funds, etc.) |

3. 14.3. Importance of fishery in Hungary

Hungarian fishery industry was a successful sector of our agriculture in the last 30 years. After the political changes, the industry restructured, the ownership changed, on the major part of the ponds fishing was given up, and in many cases changes took place in the methods of farming. These changes are due to the new aspects and the complete change in the economic environment, and are new challenges for the producers. The conditions of production became unfavourable, average yield decreased countrywide, reserves were being used, but in the same time there were remarkably successful producers.

Hydro-graphic and climatic conditions of Hungary are favourable to produce fish. Fishery was one of the primitive activities of the Hungarians, which ensures livelihood for many fisher dynasties today as well. Hungarian fish production basically takes place in fishponds. Its peculiarity is that, this activity is typical in some regions of Hungary, but in others it is almost entirely missing. The biggest producer regions are: Hortobágy, Bikal, Dalmand, Tata, Szeged, Biharugra, Szarvas, Gyomaendrőd, Dinnyés, Baja, Százhalombattaand Hajdúszoboszló. Localisation of fish producing regions in Hungary is shown in Figure 14.8.

14.10. ábra - Figure 14.8.: The most important fish producing regions in Hungary
During production, when yields are measured, gross and net yields can be discriminated. Gross yield means the total mass of harvested fish from the given area, while net yield is the quantity decreased by reuses (fingerling, two-year-old fish). Gross fish production is around 25-30 thousand tons per year, and about its two-third is the net production. Value of gross output in Hungarian fisheries sector per year is about 2.5% that of animal husbandry.

14.11. ábra - Figure 14.9.: The fish production of aquaculture in Hungary (2002-2012)

Domestic fish consumption is around 3 kg/capita/year, which is about 4-5% of total meat consumption in terms of “bony-meat”. This quantity involves both Hungarian and imported products. Domestic products are sold in fresh forms, imported products in processed forms such as, canned fish, frozen and oven-ready, frozen filet, pickled, smoked, etc. According to the available data and estimations, approximately 55-60% is live fish, 10-15% is canned fish, 20-25% is frozen and about 5% are the other fish products in the Hungarian consumption structure. Live fish comes to the market solely through the network of fishmongers, and because of the small number of them, live-fish is hardly available to the major part of consumers in countryside. Supermarkets accept fish mainly in processed forms. Imported sea-fish (salmon, panga, trout, heck, tuna fish, mackerel, herring, etc.) and fresh-water fish produced in Hungary are being processed today in our country. About 15-20% of the quantity produced is processed in plants, but the adequate level would be 60-65% compared to the level in Western Europe. There is almost none plant that deal with only fish processing. Generally, fish processing is connected with a kind of production or commercial activity. In Hungary, 21 processing plants were run, in 2012, but there are several plants having small capacity, which are specialised to sell the fish that cannot be sold in live form. Little quantity of processed products are produced in Hungary, therefore processed products, which get to the table of consumers, are from import in majority.

The industry contributes to the realisation of export revenue important in the aspect of national economy in small, but calculable extent. The main directions of our export are Germany and Italy, while the biggest competitors on the European market are Czech Republic, Slovakia, Poland, Croatia and France. In the case of our export, spring and autumn exports must be distinguished. The export fish in the autumn (carp), which is mainly for consumption, has 1.5-2.5 kg on the average. Primary consumers of the Hungarian carp are the immigrants in Western Europe. It is typical for the spring export that fish is sold above or under the former mentioned market weight, and is used for stocking of ponds. It can be observed that the predator fish can be sold in unlimited amount and for high price in western markets. It should be noticed, however, that the increase of the export of processed fish products has strategic importance considering the industry. Present day Hungarian export is realised mainly in the form of live-fish.

The import of fish products, in terms of value, is 12 times hired than the export revenue in a year. It happened several years, that Czech fish appeared on Christmas market for knock-out price, and thus interfered with producers’ interests. It can also be noticed considering the import, that it is adequate for Hungary, when it widens the range of products, has moderating effect for market prices, supplies deficiency, and has the same or higher quality than that of Hungarian products.

4. 14.4. Importance of the sector on farm level

Fishery is a ulink between plant production and animal husbandry, because it involves features of both. Climatic and soil conditions have great impact on yields. Similarly to soil quality, cultural and technical state, quality and
potential fertility (natural and artificial) of each fishpond are different; therefore it differentiates producers of fishery industry. Production has several advantages and disadvantages concerning efficiency and national economy. Here, the circumstances of husbandry are considered from the aspect of entrepreneurs.

4.1. 14.4.1. Advantages of fish production concerning farm business management

The majority of fishponds were established where it was difficult or had high risks for conventional crop production. It managed to take these less favoured areas (slack watered, alkaline soils) into agricultural production and make it profitable, where one of the basic inputs, the water, was available in adequate quantity and quality. Water supply of the pond can be harmonised with other water usage (e.g. irrigation), moreover, it is essential for Hungary to control water on the whole area of the country.

Generally, conventional fish production is worth to base on own feed basis. Mainly cereals (corn, wheat, triticale, etc.) are fed, but by-products from agriculture and the food industry, and the so-called `spoiled feeds` also can be used. It does not mean that feeds being mouldy, musty, and having lower feeding value are perfect for fish. It simply means that it can be fed often, but in this case, the same yield cannot be expected as it was fed by high quality feed. A great advantage of pond fish culture that seeds having high moisture content (20-30%), the grains cleaned by the combine harvester, can be well-utilised (direct feeding, high moisture grains). In the harvesting period, cereals are available for lower prices and the relatively high drying costs can be saved.

There are several opportunities for other activities besides the basic activity of fishery, which can be well harmonised, with the working processes of fish production. These activities can be the following: (1) hunting; (2) angling; and (3) reed production. The mentioned supplementary activities can remarkably increase the revenues and income of the industry in many cases, very often without detectable increase of inputs.

Small machinery and middle labour inputs are typical for pond fish production. The level of mechanisation can be improved, but it is not worth to substitute the domestic, cheap and low-skilled labour with expensive, import machines.

It always must be considered that fishponds, the place of fish production, are functioning as a living-space, where issues of environmental and nature protection may influence the intensity of production and the technology applied. In the systems of fishponds, high quantity of manure can be used without causing any damage in the environment, thus the problem of slurry emerged on farm level is solved.

4.2. 14.4.2. Disadvantages of fish production considering farm business management

The biggest disadvantage of fish production derives from the high costs of investment and reconstruction. Fixed asset requirement of the industry is very high, which is connected with low asset-efficiency. Long term capital tie-up and slow turnover is typical. Special equipment (tanks, pond weed-cutters, outboard motor, etc.) have a relatively high ratio within total number of machines, which has a reducing effect on indexes of equipment usage and stiffens the structure of farming on organisation level.

It is basically typical for production that the activities are seasonal (spring and fall peaks) causing job culmination, and situations are extremely unfavourable. Seasonally results in a shift of revenues and expenses in time, which may often leads to liquidity problems.

It is an additional drawback, that climatic factors may influence yields in a great extent and there is a relatively high risk of production compared to enterprises of animal husbandry. It also must be considered, that certain information about fish can be obtained only through indirect sources, thus certain input units and the yield can be determined approximately.

It is a notable disadvantage considering the industry that domestic sale is small compared to the potential market, we do not have stable inner market. It is a serious problem that the majority of the fish produced can be sold in live form, consequently costs and losses (wintering, weight-loss, transport, etc.) are high. Moreover, high water charges also throw back positions of Hungarian producers on export markets ¹.

¹In most European countries, also involved our competitors, producers does not have to pay water charge
5. 14.5. Production bases of the sector

Pond fish culture established at the end of 1900 in Hungary, were partnerships of the occupant and the proprietor of the area. Turnover was 2-3 years. Despite of this, the numbers of common carp producing pond fish culture were only 109 in 1918 with an area of 6910 ha, but other not drainable fishponds were run on 15 areas and about on 5700 ha. These results did not mean the exhaustion of conditions, because the areas of alkaline soils were several thousand ha on the Great Plain, which could have been used for establishing fishponds.

The pond fish culture production needs certain basic resources (land, fishpond, fixed assets, current assets, labour, etc.). One part of these resources is objective, while other part of them can be interpreted as subjective inputs. Objective inputs are the fishpond, the water and the fingerling; subjective inputs are the feed and the manure, besides professional skills. (Of course, the choice of proper stocking ratio is a subjective input.)

5.1. 14.5.1. Organisational constraints

Forms of operation can be distinguished on the base of the following: (1) pond size; (2) complexity of production; (3) stocking scheme; (4) production method and (5) duration of production.

According to the size of the area of the pond, small, middle and large-scale pond fish culture plants are distinguished. Small-scale plants are up to 30 ha, middle-scale plants are between 30 and 300 ha, large-scale plants are over 300 ha. It is typical for small- and middle-scale plants that they are semi-scale plants, and are well harmonised with the system of agricultural activities (fishing is only one industry within the agricultural sector). Large pond fish cultures are planned as a separate fishing plant, where the special requirements of this special industry can be realised more easily.

On the basis of the scale of working, full-scale and semi-scale pond fish culture is distinguished. The most important Hungarian pond fish culture is full-scale pond fish culture. It means that their activity starts at rearing till producing market fish. Semi-scale pond fish cultures mainly involve the separated, smaller ponds, which are lack of the technical and agronomic conditions of the production. Small and middle-scale plants, the majority of mixed profile co-operations of pond fish culture, are semi-scale in general. Consequently, they are dealing with rearing or market fish production. In the former case, fingerling is sold at the end of production period, in the latter case; purchased fingerling is grown to market fish.

On the base of the period of breeding (fish production), two and three year pond fish cultures are distinguished. The difference is that in the first one, fish develops for two years, and for three years in the other. Always the local conditions and economic circumstances determine which form of operation to choose.

On the base of stocking method, pure, mixed and combined stocking operations are distinguished. Pure stocking means that fish of the given species are in the same age and have the same size. Mixed stocking means, that fish of the given species are in different age and have different size. In combined stocking fish being in the same age group or in different age-group several species live together. Generally, the fertility can be utilised the best with combined stocking.

On the base of the method of production, fishponds can be orientated only for fish-meat production, and can be alternative pond culture systems, when this continuity is interrupted. In the latter case, after the adequate drying of the bottom of the pond, different feed plants, e.g. rice is grown. After dry utilisation, yields show a remarkable increase, mainly due to the improved natural fertility. Growing crops can reduce costs connected with fertilisation (manuring). In the beginning of their activities were based on the rich stock of natural waters, but today, production takes place on three areas different in feature in large scale conditions: (1) pond fish culture; (2) intensive fish production and (3) inland capture fisheries.

5.2. 14.5.2. Tangible assets in production in fishponds

Tangible assets are assets, which save their physical features permanently, participate in several production cycles with their total value of use (capacity). According to accounting, tangible assets are means, which serve permanently –more than one year - the activity of the enterprise in a direct or indirect way. Tangible assets involve estates, equipment, machines, other equipment, apparatus and the investments. The most important tangible asset in fish production is the fishpond, which belongs to estates. Estates are the land and every other means, which have been established in connection with the land.
Fishpond and installations belonging to this give about 75-85% of the total value of fixed assets. Relative interest of other fixed assets, such as buildings (feed-stores, social buildings, hatchery, etc.), machines, conveyances, etc., is not significant in value, but their installation, maintenance are limited for the enterprises. Because, the largest part of the value of fixed assets is the value of fishpond, and 80% of domestic production comes from them, this area is highlighted.

The area, technical state of working ponds and the technology applied, basically determines the position of fish production and domestic supply. Fish production takes place about on 18,000 ha (67%) from the 26,500 ha capacity today. Fishponds are registered as land use, about 49% of its area totally degraded, needs reconstruction, perhaps disinvestment, while on 30 % of the area lower level production can be done, and only on the rest 30% can be qualified to adequate cultural state ponds. According to the conventional allocation order of domestic fishponds, the area of ponds available can be used for rearing, fry rising and producing market fish.

Tendency of the last two decades indicates that in the first half of this period, rearing was preferred among producers because of quick turnover and small current asset requirements. In the second half of the period, which also shows the situation after the transition, these motivations are still present, moreover, problems of property protection are less when fingerling production, therefore stealing cause smaller losses. Reduction of fish production occurred in a way that it meant an almost permanent lack of fingerlings, but especially one-year-old fish. Area ratio of these two age-groups should be increased in the future. In prosperity stage of production, area usage of approximately 35% would be reasonable, but later, in a balanced stage of production, it would be stabilised at about 30%.

Concerning the water supply of domestic fishponds, it can be noticed, that it was rich for 13%, adequate for 47%, insufficient or very scarce for 40% of fishpond capacity. According to the estimations, period of draught resulted in a loss of 3 thousand tone fish for national economy.

Volume of investment costs depend on several factors, within which the most important ones are the following:

- Configurations of the soil, the quantity of movable soil;
- Type of the pond (barrier pond, water reservoir, etc.);
- Size of the pond (the more bigger, the less specific costs);
- Quantity and type of supplementary, ancillary equipment, canals, structures;
- Method of the construction (own or outside).

Many factors influence accounting costs, therefore establishment of one hectare barrier pond may show great deviations: about 3.5-5.5 million HUF (2012). Accounting costs can be reduced even to its one-third, for one hectare, when establishing a water reservoir. The establishment of a pond creates the essential condition of the production for 40-50 years. Before the investment, both ecological and economic, technical factors must be taken into consideration. These factors are the following:

- Can be solved the running and drainage without causing any damage in the environment?
- Which production stage would serve the ponds?
- Are there any opportunities for crop production close to the pond system?
- How far is it from potential markets?
- Would the establishment violate licenses?
- Presence, ratio, turnover and provisions of own and liabilities
- Are the quality and water holding capacity of the soil adequate?
- Is there water nearby, which is enough and have good quality?
- Which building method is ensured concerning the features of the ground?
As the above listed factors indicate, establishment of fishponds is an investment requiring complex attitude, which determines the method of farming on the given area for a long time, and in the same time it is a drastic intervention to the ecosystem.

Fishponds, primarily serve fish meat production, but sometimes it can be used for arable crop production. In this case, it must be considered as a land during estimation. Fish production in fishponds needs a certain feeding producing area. Many factors influence the need of the area (e.g. yields, feed-utilisation, year specific effects, quality of the soil, etc.), but it can be noticed, that about 0.3-0.4 ha arable cropland can reliably ensure the feed requirement of one hectare fishpond for a year.

When someone wants to start fish production and own fishpond is not available, it seems to be obvious to buy or rent a fishpond. Proprietors wanted to sell mainly the ponds, which had bad cultural state and were degraded. In the early 90’s, for 20-40% of the cost of establishment, ponds were available. At present (2012), the rent is about 30-40 thousand HUF/ha. It is worth to make a lease for a few years in advance. It is worth to set the dates of payment to the dates of revenues, because they are not continuous.

5.3. 14.5.3. Current assets in fish pond cultures

Current assets are resources, which serves the production in a period that is not longer than a year. Current assets are stock, outstanding, securities, and cash. The role of livestock must be emphasised, because they belong to current assets, despite the fact that, e.g. breeding animals are tangible assets.

Stocks, within current assets, will be discussed in more details. Stocks serve the enterprise activities directly or indirectly, which participates in one activity process, generally, they lost their original shape during production and become the part of the new product. On the base of origin, the most important two groups are purchased stock (raw materials and commodities, fuel and combustible, maintenance and other materials) and own produced stock (animals, unfinished products and intermediate goods, finished products). Purchased stock is every stock, which was not produced by the enterprise, and got to its property or use by purchase in general. The followings are different costs, which may emerge in connection with purchased stocks:

• Purchase price and costs, closely related to purchase (e.g. cost of transport);

• Accidental loss of value (e.g. because of decrease of market price, damage of the stock or it becomes unnecessary);

• Costs connected with storage (e.g. costs of keeping fish in over-wintering and storage ponds).

The value, which is calculated on purchase price of utilised materials in the process of production is an essential part of the Average cost, however, the accidental loss of value and storage costs are direct costs, i.e. they are not part of the Average cost.

Every stock, which is produced by the enterprise, is qualified as own produced stock. According to domestic managerial accounting, animals, work-in-process, intermediate goods and finished products are involved in own produced stock. Breeding animals (e.g. brood stock), fry, fattening and other animals are involved in the group of animals. Animals are special stocks, because they are growing on their own as a result of the inputs, and on the other hand, the costs of growing emerge in other stage of production (e.g. fry, fingerling). Products, which are being produced and waiting for further manufacturing and at least one operation have been made on, are qualified as work-in –process. A special work-in-process of agricultural production, is the on-farm inventory (inventory of assets and liabilities invested in unfinished production). It is the value of inputs utilised in the accounting period in terms of money, in order to produce the products harvested in next year (or years) following the day of turnover of 31 December. On the basis of the inventory made about the stock of work-in-process, stocking takes place typically when closing the year. Every product, on which at least one operation have to be made or at least one input have to be given before it has gone through at least one working process.

The requirement of current assets is about 25-70% of the total asset requirement in fish production in ponds. Typical current assets in the area of fishing are the following: (1) water, power; (2) manure; (3) feeds; (4) lime, medicines; (5) fingerlings; and (6) expendable (nets, rubber-clothes, baskets etc.).

5.4. 14.5.4. Human resource
Features of human resource management of fishery, which partially are the same with that of agriculture, can be summarised as it follows:

- Connected with nature, extended in space, be exposed to weather;
- Different labour requirement in each periods of a year;
- Increased danger of accidents;
- Actual working operations and the results are separated in time;
- Changing tasks during working operations;
- Skilled stuff is becoming older;
- Certain information on fish can be obtained only directly and the knowledge of them need many experience;
- Fishermen have to be a security man as well, because property protective problems are especially typical for the sector.

It is typical for fishery that its live labour requirement is average, therefore indexes of labour efficiency are relatively favourable comparing to other sectors. The major part of jobs have to be completed are seasonal (spring and fall peaks) and cause job peaks. In order to compensate them, seasonal employment is generally accepted, and the payments are received as a “dinner fish”, i.e. in product.

It is accepted today, that in a 500 ha enterprise 14-15 person is the general stuff, from which 9-10 person are skilled labour, 1 person is a master of fishing, 2-3 person are security men, and 1 person is a fisher engineer.

### 6. 14.6. Yields and production value of the sector

#### 6.1. 14.6.1. Yields of fish pond cultures

During fish production, natural yield and yields achieved by feeding are distinguished. Within natural yield, a so-called yield achieved by fertilisation can be also mentioned. Yield achieved by feeding is the result of feeds given to fish. Natural yield is the result of natural feed resources formed and utilised in the given pond. Manuring can increase the quantity of natural feed resources; therefore the yield achieved by the effect of manuring can be distinguished. Accurate separation of different yields is almost impossible, so they can only be evaluated. It is desirable to reach the ratio of 55-45 % of natural yield and the yield achieved by feeding, which depends on natural fertility and local conditions of each ponds in a great extent. System of factors influencing yields is shown in Figure 14.11.

14.13. ábra - Figure 14.11.: The most important factors influencing yields
When calculating the yield, it has to be taken into consideration the fact, in which production stage is the pond (e.g. market, growing-out, etc.), because the yields are different in rearing and producing market fish. Domestic production takes place mainly in the three-year business form, thus the market fish is finished by the fall of the third year. A part of market fish is sold in fall, the rest can be sold continuously from over-wintering-ponds. A loss emerges during winter, which is called “weight loss”. Its quantity influences the final yield considered when sales are calculated.

During fish production, staples (fish species), twin-products (broiler duck) and by-products (e.g. reed) are distinguished. The allocation per species of the quantity of fish caught as staple, was formed in the average of the last five years as it follows:

- **Common carp** 75%
- **“Herbivores”** 21%
- **Silver carp, Bighead carp** 17%
- **Grass carp** 4%
- **Predators (European catfish, Pike-perch, etc.)** 1%
- **Wild fish (Crucian carp, Bullhead, etc.)** 3%

When analysing the yields, harvested fish must be separated from the progeny of the year (progeny = harvesting – stocking).

Domestic fish production works in the conventional, three-year business form, so the market fish is finished by the fall of the third year. The size of the average body weight of one-year-old, two-year old, and edible fish for the end of production period is important. Fingerling having more body weight and better condition, survive the winter with less loss, and has better chance in the second year and besides; it can reach the required body weight gain with lower using inputs. When using inputs of the same order, it is the goal of the production to achieve as high average yields as it is possible, which means higher body weights, assumed that the number of fish is the same. Of course, the more rare stocking results in higher body weight.

In the most working ponds, despite the national average yields, it is a real goal to achieve a yield of 1.2-1.6 t/ha almost everywhere. Unfortunately, it is typical for the last period, that certain technological elements were not used accurately, because of problems of liquidity and financing current assets.
When determining average yield level needed for economically efficient fish production, it has to be considered, that fish can be produced profitably only above critical production level. Critical production level is determined by the following:

- Fix costs for one hectare per a year (HUF/ha/year)
- Average sale price of fish (HUF/kg)
- Variable cost for one kg fish (HUF/ha/year)

Taken into consideration the above mentioned factors, critical yield level for fish, the yield where production costs come back, but there is no profit, can be calculated with the help of the following formula[1]:

\[ X = \frac{AFC - M}{1 - \frac{AVC}{P_A}} \times P_A \]  

- \( X \) = critical yield level for fish having zero profit or loss (kg/ha/year)
- \( AFC \) = (Average Fix Costs) fix cost for one hectare (HUF/ha/year)
- \( M \) = returns besides fish (HUF/ha/year)
- \( AVC \) = (Average Variable Costs) variable cost for one kg fish (HUF)
- \( P_A \) = Average Price for fish (HUF/kg)

The formula shows, that the higher is the fix cost per hectare and variable cost of production of one-kg fish, and the less is the sale price, the more yield of fish is needed for profitable production.

6.2. 14.6.2. Production value in fish pond cultures

In most cases, production value is equal to sales revenue, the product of multiplication of the yield of production sold and the unit price of the product. Analysis of production value can be approached from three directions. The first, in connection with yields, the second, related to other revenues (e.g. subsidy, insurance refund), which does not increase production value, and the third, connected with sale prices (Figure 14.12.).

It is worth to increase yields of fishing rationally, but only up to the point, where it results in the increase of net income as well. It is also true here, that the maximum of the net income does not belong to the maximal yield. Increasing yields have tools, which require and others do not require additional costs. These tools need to be separated during analysis. The effect of the increase of yield requiring additional costs (feeding, manuring, water supply, etc.) on income, must be always analysed and have to be taken into consideration when making decision about its usage. The increase of yield without additional costs (proper ratio of stocking, adequate system of interests, expertise, etc.) basically is an issue of professional intelligence and attitude, besides natural risk factors of production.

14.14. ábra - Figure 14.12.:System of factors determining production value in fish-pond cultures
The trend of current sale price is one of the most important among factors influencing production value. Major part of domestic fish production gets to the trade as live-fish. Large-scale sale price of common carp and herbivores is lower, while it shows higher deviations for predators. Price of more valuable predator species (pike-perch, trout) is formed as a result of bargains. It is very common that predator species rarely and in small amounts available are used for switching products in trade. The price of live-fish is seasonally fluctuating in the function of demand and supply and shows high deviations among regions. Consumer prices are generally 40-50% higher than large-scale sale prices.

Producer price and consumer price for common carp and their ratio compared to each other were changing in different extent in the last years. The trend of common carp prices is shown in Figure 14.13.

The most important warning indicated on the figure is that consumer prices are rising in greater extent than producer prices, so the price gap is continuously opening. It also means that the additional income originating from the higher price have accepted with consumers appears in the commercial sphere.

14.15. ábra - Figure 14.13.: Trend of producer and consumer prices for carp
The volume of domestic sales seasonally shows significant deviations and very different price trends. It must be the aim of the industry to create a stable, predictable inner market, which is also, a base of maintaining our export market position in the long run. We need to achieve that export quality of fish does not exist, because only one good quality exists, both on foreign and domestic market. It is a great loss that direct export subsidies are no more, but international requirements have to be taken into consideration on this area as well.

The seasonal shortage of common carp is that may cause market problems. The main period for sale is December, because in most Hungarian families, the Christmas dinner is made of fish and fish traders have a great turnover in this time of the year.

The role of subsidies have to stressed among the other factors increasing production value. The most important subsidies is available for the environment protection and the investment.

Consequently, concerning the earlier mentioned aspects, it can be observed that the production value was about 500 - 650 thousand HUF/ha/year in 2012 (calculated on prices of the year of 2012) assuming average technology, full scale enterprise and production structure.

7. 14.7. Production costs

The volume, structure of production costs in a year differs in each enterprises and years. Production cost depends on technology applied, production level and intensity, local conditions, supply of assets, labour supply, price of inputs, human and other factors.

During the analysis of production costs, separating fixed and variable costs is needed, which is not an easy task in many cases. Volume of fixed costs per unit of product decreases with the increase of the volume of the production. To consider this fact is important especially in intensive systems having high asset requirement. In intensive systems fixed costs are relatively high.

It is worth to approach the analysis of production cost through three aspects. The first is in connection with natural inputs, the second with unit prices of inputs, the third with other expenses increasing production cost (these are expenses, which can be expressed as cash, but they do not involve natural inputs) (Figure 14.14).

14.16. ábra - Figure 14.14.:System of factors determining production cost of fish production
7.1. 14.7.1. Material cost

Similarly to other enterprises of animal husbandry, the major part of costs are material costs (55-65%), of which the most important are the following: (1) feed; (2) fingerling; (3) water-charges; (4) manure and artificial fertiliser; (5) energy; (6) medicine and lime chemicals. Materials used in fish production are products partially purchased, partially products produced in the enterprise. Purchased products are evaluated on purchase price, but it is not the same with own produced products.

7.2. 14.7.2. Labour costs

Labour costs are 15-20% of production costs. It is important to take into consideration that these expenses are emerging continuously in time, while the revenues are seasonal. Labour costs are seemed to be as fixed costs in prosperities enterprises. A part of these costs can be reduced with more machines in most fishing plants. Establishment and equipment basically determines the number and structure of employee, and work organisation. Domestic enterprises have higher average labour utilisation than their American or West-European partners (about twice), for instance.

7.3. 14.7.3. Divided costs

Major part of divided costs are connected with plant assisting service (5-10%), which depend on the equipment, mechanisation of the plant. The most significant cost item is in connection with transport and materials handling. The highest requirement for transport and materials handling emerges in the fall, in the period of harvesting. When transporting fish, besides fish meat, high quantity of water also must be moved, which increase this cost item in a great extent. Transport activities appearing interim are mainly related to feed and fertilisers. The costs of regular mowing, aeration and water movement also must be mentioned here.

7.4. 14.7.4. Depreciation and maintenance costs

Depreciation costs are not significant (1-2%), because it is not calculated for ponds, which are the major part of tied-up capital. Maintenance costs would be more significant, but these works were missed out for several decades retrospectively, so their volume is only 3-4%. Of course, a part of these works must be done only in certain years, therefore it is recommended to make reserves.

7.5. 14.7.5. Other direct costs

Other direct costs, such as interests of credits, different fees for membership, professional and extension and consultancy charges, insurance charges and different duties are 2-4% of total costs.
7.6. 14.7.6. Overheads

Volume of overhead shows high deviations among enterprises and sectors, but it also have to be mentioned that in most cases small-scale producers and businesses do not separate these costs from their general living-on costs. Hungary has significant reserves in the area of reducing overhead, mainly relating to the public sector.

7.7. 14.7.7. Cost structure

Afterwards, look over the annual cost structure of fish production (Table 14.4), which is formed in a full-scale pond fish culture as it follows:

14.17. ábra - Table 14.4.: Annual cost structure of a full-scale pond fish culture

<table>
<thead>
<tr>
<th>MATERIALS</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>- feed</td>
<td>25-30%</td>
</tr>
<tr>
<td>- breeders14</td>
<td>50-55%</td>
</tr>
<tr>
<td>- water</td>
<td>8-10%</td>
</tr>
<tr>
<td>- fertilisers</td>
<td>4-5%</td>
</tr>
<tr>
<td>- others</td>
<td>5-10%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>LABOUR COSTS</th>
<th>15-20%</th>
</tr>
</thead>
<tbody>
<tr>
<td>DIVIDED COSTS</td>
<td>5-10%</td>
</tr>
<tr>
<td>DEPRECIATION AND MAINTENANCE</td>
<td>5.6%</td>
</tr>
<tr>
<td>OTHER DIRECT COSTS</td>
<td>2.4%</td>
</tr>
<tr>
<td>OVERHEADS</td>
<td>10-15%</td>
</tr>
</tbody>
</table>

Source: Own collected data and calculation

If certain stages are picked out of the process of fish production (e.g. fingerling production, growing-out, market fish production), ratios are formed in other way. Base of breeding was calculated on market price. Afterwards it can be observed that the annual production costs, calculated on prices of 2012, are about 350-450 thousand HUF/ha assuming a full-scale pond fish culture.

8. 14.8. Income, profitability and efficiency of the sector

Net income \(^1\), that is the profit has special role, because it shows the success of the activity and thus determines the manner of producer. Achievement or the exceed of net income expected by the producer, indicates the efficiency of the activity and encourage for additional work or innovation. Low level of net income or the loss shows the failure of the activity and raises the possibility of reduction. The final decisions influenced by other factors as well, but permanent losses force producers to give up the activity.

In general, fish production is in better position concerning efficiency than the other sectors of animal breeding. The efficiency expressed with expense ratio of fish production is 15-25% under average production conditions, the efficiency expressed with capital-profit ratio is only 2-4%.

The income achievable in fish production was about 50-250 thousand HUF/ha in 2012, assuming complex, full-scale pond fish culture.

9. References

\(^1\) Net Income (NI) = Net Production Value (NPV) – Production Cost (PC)
14. THE ECONOMICS OF FISHERIES AND AQUACULTURE PRODUCTION


15. fejezet - 15. ECONOMY OF ENERGY USE OF BIOMASS

1. 15.1. Global challenges

The increase of living standard requires ever more energy, despite energy saving measures. Utilizing renewable energy escorted the history of mankind. While its utilization was based on the lack of other energy sources at the beginning, extreme economic and political conditions at the first part of the twentieth century and microeconomic aspects since 1973, today it is supported by macroeconomic evaluation including environmental, rural developmental and energy political issues. The shrinkage of extractive fossil energy stock will probably make the energetic efficiency an important factor in the distant future, which aims at reaching the maximal energy output by utilizing the lowest energy input. Global energy need was 549 EJ/y, oil consumption fluctuates between 4,8-5 billion l/year, in 2011 it was 4,87 bl/y (170 EJ). The crude oil is an important core point of modern economy, thus actions on crude oil market are in close connection, interaction with events in global economy (Jobbágy-Bai, 2012). Substitution of the whole amount is a hard but unavoidable challenge in the short run (Table 1.).

15.1. ábra - Table 15.1.: Global energy data (2011)

<table>
<thead>
<tr>
<th>Description</th>
<th>Unit</th>
<th>2011</th>
<th>2011</th>
<th>2011</th>
<th>Most important countries</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total consumption</td>
<td>EJ</td>
<td>549</td>
<td></td>
<td>2,3%</td>
<td>2,20%</td>
</tr>
<tr>
<td>Total production</td>
<td>EJ</td>
<td>555</td>
<td></td>
<td>2,4%</td>
<td>2,70%</td>
</tr>
<tr>
<td>Crude oil</td>
<td>Mt</td>
<td>4050</td>
<td>170</td>
<td>31</td>
<td>1,3% 1,30%</td>
</tr>
<tr>
<td>Natural gas</td>
<td>B m3</td>
<td>3366</td>
<td>118</td>
<td>21</td>
<td>3,0% 2,50%</td>
</tr>
<tr>
<td>Coal</td>
<td>Mt</td>
<td>7586</td>
<td>168</td>
<td>30</td>
<td>2,9% 5,30%</td>
</tr>
<tr>
<td>Nuclear</td>
<td>MtOE</td>
<td>703</td>
<td>30</td>
<td>5</td>
<td>CH, USA, RUS</td>
</tr>
<tr>
<td>Renewables</td>
<td>EJ</td>
<td>70</td>
<td>70</td>
<td>13</td>
<td>2,3% 2,20%</td>
</tr>
</tbody>
</table>


Food- and energy supply as well as liveable environment can be considered as the most important, but simultaneously hard to be solved troubles of mankind in the long run. Food and energy should be produced for growing population in limited land at the same time. These problems arise differently in regions. In Europe and in Hungary not starving but energy dependency (55% and 61%) could be taken as most critical danger in the next decades. Proportion of renewable energy sources were 12,4% and 8,1% in 2011 respectively (Eurostat, 2013). In Hungary, thanks to natural conditions, 90% of renewable energies come from biomass. The energy-related utilization of biomass is a great opportunity for agriculture.

There are direct and indirect pressures on forests and other lands to be converted from growing food for feedstock to be used for biofuel production. The balance of evidence indicates there will probably be sufficient appropriate land available to meet demands for both food and fuel, but this needs to be confirmed before global supply of biofuel is allowed to increase significantly. There is a future for a sustainable biofuels industry, but feedstock production must avoid encroaching on agricultural land that would otherwise be used for food production (Popp, 2009).

The farmer can count on more certain marketing opportunities and higher product prices thanks to the demand market, and lower transaction (storage and transportation) costs because of the domestic (incidentally local) utilization not only in energy crops but, due to the reduction of cropping areas of other crops, even in other plant production branches. The use of more intensive production technologies is necessary for safe raw material
ECONOMY OF ENERGY USE
OF BIOMASS

production. Yet, this is accompanied by an increase of prime cost, which was exceeded by the change of prices significantly.

Today, there are extensive and well-known debates (as it is known) even within the EU concerning the objectives refer to bioenergy production especially in case of biofuels and in the following areas:

• Economics
• Safety of food-supply
• Demand for land
• Environmental protection
• Energy balance
• Job creation

The most frequently and quite extremist argument is: “More than 30 million live in need and misery owing to the progress of the bio fuel industry”. They claim that the general 30% rise of food prices has been triggered by this kind of utilization of plants. It should be mentioned that after producing bio-fuel, there remains a protein containing by-product which is mainly used as a component of fodder for ruminant animal stock.

2. 15.2. Energy plants

The difficult marketing opportunities (stagnation of the domestic population and the deceasing livestock) make the better utilization of our opportunities in producing energy possible from marketing aspects, while environmental issues and realizing the EU directions enforce to do so in a longer term.

Energy crops and plantations as raw material can produce more energy per hectare and perhaps better quality, but they typically has been grown in plough land which needs for food and fodder production, too. They has the highest innovation value from plant production via processing to the utilization, from genetics to motor techs, the greatest market value and the widest possibilities for alternative use. Plant production, in comparison with other domestic economic sectors, requires more capital investment due to the land need, typically reflects lower profit margins because of the disparity between agricultural and industrial prices, and the losses due to unpredictable weather. Energy plants are suitable for improving the security of production, as they diversify the activity of farmers and produce marketable products of significant added value which are also useable by the farms themselves. Energy plants may be grown on what were formerly areas for sugar beet or on set-aside areas by hybrids of higher yields and special content (HTF and hybrids of high oil-acid content).

The energy plants are cultures cultivated on arable land which are basically selected for energy production, their main product is the energy, and the energetic utilization may be proved by the producer and the processor as well. This last aspect is important because of the supplementing subsidies. In this way energy plants do not include the traditional forest areas (as firewood is a by-product there and is not cultivated on arable land), and even straw and corn stalk either (as they are by-products). The energy yield of the concerning cultures exceeds far that of traditional plants, thus they make saving significant land areas possible to fulfil the social function of food and fodder production and traditional forest areas. They produce a unique quality, which makes the industrial use easier. The energy may be produced in any form (heat, electricity, fuel) practically, though heat production is dominant among them due to its cheapness and its biggest energetic efficiency.

At the same time, raw material supply of bio-firms has to be decolonized from the effects of years, as the decrease of fixed costs of the extremely significant investment may only be realized by the better capacity utilization. In this way an over-sized capacity may make even the inland food and fodder supply insecure and make strategic inventory management necessary.

Focusing on the production technology of energy plants, the herbaceous plants are harvested annually, the ligneous energy plants are harvested in a multiple-year-cycle. The production and technological operation of energy grass may be carried out by the presently used agricultural machines, in case of the other plants there has been a significant research and development activity carrying out to make settling and harvesting mechanized in a most effective and profitable way. All these mean that harvesting the energy grass occurs in the vegetation period, while in case of the other energy plants winter harvesting may be more favourable from financial and
labour organizing aspects. Energy plants are of good regrowing ability, which means that they have to be settled again only after several harvestings, after 10 to 30 years. In this way the significant cost of settling is spread to more years. As nutrients draw back in the root of the plant, the offset in spring is quicker and stronger, having significance mainly in a dry year.

From the point of view of fire technique, the heating value of ligneous energy plants in an absolute dry condition is higher, their ash content is lower, as well as their structure is more favourable from energetic and fire technical aspects, as those of herbaceous lignocelluloses. As a result in case of herbaceous plants the production costs are higher (mainly harvesting costs), but in case of ligneous plants the settling cost is higher.

Energy plants may be suitable for utilizing unbuilt real estate owned by local governments (even recultivated areas) as well as areas presently out of cultivation. As all these are about using new plants and technologies, the innovation content by utilizing these may not be neglected. The question is that which energy plants or their combinations may be used for producing the necessary energy quantity for the operation of the recommended firm in a most practical way.

2.1. 15.2.1. Energy Reed (Miscanthus sp.)

It is a perennial plant having rhizome, belonging to the Poaceae family and originates from China. It contains great amount of lignin and lignocelluloses, and carries out C4 photosynthesis, in this way comparing to the energy grass, its drying characteristics and its ability to utilize water as well as its potential producing ability are better. The height of the plant reaches the 2 meters at the end of the year in case of spring settling, and the 3 to 4 meters in the following years. The reason of the lower growth in the first year is that the plant develops a huge rhizome and root system, which uses up the energy of the plant in a significant part. According to European experiences the yields are 20 to 40 tons per hectare (in air-dry condition), the lifetime is 20 to 30 years. The moisture content decreases to 10 to 22% at the time of winter harvest. The plants being settled in the energy plantations are sterile hybrids, having neither seed nor pollen, may be multiplied by planting, the Hungarian selected hybrids are frost resistant (Marosvölgyi-Ivelics, 2005).

Its structure is similar to that of wood from a fire technical aspect having a little higher ash content. Winter harvesting is done by reed cutters and bailer machines or corn chafers. Wet soil rich in nitrogen is ideal to its production, thus it may be suitable for utilizing the sewage of hog farms.

In spite of its favourable production and fire technical features, it is the high settling costs that scare farmers away. The micro-selected planting material and 10 thousand stems per hectare mean a planting material cost of 2500-3000 USD per hectare, which is supplemented by the other settling cost of cca. 500 USD per hectare. Its yearly expenses are 500 USD per hectare; amortization constitutes near half of the costs. In spite of all these, energy production may be competitive to the energy grass even under the most unfavourable production parameters.

2.2. 15.2.2. Energy Grass (Elymus elongatus ssp. Ponticus cv. Szarvasi-1)

It has been state-acknowledged since 2004, it is native, perennial and a C3 energy plant, its height may reach even the 2 meters. It may be sown by seeds, it is sensitive to weeds and flooding at this time, in any other case it sprouts well. Its ash content is greater, thus its heating value lags behind the other energy plants. Its burning is not recommended in wood firing furnaces. Similar to energy reed, its weed control ability and soil saving ability is extremely good. Its per hectare yield ranges from 10 to 16 tons in a 8 to 15-year-rotation, which may be harvested twice. The harvest in August is suitable for burning, the next harvest is for mainly fodder purposes or gaining biogas. In the last case, not only the gas yield is outstanding but the fermentation is extremely quick (Figure 1), which makes the significant reduction of investment costs possible. Besides these, its use for industrial purposes is possible, such as for producing pellet, grass-fibre sheet, paper, bio-ethanol.

15.2. ábra - Figure 15.1.: Biogas yields from energy grass compared with other organic matters
Content in the upper order: (1) Sewage sludge; (2) Rumen’s content; (3) Rye straw; (4) Garbage organic material fraction; (5) Energy grass; (6) Cattle sludge; (7) Hog liquid manure.

Source: www.energiafu.hu

It may be cultivated and harvested by agricultural machines, in this way its production in agricultural firms does not require any extra investment; however, the long lifetime period (similarly to other energy plants) stiffens the cropping structure. Its other advantage is the low cost of settling (400-600 USD per hectare), from which only 40 to 60% is paid by the farmer in Hungary, the another part is state subsidy. Its yearly costs are similar to this, but most of them are expenses as well; material cost and land rent constitute a significant ratio. The last one occurs even in that case if the farmer cultivate on his own land area in form of opportunity cost. Its selling price lags a little behind the other energy plants (50-60 USD/t).

The prime cost of energy is cheaper form the energy grass than energy reed, but the income per hectare is much lower. The significance of local utilization is huge in case of both plants, which means that increasing the transportation distance by 1 kilometre (which is 2 kilometres in case of roundtrip) increases the prime cost by 0.5-1 USD per ton.

All in all, energy grass has lower settling cost, a more significant operation cost and has more problematic firing technical features. Due to its multiple utilizations and competitive per ton energy cost, its more relevant spread is especially expected among farmers with less capital situating near the purchasing markets.

3. 15.3. Short rotation woody plantations

Researchers agreed that the increasing of community, economy, industry require more and more woody material. Effects of developments of energy sector, the natural forests cannot satisfy the increasing basic wood material, that is why the production of short rotation crops almost the single solution for the discharge of the natural forests. The requirements are strongly growing, which cannot be supplied by the natural forests. Industry and energetic need unified quality, large quantity wood material. The conditions of satisfaction of the energetically and other requirements are that the price of wood decreasing as well as possible, which can be solved by utilization of short rotation woody crops (Ivelics, 2006).

It could be considered the machineries of normal cropland plants for energy farming, what is more – since peak work time develops in winter periods – their utilization becomes more favourable, their amortization costs per product unit reduce and it is suitable for employing workers just in that period which is problematical in agricultural employment. Deployment-cultivation-harvesting of energy forests is very similar to alfalfa since costs of deployments are the highest in the cost structure then - following minimal cultivation - without re-deployment is harvestable 4-5 times. However the harvesting is possible by 3-5 years in case of short rotation, it can give revenues in each year – perhaps continuously – if only the one third-one fifth of the necessary areas is planted in every year in order to continuous offshoot and harvest.
Nowadays especially imported tree species and variants have been prevailing, and therefore it is an urgent need to bring those varieties to dominance that have been bred for the domestic conditions. In the light of the experience earned so far, the yields may range from 15 to 25 tons per hectare.

On the basis of domestic research results, the Table 15.2. shows the technical and economic details of woody energy plantations.

### 15.3. ábra - Table 15.2.: Basic technological data of the most important energy tree species

<table>
<thead>
<tr>
<th>Description</th>
<th>Unit</th>
<th>Acacia</th>
<th>Poplar</th>
<th>Polish willow</th>
<th>Swedish willow</th>
</tr>
</thead>
<tbody>
<tr>
<td>line spacing</td>
<td>m</td>
<td>2.4</td>
<td>3</td>
<td>0.75–1.5</td>
<td>0.75–1.5</td>
</tr>
<tr>
<td>stem spacing</td>
<td>m</td>
<td>0.3</td>
<td>0.5</td>
<td>0.5</td>
<td>0.6</td>
</tr>
<tr>
<td>number of stems per ha</td>
<td>stem/ha</td>
<td>13,889</td>
<td>6,667</td>
<td>17,778</td>
<td>14,815</td>
</tr>
<tr>
<td>felling cycle</td>
<td>year</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>lifetime</td>
<td>year</td>
<td>15</td>
<td>15</td>
<td>15</td>
<td>15</td>
</tr>
<tr>
<td>yield upon harvesting</td>
<td>kg/ha</td>
<td>50,833</td>
<td>43,750</td>
<td>19,000</td>
<td>65,833</td>
</tr>
<tr>
<td>Total cost of creation</td>
<td>USD/ha</td>
<td>1800</td>
<td>1600</td>
<td>1900</td>
<td>2100</td>
</tr>
<tr>
<td>Price of wood chips</td>
<td>USD/t</td>
<td>60–80</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>


Mainly sandy and dry areas should be taken into consideration for production of acacia, wetlands for willow and relative good soil for poplar production.

### 4. 15.4. Algae

Production of algae species looks a very perspective possibility not only for energy but for food production, too. Similarly to other 2nd generation biofuels it should be interesting in the middle run, uses non-food raw materials or improved technology, but present it is much more expensive connected with the cheapest conventional biofuels.

The consequence of commonly used technologies in large-scale pig-breeding is significant amount sludge, which strongly endanger environment in case of inefficient disposal. In recent years algae-based sludge management became more and more accepted method because the final products could use for several purpose like fodder, raw material of chemical and food industry as well as bio-fuel.

Alga-based energy production looks a promising alternative. After several national pre-experience we started the experiments connected with alga-production, based on pig sludge, aimed especially the biodiesel production with the cooperation of the experts of the University of Debrecen and of the Monergo Ltd. The planned alga species for the experiments: Cladophora sp., Chlorella vulgaris., Spirulina platensis és Scenedesmus dimorphus.

Based on the results of our laboratory experiments, we found that whole liquid pig manure is not suitable at all for large-scale algae production; only diluted or filtered liquid pig mature can be used; we recommended the last one. Our results have shown that higher nutrient concentrations and additional CO2 can result to higher yields, but the protein content of the biomass increased at the same time and led to the reduction of lipid content in the case of the oilproducing alga species (S. dimorphus). The data obtained show that it is the C. vulgaris which should be primarily applied in large-scale experiments if our goal is to produce larger and more consistent amounts of biomass at moderate risk. Based on our outdoor experiments (C. vulgaris), nutrition supply has a significant positive effect on algae yield up to the optimum point, while the aeration level brings only moderate and uncertain growth. Twelve- to 14-day-long rotation periods would be the most reasonable possibilities with middle-level nutrition doses, using liquid pig manure as a nutrient, which probably results in larger yields and profits than the more intensive technological variants (with aeration and more fertilizer). Aeration is not recommended; instead, slow mixing is recommended. The high-level nutrient supply might explain a slightly longer rotation period (Bai et al, 2012).
The implementation and effective operation of a biodiesel plant using algae must face to face a great deal of uncertainties. The most important ones about them are the lack of Hungarian plants and the very different data available in foreign literature regarding investment costs, operating costs and yields. Rest of the uncertainty due to the possible changes of the regulatory system, as well as the market price of the competitor products like fossil diesel-oil and the traditional (first generation) biodiesel, as well as the changes of the market price and the extent of the actual utilization of protein feed as by-product.

For improving economic viability the followings should be considerable:

- Regarding algae use for fuel purpose, the producers should endeavour the internal use and the state should inspire it more effectively by much more favourable taxation system. Present legal opportunities for this purpose are: using stable machines as well as producing electricity from alga oil.

- Regarding alga production the followings should be considered:
  - Implementation of complex operation systems, which produce several types of final products and have inner mutual connections regarding especially utilization of raw material and auxiliary material.
  - Production of higher added value products, whose economic and job creating advantages remain at local level.
  - Preferring a bigger firm size, which has sufficient capital for investment costs, marketing as well as using up-to-date technologies.

5. 15.5. By-products

By-products are available in large quantities in agriculture and food industries. A significant portion is wasted, however effective utilization could be a considerable source for savings at the consumer’s, energy producer’s and national level. One of the greatest potential of energy lies in energy use of these by-products. The reason why the partial substitution of this number with by-products can be of increasing benefit is that they enable (1) by-products to be used locally, (2) the harmonization of agricultural production with food-processing and (3) the promotion of the survival of agricultural sub-regions. Their spread can help farmers to reach higher profits, because of the boom in the demand for by-products.
The comparative analysis between by-product originated and conventional energy sources should reflect both economic and energy aspects. They can decisively affect the present and the future position of these resources. Cost of a unit of heating value may be changed considerably by the effectiveness of combustion, by comfort level, and environmental factors.

Simultaneous economic analysis of the differential social levels and common harmonization of their interests may be the crucial point so that the utilization of energy from by-products is able to grow in the long run. Due to the number of ways for using agricultural and food industry by-products, the utilization of energy-producing technologies can be expected and suggested just in case of simultaneous fulfilment of two conditions:

- First of all, asset-proportional profit over deposit rates at the producer’s level and the savings at the consumer’s level are essential. Lack of these may result in the disintegration of supply-demand balance, but their state regulation generally proves effective. For establishment of a mutual advantageous subsidy system, the financial savings realized by the state treasury should be considered as the financial basis in the long run. The current extent is much lower than desired.

- Secondly, higher net profit from energy production compared to other possible methods of utilization of the by-products is also very important. Otherwise it is better to use in the way that will maximize the profit. The factors related to these conditions tend to change in unexpected ways, thus it is hard to influence them (Bai-Nemessályi, 1999).

### 6. 15.6. Bioenergy methods

Any type of energy could be produced from biomass, but the available raw material determines the possible energy methods and the final products (Table 15.4).

#### 15.5. ábra - Table 15.4.: Main characteristics of bioenergy methods

<table>
<thead>
<tr>
<th>Energy method</th>
<th>Raw material</th>
<th>Final products</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct combustion</td>
<td>Plant-origine matter with low water content</td>
<td>Heat, electricity (waste heat), ash</td>
</tr>
<tr>
<td>Biobriquette, pellet</td>
<td>The same matter in crushed pieces</td>
<td>Heat ash</td>
</tr>
<tr>
<td>Biogas</td>
<td>any type of organic matter</td>
<td>Heat, electricity, motor fuel (waste heat, CO₂)</td>
</tr>
<tr>
<td>Biodiesel</td>
<td>oil seeds and oily wastes</td>
<td>Motor fuel, electricity oil-cake, glycerine</td>
</tr>
<tr>
<td>Bioethanol</td>
<td>plants with large carbon-hydrate content</td>
<td>Motor fuel DDGS, WDGS</td>
</tr>
</tbody>
</table>

These procedures generally require subsidies under the present economic conditions depending on technology and raw material, which may get back into the national budget through other channels. The only way to harmonize the interests of different social levels is to work out a suitable state subsidy policy. A reasonable system could operate as a catalyst assuring acceptable financial conditions for the economical operation of presently unprofitable, but potentially profitable technologies at the entrepreneurial level. Material savings for the state treasury and available foreign funds should be considered as financial resources for the recommended policy. The most considerable discouraging factors for these methods are: short-term and fluctuating state subsidy system, the under-evaluation of macro- and especially environmental effects, shortage of capital and the opposition with the interests of other energy lobbies.

### 6.1. 15.6.1. Direct combustion, biobriquette, pellet
Direct combustion is the cheapest, energetically most efficient biomass-energy method. They are suitable for local utilization of biomass (in case of small – even family-size), or for the improving of a big territory, which can be achieved with the installation of biomass power plants or central heating systems.

The power plants with big capacity using solid biomass are really cost-efficient, if they can use or market the whole amount of by-product (waste heat). The cost and energy demand of road transportation should also be a considerable factor.

Small power plants relying on solid biomass should be installed in the vicinity of the heat market. It needs heat for operation in a technology continuously in ideal cald. The profitability of this method is uncertain in the case of district heating factories producing hot water, because they can use the waste heat during only half a year.

The unsuccessful operation of biobriquetting based on agricultural by-products is affected by several factors; under-utilization of available capacity and impossibility for export of the final product are probably the most important ones.

### 6.2. 15.6.2. Biogas

Anaerobic digestion could be considered a perspective method from environmental and marketing aspect which contribute with the sustainable development of agriculture and the reduction of energy import. Thanks to these reasons investment and operation of biogas plants has been strongly subsidized by all of the EU countries. The extent of subsidy typically higher in the richer countries than the less developed ones, the ratio of energy plants is nearly 50% in the raw materials and the environmental legislation is sticker.

The most typical end-product is the green electricity, the obligatory and subsidized feed-in tariff is 15-18 USDc/kWh in Germany, 17 USDc in the Netherlands, 25 USDc/kWh in Austria, 14 USDc/kWh in Hungary. The elements of guaranteed feed-in system of bio-methane has already appeared in the German, the Dutch and Swedish legislations, too. The small biogas plants using energy-plants tend to be preferred. Anaerobic digestion of energy plants is more expensive than by-products, but their biogas yield is much higher and reliable resulted reductions in the size of fermenters.

The main goal of the establishment of Hungarian biogas projects mostly was waste management, and the way of use of biogas was cogeneration. The reason of this compared the direct burning is obvious: it is practically impossible to use biogas only for heat production in case of big capacity, especially in the summer period.

Though energy could be made more marketable on the way to convert it to electricity, but it needs extra costs for the investment and operation, too. Prime costs will rise by 2-3 USDc/Nm3 in large scale and 7-9 USDc/Nm3 in small scale during this process. Besides it should need to use significant amount waste heat also in this case, because the electrical efficiency of the best gas motors is only approximately 40%, the gas turbines’ using in smaller scales is 34-35%. Reasonable use of waste heat could be the crucial point of cogeneration which is – besides some existing good samples – hardly to fulfil. Though guaranteed buyers’ market of renewable electricity is existing, but there are several points of uncertainty especially in allocation of the place of network connection, in determination of the amount of feed-in electricity and because of the pre-defined obligatory schedule.

The most important possibilities for the most profitable operation of biogas plants – excluding microbiological research - should be the followings:

- Cheaper raw materials (e.g. algae);
- Re-processing of biogas (to bio-methane) and utilization for other purpose (natural gas, automotive fuel);
- Establishments of complex factories (e.g. with algae ponds).

### 6.3. 15.6.3. Biofuels

Though the use of heat energy seems to be the most favourable choice from economic and energetic aspects, considering macroeconomic issues at regional and national level may make the production and utilization of bio-fuels desirable.
By carrying out technical and technological development in plant production, producing raw materials of biodiesel and bioethanol may be one of the successful branches of agriculture, which would make fulfilling the EU undertakings and reaching export revenue of significant added value possible. The last one may be restricted by the foreign competitors, the available land and the interest of animal husbandry. Although due to technological development and economic conditions, spread of new products and processes (cellulosic-based bioethanol, hydrogen, solar energy) will obviously have to be expected in the future, at present biodiesel, bioethanol and bio methane are determinant among bio-fuels.

Each of them differs in terms of feedstock source, net energy yield per hectare and investment cost. The net energy yield per ha with biogas can be much higher than with bioethanol production, provided the entire crop is fermented in the biogas plant. However, bioethanol would come closer to the net energy yield of biogas, when cellulose is fermented to alcohol. Additionally, the investment costs are much higher for biogas than for bioethanol (Popp et al, 2008).

During the past period, many contradictory opinions came forward relating to economies, agricultural effects, food risks as well as the energetic and environmental efficiency of bio-fuels. One thing is certain: these fuels are already used today and their significance has been increasing.

The demand for biodiesel and bioethanol will basically be influenced by three factors in the future (Bai, 2004):

- It can be used not only in near the production, it is economically transportable and it can be used in blends with diesel, consequently its demand is not limited by local market.

- The EU and the related domestic legislations prescribe the minimum ratio of biofuels – 10% by 2020 -, but it may also be fulfilled not only with the use of biodiesel and bioethanol, but second generation biofuels too.

- Economic factors, mostly the oil price in the world market, the price of the feedstock and feeds, the changing of tax on the net price of fuel, and – due to transport costs – the determination of the entitled incorporations.

The demand for biogas as motor fuel will basically be dictated by other elements in the near future:

- Cleaning and filling it into vehicles are suggested mainly in the neighbourhood of production, the economy of compression without filtering and transportation in tank are very doubtful, consequently local utilization is a crucial point.

- The percentage of motor gas within motor fuels is minimal, therefore the implementation of the EU regulations for the application of bio methane is not relevant.

- Among the economic factors, world price of natural gas and the available profit from other utilization of biogas (cogeneration, feeding into national gas pipeline) are important. In case of the latter, the guaranteed market of green electricity and bio-natural gas are advantages versus bio methane as motor fuel.

The heating values of bio-diesel and bio-ethanol is lower by 10 to 15% and 35 to 40 % respectively, than that of fossil fuel. The hydrogen content of the latter is higher than that of the others, which results in consumption akin to petrol and a more favourable output of harmful materials because of the more efficient burning. This is especially true for the mixture containing 22% of bio-ethanol.

As a result of Jobbágy (2012) analysis it was found that in case of purchasing a new alternative fuel car only CNG-powered vehicle could be a reasonable choice, the extra charge of which (depending on its scale) ensures return in 2 – 7 years, i.e. in the real expected duration of use of the car. However, the spread of these cars is determined by the lack of CNG fuel stations in Hungary. The E85-powered so called FFV-s could become a competitive alternative by lower ethanol prices or moderate governmental support (for example registration fee allowance similarly to the hybrid vehicles or reduced taxes).

Production of biodiesel and bio-ethanol may create working places, which comes from the greater maintain power of agriculture, the multiplication effects of assets markets as well as the processing of raw materials and the produced by-products. According to American studies, it is 34 people in agriculture, 1 person in the bio-ethanol production and 3 people in the processing of by-products projected to 1 million litre bio-ethanol. In case of biodiesel it could be calculated by 4-5 persons per million litres (Jobbágy, 2013).
Biofuel producers are price-takers, not price-makers. Petroleum companies dictate the ethanol price to ethanol producers because there are only a small number of oil refinery companies and a large number of ethanol producers (Popp et al, 2008).

It must be emphasized that over-sized capacity may make even the inland food and fodder supply unstable and make strategic inventory management necessary. The question can be asked even in a different way: what is more favourable to farmers and rural areas in the case of exports of plant products (1) if it is sold as plants (raw materials) abroad with its uncertainty and low added value, or (2) if it is sold as animal products (which can hardly be made competitive in comparison with foreign concurrent products and even quotas regulate the marketing) or (3) if products (fuels) with unlimited barriers are produced in Hungary by creating jobs, local markets and infrastructural developments. This latter naturally has dangers too, not only from the aspects of raw materials, but because of the interest validation ability of foreign capital.

7. References


