

Database of currently applied and promising agricultural management practices

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17	Agricultural University Athens (AUA)	Greece
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19	Institute of Soil and Water Conservation of Chinese Academy of Sciences (ISWC)	China
20	Soil and Fertilizer Institute of the Sichuan Academy of Agricultural Sciences (SFI)	China
21	CorePage (CorePage)	Netherlands
22	BothEnds (BothEnds)	Netherlands
23	University of Pannonia (UP)	Hungary
24	Institute of Soil Science of the Chinese Academy of Sciences (ISS)	China
25	Gaec de la Branchette (GB)	France

D5.3 Database of currently applied and promising agricultural management practices [Month 48]

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WP5 - UNIBE

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1. Introduction

This deliverable is part of task 3 “Selection of innovative agricultural management practices”

The selection of innovative agricultural management practices presented in this deliverable was guided by the documented existing practices across the project study sites and from other comparable sites within the WOCAT database.

In order to identify new or ‘improvable’ practices, a structured process of joint selection and negotiation within a multi-stakeholder participative workshop have been conducted at each case study site. Workshop framework was designed to provide the creative environment that enabled to develop new ideas for management improvements and allowed innovations to flourish. The soil quality improvement potential of selected practices was subsequently tested in WP6.

The aim of deliverable 5.3 is to establish a list of currently applied and promising agricultural management practices with the aim to implement the SQAPP with appropriate recommendations. For this purpose, a first set of proposed AMPs was tested, and completed by a second larger set to cover a wider range of soils and management conditions.

2. Selection of a first list of AMPs for testing

A first list of AMPs was selected within the WOCAT database. The selection was based on promising practices that have been shown to positively affect soil quality within the pedoclimatic zones considered (Table 1).

Table 1. Proposed list of AMPs

N.	List / Identification	Description	Expected impacts / Ecological benefits
1	No-till	A system where crops are planted into the soil without primary tillage	Reduces decomposition of OM rates leading to its increase in soil, enhances cycling of nutrients, enhances soil structure and increases water infiltration. Improves soil biological life including disease and weed suppression.
2	Min-till	Tillage operation with <ul style="list-style-type: none"> • reduced tillage depth • strip tillage • mulch tillage or a combination thereof	Reduces decomposition of OM rates leading to its increase in soil, enhances cycling of nutrients, enhances soil structure and increases water infiltration. Improves soil biological life including disease and weed suppression.
3	Permanent soil cover / Removing less vegetation cover	Avoiding a bare or sparsely covered soil exposed to weather conditions (rain, wind, radiation, etc) by ensuring a permanent cover (at least 30% of the soil surface) throughout the year, e.g. through cutting less grass, leaving a volunteer crop or crop residues, etc.	<ul style="list-style-type: none"> • Improves infiltration and retention of soil moisture resulting in less severe, less prolonged crop water stress and increases availability of plant nutrients. • Provides source of food and habitat for diverse soil life: created channels for air and water, biological tillage and substrate for biological activity through the recycling of organic matter and plant nutrients. • Increases humus formation.

		<i>(see also cover crops and residue maintenance / mulching)</i>	<ul style="list-style-type: none"> • Reduces the impact of rain drops on soil surface resulting in reduced crusting and surface sealing. • Reduces runoff and erosion. • Reduces wind erosion. • Increases soil regeneration. • Mitigates temperature variations on and in the soil. • Improves the conditions for the development of roots and seedling growth.
4	Cover crops	<p>a. Cover cropping: planting close-growing crops (usually annual legumes),</p> <p>b. Relay cropping: specific form of mixed cropping / intercropping in which a second crop is planted into an established stand of a main crop. The second crop develops fully after the main crop is harvested.</p> <p>c. Better crop cover: selecting crops with higher ground cover, increasing plant density, etc.</p>	<p>a. Protects soil, between perennials or in the period between seasons for annual crops. N-fixation in case of leguminous crops.</p> <p>b. Continuously covered soil. Reduces the insect/mite pest populations because of the diversity of the crops grown. Reduces the plant diseases. Reduces hillside erosion and protected topsoil, especially the contour strip cropping. Attracts more beneficial insects, especially when flowering crops are included in the cropping system.</p> <p>c. Protects soil against the impacts of raindrops or wind and keeps soil shaded; and increases moisture content.</p>
5	Leguminous crop	A leguminous crop is a plant in the family Fabaceae (or Leguminosae) that is grown agriculturally, primarily for their grain seed called pulse, for livestock forage and silage, and as soil-enhancing green manure. Well-known legumes include alfalfa, clover, peas, beans, lentils, lupins, mesquite, carob, soybeans, peanuts, and tamarind.	<p>Provides soil with nitrogen and additional nitrogen from chemical fertilizers is not necessary.</p> <p><i>(See also cover crop and green manure)</i></p>
6	Green manure / Integrated soil fertility management	Green manure is a crop grown to be incorporated into the ground, while the more general term 'integrated soil fertility management' refers to a mix of organic and inorganic materials, used with close attention to context-specific timing and placing of the inputs in order to maximize the agronomic efficiency.	Increases organic matter content, thereby improving fertility and reducing erodibility. In case of leguminous green manure, tilling it back into the soil allows exploiting the high levels of captured atmospheric nitrogen found in the roots.

7	Manuring ^a / composting ^b	<p>a) Manure is organic matter, mostly derived from animal feces (except in the case of green manure, which can be used as organic fertilizer in agriculture).</p> <p>b) Compost is organic matter that has been decomposed and recycled as a fertilizer and soil amendment. Compost is a key ingredient in organic farming.</p>	<p>a) Contributes to the fertility of the soil by adding organic matter and nutrients, such as nitrogen, that are trapped by bacteria in the soil.</p> <p>b) Improves soil fertility through nutrient content and availability, soil structure and microbiological activity; impacts plant growth and health directly and indirectly.</p>
8	Residue maintenance / Mulching	Maintaining crops residues or spreading of organic (or other) materials on the soil surface.	<ul style="list-style-type: none"> • Reduces sheet and rill erosion. • Reduces wind erosion. • Maintains or improves soil organic matter content. • Conserves soil moisture. • Provides food and escapes cover for wildlife.
9	Crop rotation ^a / Control or change of species composition ^b	<p>a. Practice of alternating the annual crops grown on a specific field in a planned pattern or sequence in successive crop years so that crops of the same species or family are not grown repeatedly on the same field</p> <p>b. Diversify species in rotation systems or grasslands</p>	<p>a. Reduces risk of pest and weed infestations.</p> <ul style="list-style-type: none"> • Improves distribution of channels or biopores created by diverse roots (various forms, sizes and depths). • Improved distribution of water and nutrients through the soil profile. • Allows exploration for nutrients and water of diverse strata of the soil profile by roots of many different plant species resulting in a greater use of the available nutrients and water. • Increases nitrogen fixation through certain plant-soil biota symbionts and improved balance of N/P/K from both organic and mineral sources. Increases humus formation. <p>b. Introduces desired / new species, reduces invasive species, controls burning, residue burning.</p>
10	Cross-slope measure	Structural measure along the contour to break slope lengths, such as terraces, bunds, grass strip, trashlines, contour tillage	Reduces surface runoff and erosion (increase infiltration capacity).
11	Measures against compaction	<p>a) Breaking compacted soil:</p> <ul style="list-style-type: none"> • e.g. deep ripping, subsoiling (hard pans); • Digging the soil up to twice as deep as normally. <p>b) Growing deep rooted plants in the rotation such as: annual alfalfa, beet, sunflower, okra, flax, turnip.</p> <p>c) Controlled traffic farming: is a system which confines all machinery loads to the least</p>	<p>a-b) Looses soil to improve drainage, infiltration, aeration and rooting characteristics, and brings nutrients up from deep below</p> <p>c-d) Minimizes soil damage and preserves soil function in terms of water infiltration, drainage and greenhouse gas mitigation, and (d) provides useful information for decision making process for site-</p>

		possible area of permanent traffic lanes d) Soil compaction models (considering tire size, inflation pressure, weather and soil conditions) to predict allowable wheel load and soil compaction maps to show how soil compaction varies at different locations and depths across the field	specific applications such as variable deep tillage to benefit from increased timeliness (and reduced management costs)
12	Integrated pest and disease management incl. organic agriculture	Appropriate measures that discourage the development of pest populations and keep pesticides and other interventions to reduce or minimize risks to human health and the environment.	Emphasizes the growth of a healthy crop with the least possible disruption to agro-ecosystems and encourages natural pest control mechanisms.
13	Water diversion and drainage	A graded channel with a supportive ridge or bank on the lower side. It is constructed across a slope to intercept surface runoff and convey it safely to an outlet or waterway	Reduces hazard towards adverse events (floods, storms,...), reduces soil waterlogging
14	Irrigation management	Controlled water supply and drainage: mixed rainfed – irrigated; full irrigation; drip irrigation	Improves water harvesting; increased soil moisture; reduces evaporation; improves excess water drainage; recharge of groundwater
15	Major change in timing of activities	Adaptation of the timing of land preparation, planting, cutting of vegetation according weather and climatic conditions, vegetation growth, etc.	Reduced soil compaction, soil loss, improved biomass, increased biomass, increased soil OM
16	Layout change according to natural and human environment/needs	eg exclusion of natural waterways and hazardous areas, separation of grazing types; increase of landscape diversity.	Reduces surface runoff and erosion, increases biomass, nutrients and soil OM, controls pests and diseases
17	Area closure / rotational grazing	Complete or temporal stop of use to support restoration	Improves vegetative cover, reduces intensity of use, and soil compaction and erosion.
18	Change of land use practices / intensity level	eg change from grazing to cutting (for stall feeding), from continuous cropping to managed fallow, from random (open access) to controlled access (grazing land), from herding to fencing, adjusting stocking rates.	Increases biomass, nutrient cycling, soil OM, improves soil cover, beneficial species (predators, earthworms, pollinators), biological pest / disease control, and increases / maintains habitat diversity. Reduces soil loss, soil crusting/sealing, soil compaction, and invasive alien species.

Task 3. Selecting innovative agricultural management practices (AMP) improving soil quality (WP5 – UNIBE)

3. Tested promising AMPs at case study sites

The impact of promising AMPs on soil quality was assessed using a Visual Soil Assessment tool (e.g. Shepherd, 2000) in a total of 138 pairs of plots/farms spread across 14 study site areas (SSA), including 10 located in Europe and 4 in China. The full description of the SSA's, the establishment of promising AMPs as well as the criteria used to select these 138 pair of farms/plots within each SSA is provided in Barão et al. (2019).

Each pair includes a farm/plot where a new promising AMP has been used for at least the last 3 years (plot-AMP) and a farm/plot where the corresponding conventional practice was implemented during the last 3 years (plot-control).

The previously selected 138 pair of farms/plots include a myriad of promising AMPs and combinations (Barão et al. 2019) in use by farmers and thus represent the promising management choices undertaken locally. The majority of the evaluated pairs of plots/farms corresponds to arable lands with fewer pairs addressing management practices in pasture and permanent farming systems (Table 2).

Globally, the results show that among 138 sets of paired plots, 104 pairs (75.4 %) show a positive impact of promising AMPs on soil quality, 20 pairs (14.5 %) do not show any difference in soil quality between soils under promising practices and soils in the control plots, and the remaining 14 plots (10.1 %) show an inverse effect. In Europe, positive effects of promising AMPs are present in 73.2% of the paired plots, while in China this value is higher (84.6%). The neutral effects of promising AMPs represent 17% of the plots in Europe and 3.8% in China, while the negative effects are comparable in both continents (9.8% and 11.5% respectively) (Table 2).

Table 2. Tested AMPs at case study sites

Promising AMP tested	Farming System			Total plots/farms
	Arable	Pasture	Permanent	
No-till	4		6	10
Min-till	8		2	10
Permanent soil cover / Removing less vegetation cover		3		3
Cover crops	3		1	4
Residue maintenance / Mulching	7		1	8
Cross-slope measure	1		2	3
Measures against compaction	2			2
Leguminous crop	5			5
Green manure / Integrated soil fertility management	2			2
Manuring & composting	12			12
Crop rotation / Control or change of species composition	12		1	13
Integrated pest and disease management incl. organic agriculture	3		4	7
Water diversion and drainage			1	1
Irrigation management	4			4
Major change in timing of activities	1			1
Area closure / rotational grazing		3		3
Change of land use practices / intensity level	2	8		10
Total single promising AMP tested	66	14	18	98
Crop rotation / Control or change of species composition; Integrated pest and disease management incl. organic agriculture	1			1
Integrated pest and disease management incl. organic agriculture; Major change in timing of activities	1			1
Leguminous crop; Residue maintenance / Mulching			1	1
Manuring & composting; Crop rotation / Control or change of species composition	1			1
Manuring & composting; Integrated pest and disease management incl. organic agriculture			1	1
Manuring & composting; Change of land use practices / intensity level		1		1
Manuring & composting; Crop rotation / Control or change of species composition	1			1
Manuring & composting; Cross-slope measure			1	1

Manuring & composting; Integrated pest and disease management incl. organic agriculture	1			1
Min-till ; Crop rotation / Control or change of species composition	1			1
Min-till; Crop rotation / Control or change of species composition	1			1
Min-till; Irrigation management			1	1
Min-till; Manuring & composting	1		2	3
Min-till; Residue maintenance / Mulching	1			1
No-till ; Crop rotation / Control or change of species composition	1			1
No-till; Residue maintenance / Mulching	1			1
Permanent soil cover / Removing less vegetation cover; Leguminous crop			1	1
Permanent soil cover / Removing less vegetation cover; Manuring & composting	1	2		3
Residue maintenance / Mulching; Irrigation management	1			1
Total combination of 2 promising AMP tested	13	3	7	23
Green manure / Integrated soil fertility management; Integrated pest and disease management incl. organic agriculture; Irrigation Management	1			1
Manuring & composting; Crop rotation / Control or change of species composition; Irrigation management	1			1
Min-till; Cover crops; Green manure / Integrated soil fertility management			1	1
Min-till; Manuring & composting; Crop rotation / Control or change of species composition	1			1
Min-till; Permanent soil cover / Removing less vegetation cover; Manuring & composting			1	1
Permanent soil cover / Removing less vegetation cover; Manuring & composting; Residue maintenance / Mulching			1	1
Total combination of 3 promising AMP tested	3	0	3	6
Manuring & composting; Residue maintenance / Mulching; Crop rotation / Control or change of species composition; measures against compaction	1			1
Min-till; Cover crops; Green manure / Integrated soil fertility management; Integrated pest and disease management incl. organic agriculture			1	1
Min-till; Residue maintenance / Mulching; Crop rotation / Control or change of species composition; Measures against compaction	1			1
Total combination of 4 promising AMP tested	3	0	1	3
Cover crops; Green manure / Integrated soil fertility management; Residue maintenance / Mulching; Crop rotation / Control or change of species composition; Measures against compaction	1			1
Min-till; Leguminous crops; Residue maintenance / Mulching; Crop rotation / Control or change of species composition; Measures against compaction	1			1
Min-till; Manuring & composting; Residue maintenance / Mulching; Crop rotation / Control or change of species composition; Measures against compaction	1			
Total combination of 5 promising AMP tested	3	0	0	3
Min-till; Manuring & composting; Residue maintenance / Mulching; Crop rotation / Control or change of species composition; Cross-slope measure; Measures against compaction	1			1
Min-till; Manuring & composting; Residue maintenance / Mulching; Crop rotation / Control or change of species composition; measures against compaction; Measures against compaction	1			1
Total combination of 6 promising AMP tested	2	0	0	2
Min-till; Leguminous crops; Manuring & composting; Residue maintenance / Mulching; Crop rotation / Control or change of species composition; Measures against compaction; Water diversion and drainage	1			1
Min-till; Permanent soil cover / Removing less vegetation cover; Leguminous crops; Manuring & composting; Residue maintenance / Mulching; Crop rotation / Control or change of species composition; Measures against compaction	2			2
Total combination of 7 promising AMP tested	3	0	0	3

4. Expanded list of AMPs

To cover a wider range of soil and land management conditions, the first list of AMPs was expanded (Table 3). 72 AMPs are considered in the SQAPP and served for the recommendations provided by SQAPP for specific needs at the farm scale. Promising AMPs in the case study areas were documented using the WOCAT format. Annex 1 provides an overview of the 34 example technologies described. These technologies may be included as examples in SQAPP. A first qualitative evaluation of the plausibility and consistency of AMPs, was done by WP6 during the field assessment of 2019.

Table 3. Expanded list of AMPs

AMP broad class	AMP category	AMP
Terrain management	Cross-slope barriers	1 Bunds
		2 Terraces
	Runoff control	3 Half moon terraces
		4 Gully rehabilitation
Soil management	Tillage	5 Minimum tillage
		6 No-tillage
		7 Contour ploughing
		8 Subsoiling
		9 Roughening the soil surface
		10 Seedbed placement
		11 Straw interlayer burial
	Traffic management	12 Avoidance of traffic
		13 Controlled traffic
		14 Respect wheel load carrying capacity
	Soil replacement	15 Claying soils
	Soil amendments	16 Soil conditioners
		17 Liming
	Conservation agriculture	18 Conservation agriculture
Vegetation management	Vegetation cover	19 Permanent soil cover in orchards
		20 Cover crops
		21 Rangeland rehabilitation
	Fallow management	22 Planted fallow
		23 Vegetative strips
	Vegetation bands	24 Shelterbelts
		25 Buffer zones/landscape elements
		26 Strip cropping
	Crop choice	27 Deep rooting crops
		28 Intercropping
		29 Growing halophytes
	Crop rotation/diversification	30 Crop rotation/diversification
Water management	Multi-layered vegetation	31 Agroforestry
		32 Diverting water flow
	Diversion	33 Intercepting drains
	Drainage	34 Submerged drains
		35 Drains
		36 Planting pits
	Water harvesting	37 Ridge-furrow systems
		38 Inorganic mulching
	Water conservation	39 Drip irrigation
	Irrigation	40 Flood irrigation
		41 Pivot irrigation
		42 Sprinkler irrigation
	Irrigation management	43 Leaching salts
		44 Minimise saline water irrigation
	Irrigation scheduling	45 Irrigation optimization
	Runoff conveyance	46 Supplemental irrigation
		47 Grassed waterways

Table 3 – continued

Nutrient management	Organic amendments	48	Liquid manure or slurry
		49	Apply animal manures
		50	Compost application
		51	Biochar application
	Inorganic amendments	52	Inorganic fertilisers
	Green manuring	53	Green manure
		54	Leguminous crops
	Retain crop residues	55	Retain crop residues
Pest management	Mulching	56	Chipped branches
		57	Straw mulch
		58	Mechanical weed control
	Weed management	59	Chemical weed control
			Biological weed control
		60	Biological pest control
	Pest management	61	Physical pest control
		62	Chemical pest control
Disease management		63	Physical disease control
		64	Chemical disease control
		Biological disease control	
Pollutant management	Remediation	65	Phytoremediation
	Balanced applications	66	Integrated pest and disease management
		67	Integrated nutrient management
			Automated targetting
Grazing management	Grazing management	68	Controlled and rotational grazing
		69	Area closure

5. Summary and conclusions

In this report, a first set of AMPs was selected and tested at the case study sites. This list has been completed by additional AMPs to take wider range of conditions into account.


































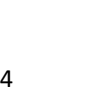
For the first set of indicators, the VSA was applied in 138 paired/plots where different promising AMPs (single or in combination) are in use by local farmers. Among the 138 sets of paired plots, 75.4 % show a positive impact of promising AMPs on soil quality, 14.5 % do not show any difference in soil quality between soils under promising practices and soils in the control plots, and the remaining 10.1 % show inverse negative effect on soil quality. A second assessment was done in 2018 and will be evaluated soon to check these results.

The stakeholders tested the recommendations of the AMPs provided in the SQAPP (expanded list) to verify their plausibility and consistency. The first results have been provided by WP6.

References

- Barão, B., Basch, G., Alaoui, A., Schwilch, G. et al. 2019. Promising Agricultural Management Practices (AMP) Assessment in Europe and China. *Science of the Total Environment* 649, 610-619.
- Shepherd, G. 2000. Visual Soil Assessment. Volume 1. Field guide for cropping and pastoral grazing on flat to rolling country. horizons.mw & Landcare Research, Palmerston North. 84p, ISBN 1-877221-92-9, horizons.mw Report Number 20/EXT/425

Annex 1: 34 AMPs documented in WOCAT format

 <p>Straw residues left on field after harvest and ... [China] Method of this agricultural technology the rice straw will be left on the field after mechanized harvesting. Succession crop, such as rice, wheat or potato, were seeded directly under no tillage condition. Both measures aim at better soil regeneration and soil conditions for agriculture and subsequently increased yield and less ... Compiler: Song Guo 10/31/2017 4:17 a.m. IN</p>	 <p>Increased organic matter input by using organic fertilizers ... [Netherlands] Mineral fertilizers are (partly) replaced by organic fertilizers in order to have a higher organic matter input. Compiler: wijndand sukkel 03/19/2017 3:30 p.m. IN</p>
 <p>Permanent grassland on peaty and eroded soils [Estonia] A permanent plant cover is maintained or established to protect soil against erosion or peat decomposition. Compiler: Endla Reintam 08/14/2017 9:18 a.m. IN</p>	 <p>No-till [Poland] No-till is a system where crops are planted into the soil without primary tillage. Compiler: Magdalena Frac 06/29/2017 12:04 a.m. IN</p>
 <p>No-tillage [Estonia] No-till farming (also called zero tillage or direct drilling) is a way of growing crops or pasture from year to year without disturbing the soil through tillage. Compiler: Endla Reintam 06/09/2017 12:37 p.m. IN</p>	 <p>Chicken manure in non irrigated arable land [Poland] Manuring and composting - amendment with chicken manure. Chicken manure as organic matter derived from animal (chickens), which can be used as organic fertilizer in agriculture. Compiler: Magdalena Frac 06/27/2017 12:49 p.m. IN</p>
 <p>Reduced tillage [Estonia] Reduced (minimum) tillage is a tillage method that does not turn the soil over. Usually only the upper 10-15 cm of the soil surface is tilled. Compiler: Endla Reintam 08/16/2017 8:38 a.m. IN</p>	 <p>Organic agriculture in hop cultivation [Poland] Integrated pest and disease management including organic agriculture. Compiler: Magdalena Frac 06/29/2017 1:01 a.m. IN</p>
 <p>Rotation des cultures [France] Plusieurs cultures espacées dans le temps sur la même parcelle. Enchaînement réfléchi et anticipé des différentes cultures d'une année à l'autre sur la même parcelle. Compiler: Julie Lemestie 09/04/2017 8:36 a.m. FR IN</p>	 <p>Minimum tillage in Mediterranean vineyards [Portugal] Minimum tillage in vineyards is performed in alternated inter-row zone, to promote soil decomposition and maintain partial vegetation cover. Compiler: Carla Ferreira 06/30/2017 11:23 a.m. IN</p>
 <p>Les prairies pharmacies [France] Les prairies pharmacies sont des mélanges de semences imprégnées pour des phytages. Le but des prairies pharmacies est de maintenir et augmenter la productivité des prairies tout en améliorant le santé des animaux. Compiler: Julie Lemestie 08/19/2017 4:57 p.m. FR IN</p>	 <p>Non-inversion tillage for arable land [Romania] Soil tillage with chisel, non-inversion of furrow, 28 cm depth of tillage implemented. Compiler: Olga Votila 07/10/2017 2:51 p.m. IN</p>
 <p>Pâturage amélioré par du Ray-grass et Trèfle Blanc [France] Pâturage, zone dans laquelle les vaches vont prélever l'herbe de ray-grass (anglais) et trèfle blanc. Compiler: Julie Lemestie 08/30/2017 2:11 p.m. FR IN</p>	 <p>Direct drill (no-till) for arable cropping systems [Romania] Direct drill (no-till) for arable cropping systems. Crop establishment with minimum soil disturbance. Compiler: Olga Votila 07/10/2017 10:38 a.m. IN</p>
 <p>Les Betteraves dans l'alimentation du bétail [France] La betterave est un légume racine riche en sucre et en cellulose utilisé dans l'alimentation du bétail. Compiler: Julie Lemestie 10/27/2017 3:52 p.m. FR IN</p>	 <p>Leguminous crop cultivated in plot temporarily set outside ... [Romania] Introducing the leguminous crops in crop rotation to improve soil fertility, as field plot set temporarily outside the crop rotation. Crop rotation with legumes is an alternative to rotation containing only cereals. Compiler: Olga Votila 07/10/2017 1:32 p.m. IN</p>
 <p>Non Labour [France] C'est travailler le sol sans retournement sur tout ou une partie des parcelles de l'exploitation avec pour objectif l'abandon de la charrue. Compiler: Julie Lemestie 03/31/2017 8:58 a.m. FR IN</p>	 <p>Converting cropland to grazing land [Slovenia] Technology is based on changing cropland to grazing land due to shallow soils with high share of rocks. This is the cause for lower yields or loss of yield during drought periods. Compiler: Matjaz Glavan 06/11/2017 11:16 p.m. IN</p>
 <p>Soil erosion control by ridges [Greece] The technology consists of shaping the land in small ridges followed an interspaced part in which the main cultivation work of the crop is carried out. Ridges are the place where the plants are growing. Compiler: Costas Kosmas 07/11/2017 7:04 a.m. IN</p>	 <p>Integrated soil fertility management with biochar and zeolite [Slovenia] Bio-char and zeolite are used in animal production and spread onto the fields as part of organic manure. Zeolite is also used as individual element in crop production to improve soils. All residues are incorporated into the soil. Compiler: Matjaz Glavan 06/07/2017 2:11 p.m. IN</p>
 <p>Water and soil conservation by using rock fragments [Greece] The presented technology of leaving rock fragments in/on the soil in order to reduce soil evaporation and erosion in sloping areas greatly contributes to soil and water conservation. Compiler: Costas Kosmas 07/06/2017 7:48 a.m. IN</p>	 <p>Organic agriculture [Slovenia] It is based on 5 years crop rotation, full absence of artificial plant protection products and mineral nitrogen and the circulation of nitrogen by organic manure, crops and residues. Compiler: Matjaz Glavan 06/09/2017 11:54 a.m. IN</p>
 <p>Establishment of intensive grazing areas on low productive ... [Greece] This technology consists of (a) ploughing the soil, (b) sowing the plants usually vetch or set or in combination in November and (c) grazing the growing plants during spring. The main purpose of this technology is to increase the produced palatable biomass in a grazing land in which the biomass ... Compiler: Costas Kosmas 07/04/2017 9:50 a.m. IN</p>	 <p>Fertilising with farmyard manure [Slovenia] The technology is based on use of livestock manure from dairy cows (excreta and cereals straw) for fertilisation of arable fields with 3-5 year rotation. Manure has a very good effect on soil production capacity and on growth of vegetable crops. Compiler: Matjaz Glavan 06/11/2017 11:40 p.m. IN</p>
 <p>Farmyard manuring [Hungary] Farmyard manure is a decomposed mixture of cattle dung, urine with bedding material and fodder residues. After rotting the farmyard manure it is incorporated into the ground to increase soil fertility. Compiler: Brigitta Toth 09/06/2017 8:46 p.m. IN</p>	 <p>Application of 'Preparation 500' in agricultural soils under ... [Spain] Application of preparation number 500, commonly known as cow horn manure. Preparation 500 is made by filling a cow's horn with cow dung, and burying it in the soil during the cooler months to turn into dark humus. This is then sprayed up to four times a year over the ... Compiler: Alicia Mouglin-Coronado 05/29/2017 7:39 p.m. IN ES</p>
 <p>Conservation tillage [Hungary] The aim of conservation tillage is to reduce the soil disturbance. It decreases decomposition of organic matter, enhances cycling of nutrients, soil structure and increases water infiltration. Compiler: Brigitta Toth 08/07/2017 12:03 p.m. IN</p>	 <p>Fruit trees under biodynamic agricultural management in southern ... [Spain] Biodynamic farming is a method of farming that aims to treat the farm as a living system, based on the application of specific organic preparations which stimulate the natural functions of the farm soils and provide the necessary component towards a self-sustaining agro-ecological farm management. Compiler: Alicia Mouglin-Coronado 05/29/2017 7:39 p.m. FR IN ES</p>
 <p>Non-inversion shallow tillage on sandy soils in the ... [Netherlands] This technique can be applied in any crop rotation or soil. Tillage of the soils is done with special machines that do not turn over the soil (non-inversion), and the tillage depth can be more shallow than with conventional tillage (ploughing). Compiler: wijndand sukkel 07/19/2017 11:12 a.m. IN</p>	 <p>Annual green manure with Phacelia tanacetifolia in southern ... [Spain] Application of annual green manure with Phacelia Tanacetifolia sp. to improve soil quality and productivity on agricultural land. Compiler: Alicia Mouglin-Coronado 10/18/2017 10:45 a.m. IN</p>
 <p>Organic agriculture with vegetable and arable crops on ... [Netherlands] Certified Organic Agriculture (EU standards) with a combination of arable and vegetable crops on sandy loam soils in the Netherlands. Compiler: wijndand sukkel 07/20/2017 10:26 a.m. IN</p>	 <p>Promoting Sustainable Agriculture in Citrus Orchards [Spain] Generally, this approach aims to encourage sustainable agricultural management in citrus orchards and keep environmental sustainability in the region of Vega Baja, in Alicante province (Spain). This approach is focused on enhancing production in the region and maintaining sustainable soil agricultural management soil to improve product quality. Compiler: Alicia Mouglin-Coronado 04/04/2017 1:48 p.m. IN ES</p>
 <p>Organic agriculture with vegetable and arable crops on ... [Netherlands] Certified Organic Agriculture (EU standards) with a combination of arable and vegetable crops on sandy loam soils in the Netherlands. Compiler: Marie Weesleik 12/06/2017 7:59 a.m. IN</p>	 <p>Organic amendment located in dripper point in organic ... [Spain] The land user applies organic amendment located in a dripper point. Sheep manure is applied every year in holes under the foot of every lemon tree. The holes are dug with a shovel. Compiler: Alicia Mouglin-Coronado 09/27/2017 11:27 a.m. IN ES</p>