

BEST MANAGEMENT PRACTICES MONITORING PROTOCOL



Life+climagri 
LIFE 13 ENV/ES/000541

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This "Monitoring Protocol" aims to provide technicians and farmers with a tool that, in a simple way, allows to detect the strengths and weaknesses of the management and characteristics of their farms in reference to the indicators of the LIFE ClimAgri project.

It is presented a Best Management Practices (BMPs) follow up evaluation tool easy to be completed by the farmer, as well as a matrix that indicates the indicators of the project that are affected by the implementation of each BMP.

This double-entry matrix has two utilities:

- In view of the results obtained in the monitoring protocol for each BMP, the farmer can take into account the indicators in which an improvement could be expected if the proposed techniques in each BMP (in the "Manual of Best Management Practices" of this project) are implemented.
- Based on the results obtained for the indicators in the GIS platform, the farmer can identify the BMPs that should be implemented in his farm to improve those indicators for which scores are low.

HOW DOES THIS PROTOCOL WORK?

The level of implementation of each BMP is assessed following a different method, depending on the BMP to be evaluated:

- List of options: This method is used for BMPs 1, 2 and 3.
The farmer must select the option that most closely matches to the real management of his farm. The score for the level of implementation of this BMP coincide with the score associated to the selected option.
- List of practices: This method is used for practices 4 to 10.
The farmer must answer whether he carries out the practice proposed in the questionnaire. He has three possible answers: "YES", "SOMETINES" or "NO". The score for the level of implementation of the BMP is calculated by adding the scores obtained for each practice.

INTERPRETATION OF THE ASSESSMENTS

The score obtained for each BMP must be interpreted as follows:

- Score ≥ 7 : The level of implementation of the BMP is good. It is recommended to manage the farm in the same way as it has been managed in the assessed period.
- Score < 7 and $> 3,5$: The level of implementation of the BMP is medium. It is recommended to improve the implementation of the BMP. For this, the farmer can follow the recommendations in the “Manual of Best Management Practices” of this project.
- Score $\leq 3,5$. The level of implementation of the BMP is poor. It is highly recommended to put into practice the recommendations in the “Manual of Best Management Practices” in order to improve the score in the assessment of the BMP in next seasons.

BMP 1: Use of permanent soil cover

Implemented practices	Val.
Use of cover crops and direct seeding: After harvesting a commercial crop and until the seeding of the following one, a cover crop is established in order to protect soil. Stubble is never removed from the surface of the soil (use of direct seeder).	10
Use of cover crops and strip till: After harvesting a commercial crop and until the seeding of the following one, a cover crop is established in order to protect soil. Stubble is never removed from the surface of the soil excepting few days before seeding, when a narrow and shallow vertical operation is carried out in the seeding lines.	9
Direct seeding: Between the harvest of one crop and the seeding of the following one there is no mechanical alteration of soil, remaining stubble on the surface for the whole period between crops.	8
Strip-till: there is no mechanical alteration of soil between the harvest of one crop and the seeding of the following one, remaining stubble over the surface for the whole period between crops, excepting few days before seeding, when a narrow and shallow vertical operation is carried out in the seeding lines.	6
Minimum tillage immediately prior to seeding: Stubble remains on the soil surface until few days before seeding, when vertical operations -which bury a part of the stubble - are carried out in order to prepare the sowing bed.	4
Conventional tillage immediately prior to seeding: Stubble remains on the soil surface until few days before seeding, when operations -which bury a part of the stubble, remaining less than 30% of soil surface covered by straw because of the number of operations or due to their intensity (e.g., moldboard)- are carried out in order to prepare the sowing bed.	3
Minimum tillage after harvest: Few days after the harvest they are carried out vertical operations through which a part of the stubble is buried, keeping at least a 30% of the soil surface covered by straw.	2
Conventional tillage after harvest: Few days after the harvest they are carried out operations through which stubble is buried, keeping less than 30% of the soil surface covered by straw because of number of operations or due to their intensity (e.g., moldboard).	0

BMP 2: Use of minimum soil disturbance practices

Implemented practices	Val.
<p>Direct seeding with discs seeder: Between the harvest of one crop and the seeding of the following one, soil is not disturbed and straw is kept over the soil for the whole period between crops. Residues in the seeding line are cut/removed by a disc preceding the seeding unit.</p>	10
<p>Direct seeding with tine seeder: Between the harvest of one crop and the seeding of the following one, soil is not disturbed and straw is kept over the soil for the whole period between crops. Residues in the seeding line are cut/removed by a tine preceding the seeding unit.</p>	8
<p>Strip-till: Between the harvest of one crop and the seeding of the following one, soil is not disturbed and straw is kept over the soil for the whole period between crops, except in the few days prior to sowing, in which it is carried out a shallow and narrow vertical operation only in the seeding line.</p>	6
<p>Minimum tillage: The seedbed is prepared through vertical tillage. As a consequence of labors, a part of the straw is buried/removed from the soil surface, although at least 30% of the surface keep covered by crop residues at the time of seeding.</p>	4
<p>Vertical conventional tillage: There are carried out vertical operations (no turned over) that remove the straw from the soil surface. Less than 30% of soil surface keeps covered by crop residues at the time of seeding.</p>	2
<p>Conventional tillage including soil turning over: There are carried out operations through which soil is turned over and crop residues are completely removed from soil surface.</p>	0

BMP 3: Perform suitable crop rotation/diversification

Implemented practices	Val.
The farm is divided into plots of similar area and a different crop is grown in each plot. Additionally, every season crops grown in each plot change according to a pre-established 4 seasons (at least) crops rotation program.	10
The farm is not divided into plots because of its size, but the crop grown changes every season according to a pre-established 4 seasons (at least) crops rotation program.	9
The farm is divided into plots of similar area and a different crop is grown in each plot. Additionally, every season crops grown in each plot change according to a pre-established 3 seasons crops rotation program.	9
The farm is not divided into plots because of its size, but the crop grown changes every season according to a pre-established 3 seasons crops rotation program.	8
The farm is divided into plots of similar area and a different crop is grown in each plot. Additionally, every season crops grown in each plot change according to a pre-established 2 seasons crops rotation program.	8
The farm is not divided into plots because of its size, but the crop grown changes every season according to a pre-established 2 seasons crops rotation program.	6
The farm is divided into plots of similar area and a different crop is grown for the same season in each plot. In some plots, the crop grown vary from one year to the other, but other plots, which represent less than 40% of the total area of the farm, are under monoculture.	5
The farm is divided into plots of similar area and a different crop is grown for the same season in each plot. In some plots, the crop grown vary from one year to the other, but other plots, which represent between 40% and 80% of the total area of the farm, are under monoculture.	4
The farm is divided into plots of similar area and a different crop is grown for the same season in each plot. In some plots, the crop grown vary from one year to the other, but other plots, which represent more than 80% of the total area of the farm, are under monoculture.	2
The whole farm is under monoculture.	0

BMP 4: Optimisation in the use of agrochemicals

Applications of phitosanitary products and fertilizers are carried out:

Answer

In the time of the day on which the treatment presents the higher efficiency due to the ambient temperature.	YES (+2)	SOMETIMES (+1)	NO (+0)
Using the type of nozzles and/or machinery regulation that guarantee a good distribution of the phytosanitary product or fertilizer.	YES (+2)	SOMETIMES (+1)	NO (+0)
At the appropriate date, taking into account the condition of the farm and verifying that the treatment is really necessary.	YES (+1,5)	SOMETIMES (+0,75)	NO (+0)
Using variable application systems, taking always into account the real needs and adjusting the dose to them.	YES (+1,5)	SOMETIMES (+0,75)	NO (+0)
Using guidance systems, preventing excessive overlap and/or untreated areas.	YES (+1,5)	SOMETIMES (+0,75)	NO (+0)
Applying the minimum dose for the effectiveness of the plant protection product or fertilizer.	YES (+1,5)	SOMETIMES (+0,75)	NO (+0)

BMP 5: Appropriate management of plant protection products

The following aspects are taken into account in the management of the products:

Answer

Anti-drift nozzles are used.	YES (+2)	SOMETIMES (+1)	NO (+0)
Nozzles are periodically checked, being replaced the damaged ones.	YES (+2)	SOMETIMES (+1)	NO (+0)
Spill containment measures are available. In case there are no fixed places in the field to prepare the spray liquid, there is a mobile system that can contain spills, such as plastic or metal trays that can be transported to the field.	YES (+1,5)	SOMETIMES (+0,75)	NO (+0)
It is avoided to place the areas where the plant-protection products are prepared close to water streams.	YES (+1,5)	SOMETIMES (+0.75)	NO (+0)
Equipment for application of plant-protection products and fertilizers have passed an official checking.	YES (+1,5)	SOMETIMES (+0.75)	NO (+0)
The transport, storage, preparation and mixing, rinsing and return of the containers is carried out in compliance with the regulations.	YES (+1,5)	SOMETIMES (+0.75)	NO (+0)

BMP 6: Use of advanced technology

Implemented practices	Answer		
Annual monitoring of work schedules and production levels.	YES (+1,25)	SOMETIMES (+0,6)	NO (+0)
Decision-making based on the results of previous years.	YES (+1,25)	SOMETIMES (+0,6)	NO (+0)
Crops harvesting with yield monitor.	YES (+1,25)	SOMETIMES (+0,6)	NO (+0)
Use of guidance systems.	YES (+1,25)	SOMETIMES (+0,6)	NO (+0)
Use of fertilizer variable application systems.	YES (+1,25)	SOMETIMES (+0,6)	NO (+0)
Use of herbicides variable application systems.	YES (+1,25)	SOMETIMES (+0,6)	NO (+0)
Recording of crops information in Geographic Information Systems (GIS).	YES (+1,25)	SOMETIMES (+0,6)	NO (+0)
Use of decision making systems based on GIS.	YES (+1,25)	SOMETIMES (+0,6)	NO (+0)

BMP 7: Implementation of optimum and deficit irrigation strategies.

Implemented practices	Answer		
A climatic characterization of the area has been made (meteorological data available).	YES (+1,25)	SOMETIMES (+0,6)	NO (+0)
The phenological cycle of the crop is known including the date of sowing.	YES (+1,25)	SOMETIMES (+0,6)	NO (+0)
There are previous experiences in the area to determine the impact of deficit irrigation on our farm.	YES (+1,25)	SOMETIMES (+0,6)	NO (+0)
There is a specific irrigation schedule.	YES (+1,25)	SOMETIMES (+0,6)	NO (+0)
Water supply has been reduced.	YES (+1,25)	SOMETIMES (+0,6)	NO (+0)
The irrigation schedule has been updated in case there has been a decrease in the water supply.	YES (+1,25)	SOMETIMES (+0,6)	NO (+0)
The water deficit of the crop is controlled.	YES (+1,25)	SOMETIMES (+0,6)	NO (+0)
The decrease in the volume of irrigation applied (if any) has not affected the crop yield.	YES (+1,25)	SOMETIMES (+0,6)	NO (+0)

BMP 8: Joint consideration of optimised agricultural, technical and financial practices to improve irrigation water management

Implemented practices	Answer		
An Irrigation Consultancy Service or a technician specialized in irrigation management is available in the area.	YES (+1,5)	SOMETIMES (+0,75)	NO (+0)
The recommendations of the Irrigation Consultancy Service or technician are followed.	YES (+1,5)	SOMETIMES (+0,75)	NO (+0)
The crop, the availability of water (time and volume) and the reliability of the supply has been taken into account in the design of the irrigation system.	YES (+1,5)	SOMETIMES (+0,75)	NO (+0)
In the design of the irrigation system it has been taken into account the characteristics of the soil.	YES (+1,5)	SOMETIMES (+0,75)	NO (+0)
A previous scheduling of the agronomic practices to be developed in the farm has been carried out.	YES (+1,5)	SOMETIMES (+0,75)	NO (+0)
Management of the Irrigation Area is taken into account in the management of irrigation water in the plot.	YES (+1,5)	SOMETIMES (+0,75)	NO (+0)
If traditional water resources are limited, consideration has been given to the use of alternative resources (such as regenerated wastewater).	YES (+1)	SOMETIMES (+0,5)	NO (+0)

BMP 9: Implementation of multifunctional margins and retention structures

Implemented practices	Answer		
The farm counts on multifunctional margins at boundaries with other farms.	YES (+1,1)	SOMETIMES (+0,55)	NO (+0)
In the farm, they have been introduced vegetation bands (or increase of plants density) in the thalwegs or areas of runoff concentration.	YES (+1,1)	SOMETIMES (+0,55)	NO (+0)
There are vegetation bands in the ditches of the service roads.	YES (+1,1)	SOMETIMES (+0,55)	NO (+0)
There are multifunctional margins on the banks of the watercourses.	YES (+1,1)	SOMETIMES (+0,55)	NO (+0)
Phytosanitary treatments are avoided in the implanted margins.	YES (+1,1)	SOMETIMES (+0,55)	NO (+0)
Fertilizer applications are avoided in the implanted margins.	YES (+1,1)	SOMETIMES (+0,55)	NO (+0)
Plants of margins are mechanically controlled, favoring the self-seeding of the species of the margins.	YES (+1,1)	SOMETIMES (+0,55)	NO (+0)
Ploughing of the margins is avoided, what allows the spontaneous growth of vegetation of the margin.	YES (+1,1)	SOMETIMES (+0,55)	NO (+0)
It is avoided the use of margins as service roads for the movement of machinery.	YES (+1,2)	SOMETIMES (+0,6)	NO (+0)

BMP 10: Measures for the promotion of biodiversity

Implemented practices	Answer		
There have been implemented multifunctional margins (buffer areas) in the vicinity of the water bodies of the farm.	YES (+2)	SOMETIMES (+1)	NO (+0)
There have been implemented multifunctional margins (buffer areas) around the perimeter of the farm.	YES (+2)	SOMETIMES (+1)	NO (+0)
Seeding is carried out through direct seeding or strip-till.	YES (+2)	SOMETIMES (+1)	NO (+0)
There are refuge areas in the farms (areas of native vegetation, ruins of buildings or walls, etc).	YES (+2)	SOMETIMES (+1)	NO (+0)
It is carried out integrated pest control.	YES (+2)	SOMETIMES (+1)	NO (+0)

