Netherlands Natural Capital Model - Technical Documentation

Developed for the Atlas of Natural Capital (www.atlasnatuurlijkkapitaal.nl)

Food Production

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1. Overview

Ecosystems contribute to the production of food, both in the form of 'wild food' and agriculturally produced crops. In the Netherlands, the vast majority of food is produced on agricultural land. Hence, we have defined the ecosystem service 'food production' as the quantity of food crops produced on agricultural land. Food production quantities have been modelled based on ecosystem conditions and functions (e.g. soil type and groundwater level).

At the current stage, five ecosystem service output maps can be viewed within the Atlas of Natural Capital for the service 'food production'. These output maps have been produced by modelling data from input maps, such as the 'soil' and 'soil biophysical units' maps from Wageningen University, using existing and newly developed methodologies. All models were developed by the Flemish Institute for Technological Research (VITO) and the National Institute for Public Health and the Environment of the Netherlands (RIVM). One generic methodology was used to produce separate sets of maps for five types of crops: nuts and fruit, vegetable, maize (i.e. cereal, maize, and other corncob mix-maize), grass, and other crops (i.e. crops not included in other categories, including energy crops).

2. Methodology

In general, output maps have been produced by making use of functions and look-up tables to model data from input maps and reference values. Three types of input data were used to model each output map:

1. **Input maps:** Spatial datasets with environmental, socio-economic and geographical information.
2. **Look-up tables:** Literature- and expert-based tables to reassign and reclassify units between maps.
3. **Reference values:** Values from scientific literature that are used in calculations in the model. *Note: for the 'food production' model no reference values have been used.*

2.1 Input and output files

Table 1 provides an overview of the five output maps produced for the service 'food production'. Information on the input sources (i.e. input maps and look-up tables) adopted for producing output maps is presented in Table 2. Brief descriptions of the units of measurement adopted in input maps and look-up tables are provided. These are described more in detail in Section 2.2.

Table 1. Output maps generated for the ecosystem service 'food production'.

CICES category	Ecosystem service	Output map*	Unit	Short description
PROVISIONING Nutrition	Food production	Biophysical suitability for food production**	Score between 0 and 1	Biophysical suitability values for crop production based on soil characteristics and groundwater level.
		Potential capacity for food production	Yield (%)	Potential agricultural yield for a given crop in a given area (in % of maximum possible yield), based on environmental conditions.
		Actual food production	Yield (%)	Actual agricultural yield for a given crop in a given area (in % of maximum possible yield).
		Monetary value of food production (incl. subsidies)	€/ha /year	The monetary value of the actual production of a given crop including subsidies.
		Monetary value of food production (excl. subsidies)	€/ha /year	The monetary value of the actual production of a given crop excluding subsidies.

*A set of output maps was produced for each of the five crop types.
**Output maps not published on the Atlas of Natural Capital website.

Table 2. Input sources adopted for generating output maps for the ecosystem service 'food production'.

Input	Unit	Short description	Source
INPUT MAP			
Agricultural crop parcels	[-] Categories for crop types	Yearly updated cadastral map of agricultural parcels with information on crops types per parcel.	Ministry of Economic Affairs (RvO)
Land cover/ecosystem unit map	[-] Categories for land cover and ecosystem type	Land cover and ecosystem units map, depicting land cover/ecosystem classes for the Netherlands in 2013.	Statistics Netherlands (CBS)
Soil biophysical units	[-] Categories for soil biophysical units	Defines areas with similar soil characteristics and hydrological activity.	Wageningen Environmental Research
Soil map	[-] Categories for soil biophysical units and groundwater table	Provides spatial information on the groundwater table and on the nature and composition of the top soil until roughly 1 meter depth.	Wageningen Environmental Research
LOOK-UP TABLE			
Agri-environmental measures	Agri-environment measures	Assigns codes based on the existence (=1) or the absence (=0) of a buffer strips in different agri-environments.	VITO
Crop type	5 crop type classes	Classifies and codes crops into encompassing categories (5 in the Netherlands).	VITO
Floodplain	Land cover type floodplain	Reclassifies the land cover map into two classes: floodplain and non-floodplain.	VITO
Flood-based yield loss	Yield loss levels	Assigns different yield loss levels based on the type of crop and the presence (=1) or absence (=0) of a floodplain.	Van Gossum et al. (2014)
Management-based yield loss	Yield performance levels	Assigns different yield performance levels based on Agri-environment measure codes (existence or absence of a buffer strip).	Van Gossum et al. (2014)
Monetary values for	€/ha	For different performance levels for different	Van Broekhoven et al.

crops		crops, €/ha values are assigned, including values with and without subsidies.	(2010)
Performance percentage	Performance percentage classes	Assigns soil performance classes based on suitability levels.	Van Gossum et al. (2014)
Performance class	Performance classes	Assigns different performance levels (4 in the Netherlands) based on food production minimum and maximum ranges.	VITO
Soil profile	Soil profile classes	Soil profile classes (5 in the Netherlands) are assigned based on soil unit values.	VITO
Soil texture	8 texture classes	Defines eight soil texture classes found in the Netherlands. The classes are based on the Flemish texture system.	VITO
Suitability of soil profile	Suitability levels	Assigns suitability levels to different soil profile classes, which will vary depending on the crop category.	Van Gossum et al. (2014)
Suitability of soil texture	Suitability levels	Assigns suitability levels to different soil texture classes, which will vary depending on the crop category.	Van Gossum et al. (2014)

2.2 Modelling ecosystem service maps

Figure 1 provides a (generic) schematic overview on the way input data have been modelled to produce output maps for the ecosystem service 'food production.' Thereafter, the individual steps from the schematic overview will be explained. Five types of crops have been modelled: Fruits, vegetables, maize, grass, and other crops. For each crop type five output maps have been produced. Therefore, steps in Figure 1 have been repeated separately for the five different crop types. The map on the 'potential capacity for food production' models input data on soil biophysical units and soil types to obtain information on soil textures and profiles, and their respective suitability for the production of specific crop types. Calculations take into consideration losses in yield resulting from the existence of floodplains in an area. The 'biophysical capacity for food production' is calculated by normalizing the percentage values obtained for the potential capacity for food production. The map on 'actual food production' considers areas where specific crops are produced and combines this information with the potential production of every crop based on underlying soil properties. Monetary values including and excluding subsidies were assigned to actual production values based on figures obtained from a study by Van Broekhoven et al. (2010).

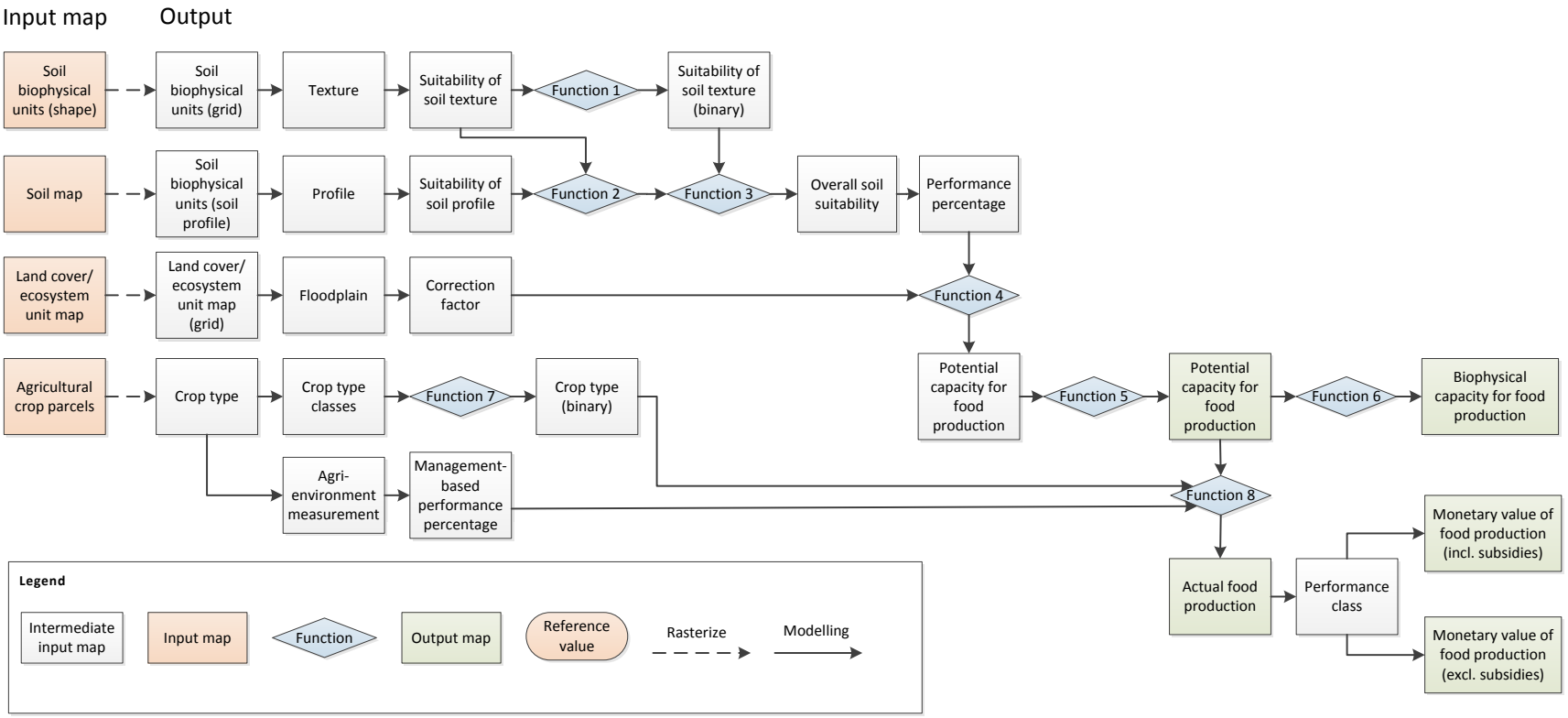

Figure 1. Schematic overview of 'food production' model (generic). This method was applied to all five crop groups.

Step 1: Determining the soil texture suitability for crop production

1.1 The map 'Soil biophysical units (shape)' is a vector file that illustrates areas with similar soil characteristics and hydrological activity. We begin by rasterizing the vector file into a grid file 'Soil biophysical units (grid)'.

1.2 The soil biophysical units from 'Soil biophysical units (grid)' are then reclassified into codes for eight soil texture classes (see Table 3) found in the Netherlands, which are based on the Flemish texture system, using the look-up table 'Soil texture'.

1.3 The suitability of different soil textures for producing a specific crop is determined by reclassifying soil texture classes into one of five soil texture suitability levels (see Table 4), using the look-up table 'Suitability of soil texture' (Van Gossum et al., 2014).

Table 3. Codes for soil textures.

Code	Soil texture class
1	Loam soils (A)
2	Clay (E)
3	Sandy loam soils (L)
4	Light sandy loam soils (P)
5	Loamy sand soils (S)
6	Heavy clay soils (U)
7	Peat (Q)
8	Sandy (Z)

Table 4. Suitability level of soil texture classes for the production of 5 crop types.

		Crop type (code)				
		Other crops (1)	Nuts and fruit (2)	Grass (3)	Vegetables (4)	Maize (5)
Texture class	1	1	1	1	3	1
	2	1	2	1	4	2
	3	1	1	1	1	1
	4	2	2	2	1	1
	5	3	2	2	2	2
	6	2	3	2	5	3
	7	5	5	5	5	5
	8	3	3	3	3	2

Note: Only areas where crops are available will receive a soil-texture suitability score. Areas where no crops are present have a crop-type code of zero and will thus receive no score.

Step 2: Determining soil profile suitability for crop production

2.1 The map 'Soil map' is a vector file that provides information on the groundwater table and on the nature and composition of the soil until roughly 1 meter in depth. It can be used to obtain information on the soil profile. The vector file is rasterized into grid file 'Soil biophysical units (profile)'.

2.2 The units from 'Soil biophysical units (soil profile)' are reclassified into codes for five soil-profile classes (see Table 5) using the look-up table 'Soil profile'. Soil profile classes were translated from the Flemish approach, developed by VITO (Van Gossum et al., 2014).

2.3 The suitability of different soil profiles for producing a specific crop is determined by assigning soil profile suitability levels to profile classes (see Table 6) using the look- up table 'Suitability of soil profile' (Van Gossum et al., 2014).

Table 5. Codes for soil profile classes.

Code	Soil profile
1	Soil without profile development (P)
2	Land with clear humus and / or iron enrichment horizon (pods) (G)
3	Soils with deep anthropogenic humus A horizon (M)
4	Soils with blackish humus A horizon (E)
8	Land with clay enrichment horizon (or texture B horizon) (A)

Note: A wider variety of soil profile classes have been identified but only the ones presented here are used for Dutch maps.

Table 6. Suitability level of soil profile classes for the production of 5 crop types.

		Crop type (code)				
		Other crops (1)	Nuts and fruit (2)	Grass (3)	Vegetables (4)	Maize (5)
Profile class	1	0	0	0	0	0
	2	1	1	1	1	1
	3	-1	-1	-1	-1	-1
	4	0	0	0	0	0
	8	0	0	0	0	0

Note: Only areas where crops are available will receive a soil-profile suitability score. Areas where no crops are present have a crop-type code of zero and will thus receive no score.

Step 3: Determining the general suitability of the soil for crop production

3.1 Following Function 1 (see Table 7), the suitability of soil texture for producing a crop is recalculated, whereby texture suitability levels with a value of 0 will remain as 0 (i.e. non-agricultural land uses) and all other values will receive a value of 1.

3.2 Following Function 2 (see Table 7), we obtain the overall soil suitability level by adding the soil texture suitability levels (i.e. 0 to 5) obtained in Step 1.3 and the soil profile suitability levels (i.e. -1, 0, or 1) obtained in Step 3.1. We then recalculate the overall soil suitability value, whereby any value higher than 5 will be assigned a value of 5 and any value below 1 will be assigned a value of 1.

3.3 Following Function 3 (see Table 7), the overall soil suitability value obtained in Step 3.2 is multiplied by the binary variable obtained for texture suitability in Step 3.1. In doing so, all areas where crops are not available will receive a value of 0, and other areas will receive a score between 1 and 5.

Table 7. Functions 1, 2, and 3, used for calculating the 'suitability of soil texture (binary)' and the 'overall soil suitability' (suitability based on soil texture and profile) for crop production.

Function	Expression
Function 1: Suitability of soil texture (binary)	$f(x) = \begin{cases} 1, & x > 0 \\ 0, & x = 0 \end{cases}$ where x=suitability of soil texture
Function 2: Overall soil suitability	$f(x) = \begin{cases} 5, & (x_1 + x_2) > 5 \\ 1, & (x_1 + x_2) < 1 \end{cases}$ where x_1= suitability of soil texture, x_2= suitability of soil profile
Function 3: Overall soil suitability (recalculated)	$f(x) = x_1 \times x_2$ where x_1= overall soil suitability, x_2= suitability of soil texture (binary)

Step 4: Determining soil performance

4.1 Overall soil suitability levels obtained in Step 3.3 are reclassified into soil-performance percentages (see Table 8), using the look-up table 'Performance percentage' (Van Gossum et al., 2014).

Table 8. Performance percentage classes for different soil suitability levels.

Overall soil suitability (reclassified)	Performance (%)
1	1
2	0.8
3	0.6
4	0.4
5	0.15

Step 5: Correcting values in floodplain areas

5.1 The vector file 'Land cover/ecosystem unit map' is rasterized into the grid file 'Land cover/ecosystem unit map (grid)'.

5.2 The land-use classes from the map 'Land cover/ecosystem unit map (grid)' are reclassified using the look-up table 'Floodplain' to assign areas where floodplains are present. A value of 1 is assigned whenever a floodplain is present and 0 otherwise.

5.3 The 'correction factor' is calculated by assigning yield-loss percentage levels based on whether a floodplain is present in an area, since the existence of floodplains will reduce yield performance. For this purpose, the look-up table 'Flood-based yield loss' is used (see Table 2.7).

Table 9. Percentage yield-loss resulting from the presence of floodplains.

Crop type code	Flood-based yield-loss (%)
1	0.21
2	0.31
3	0.15
4	0.31
5	0.21

Step 6: Calculating the map 'potential capacity for food production'

6.1 Following Function 4 (see Table 10), the potential capacity for food production is calculated by subtracting the yield-loss levels obtained in Step 5.3 from the performance percentages obtained in Step 4.1.

6.2 Following Function 5 (see Table 10), the ecosystem service 'potential for food production' is calculated. The potential capacity calculated in Step 6.1 is recalculated using an 'if' statement, whereby performance levels with a value lower than 0 are assigned a value of 0 and performance levels with a value higher than 0 remain the same. This should result in a performance level between 0 and 1.

Table 10. Functions 4 and 5, used for calculating the 'Potential capacity for food production' map.

Function	Expression
Function 4: Potential capacity for food production	$f(x) = x_1 - x_2$ where x_1= soil performance (%), x_2= flood based yield-loss (%)
Function 5: Potential capacity for food production (recalculated)	$f(x) = \begin{cases} x, & x > 0 \\ 0, & x < 0 \end{cases}$ where x=potential capacity for food production

Step 7: Calculating the map 'biophysical capacity for food production'

7.1 Following Function 6 (see Table 11), the 'biophysical capacity for food production' output map is calculated by normalizing the values from the 'potential capacity for food production'.

Table 11. Function 6, used for calculating the 'biophysical capacity for food production' map.

Function	Expression
Function 6: Biophysical capacity for food production	$f(x) = normalize\ (x)$ where x= potential capacity for food production (recalculated)

Step 8: Assigning areas where crops are present

8.1 The vector file 'Agricultural crop parcels' is rasterized to grid file 'crop type'.

8.2 The look-up table 'Crop type classes' is use to reclassify different crop types into crop type classes (see Table 12).

8.3 Following Function 7 (see Table 13), a binary variable is created whereby a 1 is assigned for locations where crops are present and 0 for locations where they are absent.

Table 12. Crop type codes.

Code	Crop type class
0	No agriculture/temporarily no agriculture
1	Other crops
2	Nuts and fruit
3	Grass
4	Vegetables
5	Maize

Table 13. Function 7, used for defining areas where crops are present.

Function	Expression
Function 7: Crop type (binary)	$f(x) = \begin{cases} 1, & x_1 = x_2 \\ 0, & x_1 \neq x_2 \end{cases}$ where x_1=crop type, x_2=crop

Step 9: Assigning yield performance percentages to green borders

9.1 The look-up table 'Agri-environmental measures' is use to reclassify different crop type classes, whereby a value of 1 is assigned whenever a green border is present and a value of 0 otherwise (see Table 2.9).

9.2 Agri-environment measures are reclassified into yield-performance percentages using the 'Management-based yield loss' look-up table, whereby locations in which green borders are present are assigned a different performance percentage than locations where they are absent (see Table 14). This is the case since the presence of green borders, while enhancing other ecosystem services, limits the amount of space that can be allocated to the production of food.

Table 14. Management-based performance percentage.

Agri-environmental measure	Agri-environmental measure code	Management-based performance percentage (%)
Green border	1	0.2
No measure	0	1

Step 10: Calculating the map 'actual food production'

10.1 Following Function 8 (see Table 15), the map for 'actual food production' is calculated by multiplying the 'potential for food production' obtained in Step 6, times the 'crop type (binary)' variable calculated in Step 8, and times the 'management-based yield performance' variable calculated in Step 9. The formula is used to assign crop yield performance levels on areas where crops are present, taking into consideration the yield-loss percentage resulting from the existence of green border is present or not.

Table 15. Function 8: Calculating the 'actual food production' map.

Function	Expression
Function 8: Actual food production	$f(x) = x_1 \times x_2 \times x_3$ where x_1= potential capacity for food production (recalculated), x_2= crop type (binary), x_3= management-based performance percentage

Step 11: Calculating the map 'monetary value of food production'

11.1 The map for the 'monetary value of production including subsidies' is created by first reclassifying the values in 'actual food production' obtained in Step 10 into different performance levels based on minimum and maximum food production levels (see Table 16), using the 'Performance class' look-up table.

11.2 The map 'monetary value of food production (included subsidies)' is obtained by reclassifying the performance classes obtained in Step 11.1 into euro values (€/ha) for every crop (see Table 17), using the look-up table 'Monetary values for crops'. Euro values including subsidies are assigned to crops depending on the crop type and its performance class.

11.3 The map 'monetary value of food production (excluding subsidies)' is obtained by reclassifying the performance classes obtained in Step 11.1 into euro values (€/ha) for every crop (see Table 18), using the look-up table 'Monetary values for crops'. Euro values without subsidies are assigned to crops depending on the crop type and its performance class.

Table 16. Crop performance classes assigned to actual food production levels.

Actual food production (lower limit)	Actual food production (upper limit)	Performance class
-1	0	0
0.75	1	1
0.25	0.75	2
0	0.25	3

Table 17. Monetary values (including subsidies) for all crop types.

		Crop type (code)					
		No crops (0)	Other crops (1)	Nuts and fruit (2)	Grass (3)	Vegetables (4)	Maize (5)
Performance class	0	0.00	0.00	0.00	0.00	0.00	0.00
	1	0.00	1630.62	7186.52	587.26	4934.55	726.03
	2	0.00	1053.35	3371.00	454.25	2595.28	524.71
	3	0.00	492.26	-24.58	321.36	339.30	338.63

Table 18. Monetary values (excluding subsidies) for all crop types.

		Crop type (code)					
		No crops (0)	Other crops (1)	Nuts and fruit (2)	Grass (3)	Vegetables (4)	Maize (5)
Performance class	0	0.00	0.00	0.00	0.00	0.00	0.00
	1	0.00	1195.58	7149.45	241.78	4777.02	226.97
	2	0.00	633.37	3255.74	158.99	2381.45	93.40
	3	0.00	117.54	-125.89	78.50	209.80	-48.92

3. Remarks and areas for improvement

The model provides insight into relative measures for food production, but does not provide quantitative output in terms of the amount of food produced (e.g. tons of produce or energetic value).

The model currently does not take local agricultural management into account, such as pesticide and fertilizer use, crop rotation and the variation in agro-environmental schemes.

The current monetary calculations make use of Flemish agricultural accounting data for 2010. Comparable data for the Netherlands could improve the model accuracy.

References

Van Broekhoven E.. Somers L. & Tacquenier B.. 2012. Overzicht van de boekhoudkundige resultaten van 749 land- en tuinbouwbedrijven Boekjaar 2010 Landbouwmonitoringsnetwerk.

Van Gossum. P.. Danckaert. S.. Spanhove. T.. & Wils. C. (2014). Hoofdstuk 11 - Ecosysteemdienst voedselproductie. In M. Stevens (Ed.). Natuurrapport - Toestand en trend van ecosystemen en ecosysteemdiensten in Vlaanderen. Brussel: Instituut voor Natuur-en Bosonderzoek.

Appendix

A1 Input and output file names and sources

Table A 1. Input source file-names and sources.

Input	File name	Source
Input map		
Agricultural crop parcels	Basisregistratie gewaspercelen 2012 (BRP).shp	Ministry of Economic Affairs (RvO)
Crop type	Gewas.asc	Ministry of Economic Affairs (RvO)
Land cover/ecosystem unit map	LCEU kaart.shp	Statistics Netherlands (CBS)
Soil biophysical units (shape)	BOFEK2012.shp	Wageningen Environmental Research
Soil biophysical units (soil profile)	'Eerste_bod.asc	Wageningen Environmental Research
Soil map	GxG-NHI.asc	Wageningen Environmental Research
Look-up table		
Agri-environmental measures	Landbouwmilieumaatregelen.tab	VITO
Crop type classes	Teelt.tab	VITO
Flood-based yield loss	Opbrengstverlies_overstroming.tab	VITO
Floodplain	Uiterwaarden.tab	Van Gossum et al. (2014)
Management-based yield loss	Opbrengstverlies_beheer.tab	Van Gossum et al. (2014)
Monetary values for crops	Boekhoudkundigeresultaten.tab	Van Broekhoven et al. (2010)
Performance class	Rendementsklasse.tab	Van Gossum et al. (2014)
Performance percentage	Rendement.tab	VITO
Soil profile	Bodemgeschiktheid(b).tab	VITO
Soil texture	Bodemgeschiktheid(a).tab	VITO
Suitability of soil profile	Profiel.tab	Van Gossum et al. (2014)
Suitability of soil texture	Textuur.tab	Van Gossum et al. (2014)

Table A 2. Output map file-names.

Output map	File name
Actual food production	Metafiche_ActueleVoedselproductie.xls
Biophysical capacity for food production	Metafiche_FysischeGeschiktheidVoedselproductie.xls
Monetary value of food production (excl. subsidies)	Metafiche_WaardeActueleVoedselproductie zonder subsidie.xls
Monetary value of food production (incl. subsidies)	Metafiche_WaardeActueleVoedselproductiemet subsidie.xls
Potential capacity of food production	Metafiche_PotentiëleVoedselproductie.xls

A2 Functions

Table A 3. Functions.

Function	Expression
Function 1: Suitability of soil texture (binary)	$f(x) = \begin{cases} 1. & x > 0 \\ 0. & x = 0 \end{cases}$ where x=suitability of soil texture
Function 2: Overall soil suitability	$f(x) = \begin{cases} 5. & (x_1 + x_2) > 5 \\ 1. & (x_1 + x_2) < 1 \end{cases}$ where x_1= suitability of soil texture. x_2= suitability of soil profile
Function 3: Overall soil suitability (recalculated)	$f(x) = x_1 \times x_2$ where x_1= overall soil suitability. x_2= suitability of soil texture (binary)
Function 4: Potential capacity for food production	$f(x) = x_1 - x_2$ where x_1= soil performance (%). x_2= flood based yield-loss (%)
Function 5: Potential capacity for food production (recalculated)	$f(x) = \begin{cases} x. & x > 0 \\ 0. & x < 0 \end{cases}$ where x=potential capacity for food production
Function 6: Biophysical capacity for food production	$f(x) = normalize\ (x)$ where x= potential capacity for food production (recalculated)
Function 7: Crop type (binary)	$f(x) = \begin{cases} 1. & x_1 = x_2 \\ 0. & x_1 \neq x_2 \end{cases}$ where x_1=crop type. x_2=crop
Function 8: Actual food production	$f(x) = x_1 \times x_2 \times x_3$ where x_1= potential capacity for food production (recalculated). x_2= crop type (binary). x_3= management-based yield performance

A3 Script

```
//Unzip de benodigde inputkaarten
cmd unzip -u Gewas
cmd unzip -u Eerste_bod
cmd unzip -u bofek2012
cmd unzip -u LCEU


//STAP 1: Laad de benodigde inputkaarten
assign(Gewas.'Gewas.asc')
assign(Eerste_bod.'Eerste_bod.asc')
assign(bofek2012.'bofek2012.asc')
assign(LCEU.'LCEU.asc')


//STAP 2: Herclassificatie Textuur en Drainage volgens Vlaamse bodemklasses
assign(Textuur.reclass('../kt/Textuur.tab'.bofek2012))
assign(Profiel.reclass('../kt/Profiel.tab'.Eerste_bod))
deleteVariable(bofek2012.Eerste_bod)
```

```
//Teelt type = 'akker'
assign(Teelt.1)


//STAP 3: Bepaal landbouwgeschiktheid van de bodem
assign(Bodemgeschiktheid1.reclassi(2.'../kt/Bodemgeschiktheid(a).tab'.Textuur.Teelt.1))
assign(Geschikt.if(eq(Bodemgeschiktheid1.0).0.1))
assign(Bodemgeschiktheid2.Bodemgeschiktheid1+reclassi(2.'../kt/Bodemgeschiktheid(b).tab'.Profiel.Teelt.1))
assign(Bodemgeschiktheid2.Geschikt*if(gt(Bodemgeschiktheid2.5).5.if(lt(Bodemgeschiktheid2.1).1.Bodemgeschiktheid2)))
deleteVariable(Bodemgeschiktheid1.Geschikt)


//STAP 4: Corrigeer landbouwgeschiktheid door rekening te houden met overstromingsgevoeligheid
assign(Rendement.reclass('../kt/Rendement.tab'.Bodemgeschiktheid2))
assign(Correctiefactor2.reclassi(2.'../kt/Opbrengstverlies_overstroming.tab'.Teelt.reclass('../kt/Uiterwaarden.tab'.LCEU).1))
deleteVariable(Bodemgeschiktheid2)


//STAP 5: Bepaal de de biofysische geschiktheid en de potentiële voedselproductie
assign(Potentiele_voedselproductie.Rendement-Correctiefactor2)
assign(Potentiele_voedselproductie.if(lt(Potentiele_voedselproductie.0).0.Potentiele_voedselproductie))
assign(Fysische_geschiktheid.normalise(Potentiele_voedselproductie))
write('out/Fysische_geschiktheid_akker.asc'.Fysische_geschiktheid)
write('out/Potentiele_voedselproductie_akker.asc'.Potentiele_voedselproductie)
deleteVariable(Fysische_geschiktheid.Correctiefactor2.Rendement)


//STAP 6: Bepaal de actuele voedselproductie
assign(Teelt_type_binair.if(eq(reclass('../kt/Teelt.tab'.Gewas).Teelt).1.0))
assign(Opbrengstpercentage.reclass('../kt/Opbrengstverlies_beheer.tab'.reclass('../kt/Landbouwmilieumaatregelen.tab'.Gewas)
))
assign(Actuele_voedselproductie.Opbrengstpercentage*Teelt_type_binair*Potentiele_voedselproductie)
write('out/Actuele_voedselproductie_akker.asc'.Actuele_voedselproductie)
deleteVariable(Teelt_type_binair.Potentiele_voedselproductie.Opbrengstpercentage)


//STAP 7: Bepaal de waarde van de actuele voedselproductie
write('out/Waarde_actuele_voedselproductie_met_subsidie_akker.asc'.reclassi(2.'../kt/Boekhoudkundige_resultaten.tab'.nrecl
ass('../kt/Rendementsklasse.tab'.Actuele_voedselproductie).Teelt.1))
write('out/Waarde_actuele_voedselproductie_zonder_subsidie_akker.asc'.reclassi(2.'../kt/Boekhoudkundige_resultaten.tab'.nr
eclass('../kt/Rendementsklasse.tab'.Actuele_voedselproductie).Teelt.2))
deleteVariable(Actuele_voedselproductie.Teelt)


//Teelt type = 'fruit'
assign(Teelt.2)


//STAP 3: Bepaal landbouwgeschiktheid van de bodem
assign(Bodemgeschiktheid1.reclassi(2.'../kt/Bodemgeschiktheid(a).tab'.Textuur.Teelt.1))
assign(Geschikt.if(eq(Bodemgeschiktheid1.0).0.1))
assign(Bodemgeschiktheid2.Bodemgeschiktheid1+reclassi(2.'../kt/Bodemgeschiktheid(b).tab'.Profiel.Teelt.1))
assign(Bodemgeschiktheid2.Geschikt*if(gt(Bodemgeschiktheid2.5).5.if(lt(Bodemgeschiktheid2.1).1.Bodemgeschiktheid2)))
deleteVariable(Bodemgeschiktheid1.Geschikt)
```

```
//STAP 4: Corrigeer landbouwgeschiktheid door rekening te houden met overstromingsgevoeligheid
assign(Rendement.reclass('../kt/Rendement.tab'.Bodemgeschiktheid2))
assign(Correctiefactor2.reclassi(2.'../kt/Opbrengstverlies_overstroming.tab'.Teelt.reclass('../kt/Uiterwaarden.tab'.LCEU).1))
deleteVariable(Bodemgeschiktheid2)


//STAP 5: Bepaal de de biofysische geschiktheid en de potentiële voedselproductie
assign(Potentiele_voedselproductie.Rendement-Correctiefactor2)
assign(Potentiele_voedselproductie.if(lt(Potentiele_voedselproductie.0).0.Potentiele_voedselproductie))
assign(Fysische_geschiktheid.normalise(Potentiele_voedselproductie))
write('out/Fysische_geschiktheid_fruit.asc'.Fysische_geschiktheid)
write('out/Potentiele_voedselproductie_fruit.asc'.Potentiele_voedselproductie)
deleteVariable(Fysische_geschiktheid.Correctiefactor2.Rendement)


//STAP 6: Bepaal de actuele voedselproductie
assign(Teelt_type_binair.if(eq(reclass('../kt/Teelt.tab'.Gewas).Teelt).1.0))
assign(Opbrengstpercentage.reclass('../kt/Opbrengstverlies_beheer.tab'.reclass('../kt/Landbouwmilieumaatregelen.tab'.Gewas)
))
assign(Actuele_voedselproductie.Opbrengstpercentage*Teelt_type_binair*Potentiele_voedselproductie)
write('out/Actuele_voedselproductie_fruit.asc'.Actuele_voedselproductie)
deleteVariable(Teelt_type_binair.Potentiele_voedselproductie.Opbrengstpercentage)


//STAP 7: Bepaal de waarde van de actuele voedselproductie
write('out/Waarde_actuele_voedselproductie_met_subsidie_fruit.asc'.reclassi(2.'../kt/Boekhoudkundige_resultaten.tab'.nrecla
ss('../kt/Rendementsklasse.tab'.Actuele_voedselproductie).Teelt.1))
write('out/Waarde_actuele_voedselproductie_zonder_subsidie_fruit.asc'.reclassi(2.'../kt/Boekhoudkundige_resultaten.tab'.nre
class('../kt/Rendementsklasse.tab'.Actuele_voedselproductie).Teelt.2))
deleteVariable(Actuele_voedselproductie.Teelt)


//Teelt type = 'gras'
assign(Teelt.3)


//STAP 3: Bepaal landbouwgeschiktheid van de bodem
assign(Bodemgeschiktheid1.reclassi(2.'../kt/Bodemgeschiktheid(a).tab'.Textuur.Teelt.1))
assign(Geschikt.if(eq(Bodemgeschiktheid1.0).0.1))
assign(Bodemgeschiktheid2.Bodemgeschiktheid1+reclassi(2.'../kt/Bodemgeschiktheid(b).tab'.Profiel.Teelt.1))
assign(Bodemgeschiktheid2.Geschikt*if(gt(Bodemgeschiktheid2.5).5.if(lt(Bodemgeschiktheid2.1).1.Bodemgeschiktheid2)))
deleteVariable(Bodemgeschiktheid1.Geschikt)


//STAP 4: Corrigeer landbouwgeschiktheid door rekening te houden met overstromingsgevoeligheid
assign(Rendement.reclass('../kt/Rendement.tab'.Bodemgeschiktheid2))
assign(Correctiefactor2.reclassi(2.'../kt/Opbrengstverlies_overstroming.tab'.Teelt.reclass('../kt/Uiterwaarden.tab'.LCEU).1))
deleteVariable(Bodemgeschiktheid2)


//STAP 5: Bepaal de de biofysische geschiktheid en de potentiële voedselproductie
assign(Potentiele_voedselproductie.Rendement-Correctiefactor2)
assign(Potentiele_voedselproductie.if(lt(Potentiele_voedselproductie.0).0.Potentiele_voedselproductie))
assign(Fysische_geschiktheid.normalise(Potentiele_voedselproductie))
write('out/Fysische_geschiktheid_gras.asc'.Fysische_geschiktheid)
write('out/Potentiele_voedselproductie_gras.asc'.Potentiele_voedselproductie)
deleteVariable(Fysische_geschiktheid.Correctiefactor2.Rendement)
```

```
//STAP 6: Bepaal de actuele voedselproductie
assign(Teelt_type_binair.if(eq(reclass('../kt/Teelt.tab'.Gewas).Teelt).1.0))
assign(Opbrengstpercentage.reclass('../kt/Opbrengstverlies_beheer.tab'.reclass('../kt/Landbouwmilieumaatregelen.tab'.Gewas)
))
assign(Actuele_voedselproductie.Opbrengstpercentage*Teelt_type_binair*Potentiele_voedselproductie)
write('out/Actuele_voedselproductie_gras.asc'.Actuele_voedselproductie)
deleteVariable(Teelt_type_binair.Potentiele_voedselproductie.Opbrengstpercentage)


//STAP 7: Bepaal de waarde van de actuele voedselproductie
write('out/Waarde_actuele_voedselproductie_met_subsidie_gras.asc'.reclassi(2.'../kt/Boekhoudkundige_resultaten.tab'.nrecla
ss('../kt/Rendementsklasse.tab'.Actuele_voedselproductie).Teelt.1))
write('out/Waarde_actuele_voedselproductie_zonder_subsidie_gras.asc'.reclassi(2.'../kt/Boekhoudkundige_resultaten.tab'.nre
class('../kt/Rendementsklasse.tab'.Actuele_voedselproductie).Teelt.2))
deleteVariable(Actuele_voedselproductie.Teelt)


//Teelt type = 'groenten'
assign(Teelt.4)


//STAP 3: Bepaal landbouwgeschiktheid van de bodem
assign(Bodemgeschiktheid1.reclassi(2.'../kt/Bodemgeschiktheid(a).tab'.Textuur.Teelt.1))
assign(Geschikt.if(eq(Bodemgeschiktheid1.0).0.1))
assign(Bodemgeschiktheid2.Bodemgeschiktheid1+reclassi(2.'../kt/Bodemgeschiktheid(b).tab'.Profiel.Teelt.1))
assign(Bodemgeschiktheid2.Geschikt*if(gt(Bodemgeschiktheid2.5).5.if(lt(Bodemgeschiktheid2.1).1.Bodemgeschiktheid2)))
deleteVariable(Bodemgeschiktheid1.Geschikt)


//STAP 4: Corrigeer landbouwgeschiktheid door rekening te houden met overstromingsgevoeligheid
assign(Rendement.reclass('../kt/Rendement.tab'.Bodemgeschiktheid2))
assign(Correctiefactor2.reclassi(2.'../kt/Opbrengstverlies_overstroming.tab'.Teelt.reclass('../kt/Uiterwaarden.tab'.LCEU).1))
deleteVariable(Bodemgeschiktheid2)


//STAP 5: Bepaal de de biofysische geschiktheid en de potentiële voedselproductie
assign(Potentiele_voedselproductie.Rendement-Correctiefactor2)
assign(Potentiele_voedselproductie.if(lt(Potentiele_voedselproductie.0).0.Potentiele_voedselproductie))
assign(Fysische_geschiktheid.normalise(Potentiele_voedselproductie))
write('out/Fysische_geschiktheid_groenten.asc'.Fysische_geschiktheid)
write('out/Potentiele_voedselproductie_groenten.asc'.Potentiele_voedselproductie)
deleteVariable(Fysische_geschiktheid.Correctiefactor2.Rendement)


//STAP 6: Bepaal de actuele voedselproductie
assign(Teelt_type_binair.if(eq(reclass('../kt/Teelt.tab'.Gewas).Teelt).1.0))
assign(Opbrengstpercentage.reclass('../kt/Opbrengstverlies_beheer.tab'.reclass('../kt/Landbouwmilieumaatregelen.tab'.Gewas)
))
assign(Actuele_voedselproductie.Opbrengstpercentage*Teelt_type_binair*Potentiele_voedselproductie)
write('out/Actuele_voedselproductie_groenten.asc'.Actuele_voedselproductie)
deleteVariable(Teelt_type_binair.Potentiele_voedselproductie.Opbrengstpercentage)


//STAP 7: Bepaal de waarde van de actuele voedselproductie
write('out/Waarde_actuele_voedselproductie_met_subsidie_groenten.asc'.reclassi(2.'../kt/Boekhoudkundige_resultaten.tab'.n
reclass('../kt/Rendementsklasse.tab'.Actuele_voedselproductie).Teelt.1))
```

```
write('out/Waarde_actuele_voedselproductie_zonder_subsidie_groenten.asc'.reclassi(2.'../kt/Boekhoudkundige_resultaten.tab'.nreclass('../kt/Rendementsklasse.tab'.Actuele_voedselproductie).Teelt.2))
deleteVariable(Actuele_voedselproductie.Teelt)


//Teelt type = 'mais'
assign(Teelt.5)


//STAP 3: Bepaal landbouwgeschiktheid van de bodem
assign(Bodemgeschiktheid1.reclassi(2.'../kt/Bodemgeschiktheid(a).tab'.Textuur.Teelt.1))
assign(Geschikt.if(eq(Bodemgeschiktheid1.0).0.1))
assign(Bodemgeschiktheid2.Bodemgeschiktheid1+reclassi(2.'../kt/Bodemgeschiktheid(b).tab'.Profiel.Teelt.1))
assign(Bodemgeschiktheid2.Geschikt*if(gt(Bodemgeschiktheid2.5).5.if(lt(Bodemgeschiktheid2.1).1.Bodemgeschiktheid2)))
deleteVariable(Bodemgeschiktheid1.Geschikt)


//STAP 4: Corrigeer landbouwgeschiktheid door rekening te houden met overstromingsgevoeligheid
assign(Rendement.reclass('../kt/Rendement.tab'.Bodemgeschiktheid2))
assign(Correctiefactor2.reclassi(2.'../kt/Opbrengstverlies_overstroming.tab'.Teelt.reclass('../kt/Uiterwaarden.tab'.LCEU).1))
deleteVariable(Bodemgeschiktheid2)


//STAP 5: Bepaal de de biofysische geschiktheid en de potentiële voedselproductie
assign(Potentiele_voedselproductie.Rendement-Correctiefactor2)
assign(Potentiele_voedselproductie.if(lt(Potentiele_voedselproductie.0).0.Potentiele_voedselproductie))
assign(Fysische_geschiktheid.normalise(Potentiele_voedselproductie))
write('out/Fysische_geschiktheid_mais.asc'.Fysische_geschiktheid)
write('out/Potentiele_voedselproductie_mais.asc'.Potentiele_voedselproductie)
deleteVariable(Fysische_geschiktheid.Correctiefactor2.Rendement)


//STAP 6: Bepaal de actuele voedselproductie
assign(Teelt_type_binair.if(eq(reclass('../kt/Teelt.tab'.Gewas).Teelt).1.0))
assign(Opbrengstpercentage.reclass('../kt/Opbrengstverlies_beheer.tab'.reclass('../kt/Landbouwmilieumaatregelen.tab'.Gewas)
))
assign(Actuele_voedselproductie.Opbrengstpercentage*Teelt_type_binair*Potentiele_voedselproductie)
write('out/Actuele_voedselproductie_mais.asc'.Actuele_voedselproductie)
deleteVariable(Teelt_type_binair.Potentiele_voedselproductie.Opbrengstpercentage)
```