# The questionnaire on the status, monitoring and management of salt-affected soils

**INSTRUCTIONS**

This survey consists of 19 blocks of questions in five sections: (I) General information; (II) Status of measurement, mapping and monitoring salt-affected soils; (III) Status of sustainable management of salt-affected soils; (IV) Status of crop/plant production in salt-affected environments; and (V) Status of sustainable water management in saline/sodic environments.

Please note that in this survey, the term "COUNTRY" refers to the country for which you are answering the questions, not necessarily your country of origin.

Please link any relevant publications, documents or websites or any other information related to the survey.

You may only answer questions for which you have available information and sufficient expertise. You may skip questions if you don’t have enough information to answer.

**INFORMATION ABOUT THE RESPONDENT**

|  |  |
| --- | --- |
| Title (Mr., Ms.) |  |
| Full name (surname, first name): |  |
| Institution: (Ministry/Organization/University/Others): |  |
| Country (for which you are answering the questions, not necessarily your country of origin): |  |
| Contact e-mail: |  |

|  |  |  |
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| **No** | **(I) GENERAL INFORMATION ABOUT SALT-AFFECTED SOILS** | |
| **1** | How widespread are **naturally occurring salt-affected soils** in your country: | Widespread (>50%)  Common (20-50%)  Rare (1-20%)  None (<1%) |
| **2** | How widespread are salt-affected soils **developed as a result of human activity** in your country: | Widespread (>50%)  Common (20-50%)  Rare (1-20%)  None (<1%) |
| **3** | Are salt-affected soils **recognised as a problem** for agricultural production in your country: | Often  Occasionally  Rarely  Never |
|  | **(II) STATUS OF MEASUREMENT, MAPPING AND MONITORING SALT-AFFECTED SOILS** | |
|  | 1. **Areas of salt-affected soils** | |
| **4** | What is the **total area of salt-affected soils** in your Country (according to official data)? | Please give the total area (in ha) according to official data. Please note that salt-affected soils include both saline and sodic soils. Please include the link or reference to the source of data.  If official data are not available please write here: “No official data available” and go to Question #7. |
| **5** | What is the **total area of saline soils** in your Country (according to official data)? | Please give the total area (in ha) according to official data. Please include the link or reference to the source of data. If there is not discrimination between saline, sodic and saline sodic soils in your Country, please write: “SAS are not separated into saline and sodic in the official statistics in my Country”.  If official data are not available please write here: “No official data available” and go to Question #7. |
| **6** | What is the **total area of sodic soils** in your Country (according to official data)? | Please give the total area (in ha) according to official data. Please include the link or reference to the source of data. If there is not discrimination between saline, sodic and saline sodic soils in your Country, please write: “SAS are not separated into saline and sodic in the official statistics in my Country”.  If official data are not available please write here: “No official data available” and go to Question #7. |
| **7** | What is the **total area of salt-affected soils** (saline, sodic and saline sodic) in your Country **according to other data**? | Please give the area of SAS and different categories of SAS (saline, sodic, saline sodic) according to other sources if there is no official data or if you consider these data as more updated. Please include the link or reference to the source of data. |
|  | 1. **Soil salinity and sodicity measurements used in your country** | |
| **8** | What chemical methods **are used** in your Country to measure soil salinity? (choose all applicable)  Please include the links to the procedures. | Electrical conductivity in saturated paste extract  Electrical conductivity at 1:1 soil-to-water ratio  Electrical conductivity at 1:2 soil-to-water ratio  Electrical conductivity at 1:2.5 soil-to-water ratio  Electrical conductivity at 1:5 soil-to-water ratio  Electrical conductivity at 1:10 soil-to-water ratio  Total dissolved solids (by gravimetric analysis)  Total soluble salts (calculated as the sum of Na+, Mg2+, Cl-, SO42-, HCO3-, CO32-)  Content of soluble Na+  Content of soluble Cl-  Other (please specify which one) |
| **9** | Is electromagnetic method is used in your country to measure soil salinity/sodicity in the field? | Yes (please answer to questions #10-12)  No (please skip questions #10-12) |
| **10** | If electromagnetic method is used, **what device** is used to measure electromagnetic induction? | (indicate the brand and model of the device) |
| **11** | If electromagnetic method is used, what is the **total area** of the fields where electromagnetic induction was measured? If no exact figures are available, please indicate your approximate estimate | Between 1-1,000 ha  Between 1,000-10,000 ha  Between 10,000-100,000 ha  More than 100,000 ha  Exact area (if available) |
| **12** | If electromagnetic method is used, is this **included into the national/regional standards** of soil measurement or monitoring in your country? | Yes (Please include the links to these normative documents or standards)  No |
| **13** | What methods **are most common** in your Country to measure soil salinity? (please choose up to three methods most used) | Electrical conductivity in saturated paste extract  Electrical conductivity at 1:1 soil-to-water ratio  Electrical conductivity at 1:2 soil-to-water ratio  Electrical conductivity at 1:2.5 soil-to-water ratio  Electrical conductivity at 1:5 soil-to-water ratio  Electrical conductivity at 1:10 soil-to-water ratio  Total dissolved solids (by gravimetric analysis)  Total soluble salts (calculated as the sum of Na+, Mg2+, Cl-, SO42-, HCO3-, CO32-)  Content of soluble Na+  Content of soluble Cl-  Other (please specify which one) |
| **14** | What methods **are used** in your Country to measure soil sodicity? (choose all applicable)  Please include the links to the procedures. | Exchangeable sodium proportion (ESP)  Sodium adsorption ratio (SAR)  Physical methods (specific swelling, low infiltration rate etc.)  Morphological methods (structure of sodic/solonetzic horizon etc.)  Others (please specify which one) |
| **15** | What methods **are most common** in your Country to measure **soil sodicity**? (please choose up to two methods that are most used) | Exchangeable sodium proportion (ESP)  Sodium adsorption ratio (SAR)  Physical methods (specific swelling, low infiltration rate etc.)  Morphological methods (structure of sodic/solonetzic horizon etc.)  Others (please specify which one) |
| **16** | What method is **most common** in your Country to measure **exchangeable Na+**?  Please include the links to the procedures (if available) | Salt removal (step 1), cation exchange (step 2), measurement of Na+ (step 3)  Without salt removal, measurement of soluble Na+ (step 1), cation exchange (step 2), measurement of Na+ (step 3), recalculation of exchangeable Na+ based on the subtraction of soluble Na+ from total Na+ (step 4)  Without salt removal, cation exchange (step 1), measurement of Na+ (step 2)  Others (please specify which one) |
| **17** | What method is **most common** in your Country to measure **cation exchange capacity**?  Please include the links to the procedures (if available) | ammonium acetate extraction (buffered at pH 7)  ammonium chloride extraction  triethanolamine buffered barium chloride extraction (buffered at pH 8.2)  hexamminecobalt(III) chloride extraction  other (please specify which)  not applicable (CEC not measured in your Country) |
| **18** | What method is **most common** in your Country to measure **sodium adsorption ratio (SAR) of soil**?  Please include the links to the procedures (if available) | SAR is measured through the content of Ca2+, Mg2+, Na+ in the water saturated soil paste extract  Another method, describe which |
| **19** | If **soil sodicity** is assessed using a **physical method**, how exactly?  Please include the links to the procedures (if available) | Specific swelling  Low infiltration rate  Low hydraulic conductivity  Soil dispersion test  Other (please specify which) |
| **20** | If **soil sodicity** is assessed using a **morphological method**, how exactly?  Please include the links to the procedures (if available) | Specific structure of sodic/solonetzic horizon  Specific microfeatures of sodic/solonetcis horizon  Other (please specify which) |
| **21** | What method is **most common** in your Country to measure **soil alkalinity**? (please choose up to two methods that are most used)  Please include the links to the procedures (if available) | Soil pH (extract of saturated paste)  Soil pH (water 1:1)  Soil pH (water 1:2)  Soil pH (water 1:2.5)  Soil pH (water 1:5)  Soil pH (CaCl2 1:2.5)  Total alkalinity, or content of alkaline anions (with methyl orange and phenolphthalein indicators)  Other (please specify which) |
| **22** | Is the **harmonization** of soil salinity and sodicity analysis needed **within your Country**? | Yes (please describe for which analysis)  No |
| **23** | Do you have any difficulties when **comparing your data** with the **data from other countries**? | Yes (please describe for which analysis)  No |
| **24** | Is the **harmonization** of soil analysis needed **among countries**? | Yes (please describe for which analysis)  No |
| **25** | What are the **main benefits** for you and other experts/practitioners from your Country **from the harmonization** of chemical analyses for soil salinity/sodicity? | Important for national/regional soil monitoring system  Important for publishing in high quality journals  Important for communication and exchange of experience between scientists/practitioners  Important for comparability of data in soil databases  Important for the development of recommendations to farmers  Other (please specify which one)  I see no benefits |
| **26** | Do you use **conversion equations** between the results of **different methods** for soil salinity and sodicity measurements used inside and outside your Country?  Please include the links to the equations (if available) | Yes (please include the links to the equations)  No, there is no need  No, as I don’t know about them |
|  | 1. **Soil salinity and sodicity classification used in your country** | |
| **27** | Which **classification** of soil salinity/sodicity is most common in your Country? | Please give a reference (webpage or publication) |
| **28** | Which of the **thresholds** between saline and nonsaline soils is used in your Country? (Please choose only one most used)  Please include the link or reference to the source | 2 dS/m  4 dS/  15 dS/m  1 g/kg (0.1% of salts)  1.5 g/kg (0.15% of salts)  10 g/kg (1% of salts)  Other (please specify) |
| **29** | Which of the **thresholds** between sodic and nonsodic soils is used in your Country? (Please choose only one most used)  Please include the link or reference to the source | >6% exchangeable sodium proportion (ESP)  >10% exchangeable sodium proportion (ESP)  >15% exchangeable sodium proportion (ESP)  >25% exchangeable sodium proportion (ESP)  >13 Sodium adsorption ratio (SAR)  Other (please specify which one) |
|  | 1. **Soil salinity and sodicity mapping used in your country** | |
| **30** | What is the main **methodology of mapping** soil salinity/sodicity used in your **organization**? | Please describe the main principles and give a link/reference to the methodology |
| **31** | What is the main **methodology of mapping** soil salinity/sodicity used by **farmers in your country**? | Please describe the main principles and give a link/reference to the methodology |
| **32** | Is there **an official protocol/procedure of mapping** soil salinity/sodicity used in your Country? | Yes and it is constantly updated and based on modern mapping techniques (give a link/reference to the methodology)  Yes, but it is outdated and does not include the modern mapping techniques ((give a link/reference to the methodology)  No, but it is needed  No, it is not needed |
| **33** | What is a **typical depth of soil salinity mapping** in your Country? | Please indicate the depth |
| **34** | What is a **typical depth of soil sodicity mapping** in your Country? | Please indicate the depth |
| **35** | Are **all areas** that are prone to salinity or sodicity **mapped** in your Country? | Yes (please answer Questions #36-37)  No (please skip Questions #36-37) |
| **36** | What is the most detailed **scale / spatial resolution** of the map of salt-affected soils **of your (whole) Country**? | Please indicate the scale or spatial resolution |
| **37** | What is the most detailed **scale / spatial resolution** of the map of salinity/sodicity **of cropland of your country**? | Please indicate the scale or spatial resolution |
|  | 1. **Soil salinity and sodicity monitoring used in your country** | |
| **38** | Do you have a **monitoring system of soil salinity/sodicity** in your Country? | Yes, there is a national monitoring of soil salinity / sodicity over whole country (please answer Questions #39-43 and skip Question #44)  Yes, there is a monitoring of soil salinity / sodicity in large regions of the country prone to salinity or sodicity problems (please answer Questions #39-43 and skip Question #44)  Yes, there is a monitoring of soil salinity / sodicity at the local level (please answer Questions #39-43 and skip Question #44)  No (please skip Questions #39-43 and answer Question #44) |
| **39** | What are the **main principles** of its work? | Please describe briefly the main principles of its work (the organizations/ministries in charge, coverage, indicators, periodicity, etc.) |
| **40** | Are **water parameters** (ground water quality and depth, irrigation water quality) measured along with soil parameters? | Yes (please describe how exactly: which parameters, how often, separately or in conjunction with soil parameters)  No, but it is important to measure these parameters too  No, there is no need |
| **41** | Are **remote sensing parameters** used for soil salinity/sodicity monitoring? | Yes (please specify which one)  No, because they are not informative  No, but they should be included  No |
| **42** | How are the results of soil salinity / sodicity monitoring **used for decision making**? | They are used for irrigation water management (amount of leaching water, regulation of quality of water or other water-related decisions). Please describe how exactly  They are used for calculating the amount of chemical amendments (e.g., gypsum). Please describe how exactly  They are used for drainage management. Please describe how exactly  They are used to provide the economic incentives to farmers or calculate fees. Please describe how exactly  They are used to calculate fees (e.g., in case of mismanagement or for other purposes). Please describe how exactly  They are used to calculate the taxes  Other (please describe how exactly) |
| **43** | Do you have **suggestions to improve** the monitoring system in your Country? | Yes (please describe briefly how)  No, the monitoring system works perfectly well  No, and I think that the monitoring is no needed  No, I don’t have enough knowledge to suggest improvements  No |
| **44** | Do you think it is necessary to **establish the monitoring system** of soil salinity/sodicity in your Country? | Yes, for the whole country  Yes, only for the cropland  Yes, only for the irrigated cropland  Yes, only for the hot spot areas  No, no need |
|  | 1. **Soil salinity and sodicity risk assessment used in your Country** | |
| **45** | Do projects of irrigation and drainage in your Country perform an **evaluation of the risk of developing secondary soil salinization/sodification**? | Yes (please describe briefly the main principles)  No, but it should be included (as there is a risk)  No, there is no need (as the risk is low)  No |
| **46** | Are there **integrated indices** used for risk assessment? | Yes (please specify which one)  No, but it is demanded and should be elaborated  No, there is no demand  No |
|  | **(III) STATUS OF SUSTAINABLE MANAGEMENT OF SALT-AFFECTED SOILS** | |
|  | 1. **Practices of management of salt-affected soils used in your Country** | |
| **47** | Which **practices** are used in your Country for the management of salt-affected soils (choose all that apply)? | Practices aimed at reduced evaporation (mulches, interlayers from loose materials etc.)  Salt removal from the topsoil (leaching, drainage, surface scraping etc.)  Practices aimed at improved soil structure and increased infiltration (compost and residue incorporation etc.)  Biochar  Deep ploughing  Chemical amelioration (adding gypsum and other Ca-containing amendments etc.)  Practices aimed at decreased salt relocation and accumulation (land shaping and leveling etc.)  Crop system management (improved crop rotation, agrobiodiversity, crop system diversification etc.)  Crop adaptation (use of halophytes and non-conventional crops, breeding and genetic engineering, halopriming etc.)  Agroforestry  Biotechnologies (including bioinoculants, biofortification etc.)  Other (please specify) |
| **48** | Is there an official statistics or published data (papers, reports, websites) on the areas of these practices in your Country? | Yes (please answer Questions #49)  No (please skip Question #49) |
| **49** | What are the areas where practices for the management of salt-affected soils are applied? | Give areas of practices for which data in your Country are available. You can specify the name of the practice, e.g. construction of drainage system, land leveling etc. You can use the list given under Question#47 or use the list as given in your national statistics or published data/reports. Include time period, e.g. in 2020 or since 2000 or 2010-2020 etc.  Please give a link or reference where data are taken |
|  | 1. **Indicators of sustainable soil management (SSM)** | |
| **50** | Are indicators recommended by FAO SSM Protocol0F[[1]](#footnote-2)\* measured on salt-affected soils to assess their state (under national monitoring program or under standard protocols of soil measurements used on cropland or under reclamation project assessment)? | Yes (please skip Question #51)  Yes, but more additional indicators are also measured (please answer Question #51)  No, but it is necessary to measure them (please skip Question #51)  No, but it is necessary to use indicators other than those recommended by FAO (please answer Question #51  No, other indicators are measured (please answer Question #51)  No, there is no need in additional indicators (please skip Question #51) |
| **51** | What indicators other than those recommended by FAO SSM Protocol are measured on salt-affected soils in your Country to assess their state? | Please list all indicators that are measured. Please include references or web-links whenever possible. |
|  | 1. **Database of the practices of management of salt-affected soils** | |
| **52** | Does your Country have a national/international database of good practices for sustainable management of saline and sodic soils? | Yes, and it is sufficient (please give a web-link or reference)  Yes, but it is incomplete and should be updated (please give a web-link or reference)  No, but it is demanded  No, there is no need in such database  No |
|  | 1. **Policy regulation over salt-affected soils** | |
| **53** | Does your Country have a **specific policy** regulating the use and management of SAS in your Country? | Yes, and it doesn’t need improvements (please give a web-link or reference to the main documents)  Yes, but it needs improvements to become more efficient ((please give a web-link or reference to the main documents)  No, but it is necessary to develop such a policy  No, there is no need in such a policy  No |
| **54** | Does your Country have a **governmental body** (ministry, agency) responsible for the monitoring and management of SAS in your Country? | Yes, there is one governmental institution that regulates all aspects of monitoring and management of salt-affected soils (please specify this governmental body and its functions related to SAS). Please skip Question #55.  Yes, there are several governmental institutions that regulate different aspects of monitoring and management of salt-affected soils (please specify these governmental bodies and their functions on SAS monitoring and management). Please answer Question #55.  No, there is no such a governmental body, but it is necessary to assign some functions on SAS management and monitoring to the existing governmental body(s) (please specify the functions and the governmental institution(s) that can handle such functions). Please skip Question #55.  No, there is no need in such a governmental body. Please skip Question #55. |
| **55** | If there are several governmental institutions responsible for monitoring and management of SAS, is there **coordination between them** on SAS aspects? | Yes (please specify what is the form of coordination: joint reporting on the status of SAS, shared database, etc.)  No, but such a coordination is needed (please specify, in which form)  No, there is no need in coordination |
| **56** | In your Country, is there a law **protecting saline environments** as a shelter of biodiversity? | Yes (please give a reference or link)  No, but it is needed as there are some valuable and rare environments (e.g., marshes, mangroves etc.) that are at the risk of extinction  No, there is no need as there are no valuable ecosystems with salt-affected soils in my Country |
|  | 1. **Extension service on salt-affected soils** | |
| **57** | Does your Country have an **extension service** which supports farmers coping with soil salinity/sodicity? | Yes, and it has a good geographic coverage and supports with all aspects of SAS management (training, soil analysis, recommendations, etc.). Please answer Question #58.  Yes, and it has a good geographic coverage but supports with few aspects of SAS management (please specify which ones). Please answer Question #58.  Yes, it supports with all aspects of SAS management (training, soil analysis, recommendations, etc.) but has a poor geographic coverage or poor accessibility for farmers. Please answer Question #58.  No, but it is demanded. Please skip Question #58.  No, no need. Please skip Question #58. |
| **58** | What sorts of **materials/services are most demanded** by farmers and extension services to help manage salt-affected soils in a sustainable manner? | Trainings about management of salt-affected soils  Soil analyses (please specify which analyses)  Interpretation of soil analyses  Irrigation water or ground water analyses  Soil salinity/sodicity mapping  Recommendations on SAS management  Other (please specify which ones) |
|  | **(IV) STATUS OF CROP/PLANT PRODUCTION IN SALT-AFFECTED ENVIRONMENTS** | |
|  | 1. **Losses of crop yields resulting from soil salinization/sodification** | |
| **59** | What is the total area of **cropland affected by salinity** in your Country? | Please give the areas (in ha) and the reference to the source of data (only saline soils). If there are monitoring data for the time period, give them too. |
| **60** | What is the total area of **cropland affected by sodicity** in your Country? | Please give the areas (in ha) and the reference to the source of data (including sodic and saline sodic soils). If there are monitoring data for the time period, give them too. |
| **61** | What are the **most common crops** grown on salt-affected soils in your Country? | Cotton  Rice  Barley  Alfalfa  Sorghum  Tall wheatgrass  Halophytes (e.g. Quinoa (*Chenopodium quinoa*), *Atriplex* sp., *Salicornia* sp., saltgrass (*Distichlis spicata)*, etc.)  Non-conventional crops (Amaranth or others)  Others (please specify which ones) |
| **62** | Is there a national assessment on the **losses of yields** due to soil salinity? | Yes (please give the number of total losses including the time period and the reference to the source)  No |
| **63** | Is there a national assessment on the **losses of yields** due to soil sodicity? | Yes (please give the number of total losses including the time period and the reference to the source)  No |
| **64** | Is there a national assessment of the **yield gains due to reclamation or other improvements** of salt-affected soils | Yes (please give the number of yield gains including the time period and the reference to the source)  No |
|  | 1. **Indicators used by crop scientist on salt-affected soils** | |
| **65** | What are the main **soil parameters** which are **assessed by crop scientists** (and similar specialists) for growing crops/plants on salt-affected soils in your Country? | They are similar to those used by soil scientists, and they give enough information for crop scientists (Please list these indicators)  They are similar to those used by soil scientists, but they are not enough for crop scientists to prepare their recommendations/decisions (Please list these indicators)  They are different to those used by soil scientists, and they give enough information for crop scientists (Please list these indicators)  They are different to those used by soil scientists (please list these indicators), but they are not enough and should be amended with those used by soil scientist |
|  | 1. **Models of crop response to soil salinity/sodicity** | |
| **66** | **What models** are used in your Country or research to **predict crop/plant responses** to salinity/sodicity? | Please give a name (if applicable), short description and reference to webpage or publication |
| **67** | Are **soil management practices** included into this model(s) **as variables affecting** the crop/plant growth? | Yes (please indicate in what way)  No, but they should be included (please indicate in what way)  No, there is no need (please explain why) |
| **68** | **What variables** are used in this model? | Crop type (wheat, rice, barley etc.)  Cultivar characteristics (specific properties of a crop)  Salinity/sodicity level (grades of salinity/sodicity)  Electrical conductivity  Content of total soluble salts  Other soil conditions (specify which ones)  Weather data  Crop management (fertilizers, pesticides, insecticides, weeds etc., excluding soil management)  Others (please specify which ones) |
| **69** | Are there national or more local **scenarios of crop production** in your Country **under different abiotic stresses** (droughts, salinity, temperature extremes etc.)? | Yes (please give a web-link or reference) and they are used for decision making by governments and local authorities (please specify how exactly)  Yes (please give a web-link or reference), but they are not used for decision making by governments and local authorities  No, but they can be of great importance for efficient decision making  No |
| **70** | Are there **assessments** at the national or local level in your Country of the **cost of inaction** in case of growing salinity/sodicity? | Yes (please give a web-link or reference), and they are used to perform measures on salinity/sodicity management (please specify how exactly)  Yes(please give a web-link or reference), but they are not used to perform measures on salinity/sodicity management  No, but they can be of great importance for improved salinity/sodicity management  No |
|  | **(V) STATUS OF SUSTAINABLE WATER MANAGEMENT IN SALINE/SODIC ENVIRONMENTS** | |
|  | 1. **Areas of irrigated farmland and its exposure to salinization/sodification** | |
| **71** | What is the **total area of irrigated farmland** in your Country? | Please give a total area (in ha) and the reference to the source |
| **72** | Are there **official statistics** about the areas **affected by salinity/sodicity (both primary and secondary) in irrigated farmland** in your Country? | Yes, and it is open to the public (please give the total areas for saline and sodic soils in irrigated farmland and the reference to the source of data)  Yes, but it is not open to the public  No |
| **73** | Is there a national assessment on the **areas of secondary salinized soils** in irrigated farmland? | Yes, and it contains the differentiation in the areas depending on the leading factor (e.g. ground water level rise, irrigation with water of poor quality, waterlogging, overfertilization etc.). Please give the areas and the reference to the source  Yes, but there is no differentiation in the areas depending on the leading factor (e.g. ground water level rise, irrigation with water of poor quality, waterlogging, overfertilization etc.). Please give the areas and the reference to the source  No |
| **74** | Is there a national assessment on the **areas of secondary sodified soils** in irrigated farmland? | Yes (please give the areas and the reference to the source)  No |
| **75** | What **irrigation methods**1F**[[2]](#footnote-3)\* are most common** in your Country?  Give areas and references to the source for the used methods if available | Surface irrigation (basin/flood irrigation subtype)  Surface irrigation (border irrigation subtype)  Surface irrigation (furrow irrigation subtype)  Surface irrigation (uncontrolled flooding)  Sprinkler irrigation  Drip irrigation  Manual irrigation  Other (please specify which one) |
|  | 1. **Irrigation water quality monitoring** | |
| **76** | Is brackish water used for irrigation in your Country? | Yes, and there is an official statistics on its use (please give the total areas and the reference to the source). Please answer Question #77-79.  Yes, but there is only unofficial data on its use (please give the total areas and the reference to the source). Please answer Question #77-79.  Yes, but there is no data on its areas. Please answer Question #77-79.  No, because it is officially banned or restricted (please give the links to the regulatory documents). Please answer Question #77.  No, but there are plans to start using it (please give a reference to the source)  No, because there is enough good quality water for irrigation  No, it’s not used and no plans to start using it |
| **77** | Is there a regulation on the use of brackish water for irrigation in your Country? | Yes, and it is strictly followed (please give a reference to the regulatory documents)  Yes, but the regulation is quite soft and not strictly followed (please give a reference to the regulatory documents)  No, but there is an urgent need to ratify such regulation as the soil quality is rapidly deteriorating  No, but such a regulation may be useful (not urgent)  No, there is no need in such regulation (please explain why) |
| **78** | What crops are mainly used under irrigation with brackish water? | Wheat  Corn  Cotton  Rice  Barley  Alfalfa  Sorghum  Tall wheatgrass  Halophytes (e.g. Quinoa (*Chenopodium quinoa*), *Atriplex* sp., *Salicornia* sp., saltgrass (*Distichlis spicata)*, etc.)  Non-conventional crops (Amaranth or others)  Others (please specify which ones) |
| **79** | What agronomic practices are mainly used under irrigation with brackish water to avoid soil salinization and sodification? | Improved drainage (specify how)  Improved water percolation (specify how)  Improved irrigation management (avoiding over-irrigation, tuned irrigation scheduling etc.)  Reduced salt build-up and surface accumulation (specify how)  Mixing with fresh water  Used only on coarse-textured soils  Used on hydroponics  No specific measures (Salinization/sodification threat is not considered seriously)  Others (please specify) |
| **80** | What criteria are used in your Country to assess the quality of water for irrigation (mark all that apply)?  Please give threshold values and the reference to the source | Water electrical conductivity  SAR of water  Total dissolved solids  Total soluble salts  pH  Toxic ions  Others (please specify which ones) |
| **81** | Do you think that some water quality indicators are overlooked? | Yes (please specify which ones and why they are important)  No, the above-mentioned criteria are enough to avoid soil salinization/sodification |
| **82** | Is there an irrigation water monitoring system functioning in your Country? | Yes, there is a national irrigation water monitoring over whole country (please answer Questions #83-84)  Yes, there is an irrigation water monitoring in large regions of the country prone to salinity or sodicity problems (please answer Questions #83-84)  Yes, there is an irrigation water monitoring at the local level (please answer Questions #83-84)  No, but it is necessary to establish it (please skip Questions #83-84)  No, there is no need (please skip Questions #83-84) |
| **83** | What are the main principles of its work? | Please describe briefly the main principles of its work (the organizations/ministries in charge, coverage, indicators, periodicity, etc.) |
| **84** | Is the irrigation water monitoring integrated with soil salinity/sodicity monitoring? | Yes  No, they are implemented separately, but there is some coordination or exchange of data (please specify in which way)  No, they are implemented separately and coordination is absent  No, there is no soil salinity/sodicity monitoring in my Country |
| **85** | How much is the contribution of irrigation water quality on soil salinization/sodification in your Country? | It is a leading factor of soil salinization/sodification in my Country (please give an area affected and reference to the source)  It is a significant, but not the leading factor of soil salinization/sodification in my Country (please give an area affected and reference to the source)  It is an insignificant factor of soil salinization/sodification in my Country (please give an area affected and reference to the source)  There is no data or national assessments to report on it |
| **86** | What measures are used in your Country to improve the quality of irrigation water? | Water mixing  Water desalination  Water freezing  Other (please specify which one)  None |
|  | 1. **Ground water monitoring** | |
| **87** | Is there a ground water monitoring system functioning in your Country? | Yes, there is a national ground water monitoring over whole country (please answer Questions #88-89)  Yes, there is a ground water monitoring in large regions of the country prone to salinity or sodicity problems (please answer Questions #88-89)  Yes, there is a ground water monitoring at the local level (please answer Questions #88-89)  No, but it is necessary to establish it (please skip Questions #88-89)  No, there is no need (please skip Questions #88-89) |
| **88** | What are the main principles of its work? | Please describe briefly the main principles of its work (the organizations/ministries in charge, coverage, indicators, periodicity, etc.) |
| **89** | Is the ground water monitoring integrated with soil salinity/sodicity monitoring? | Yes  No, they are implemented separately, but there is some coordination or exchange of data (please specify in which way)  No, they are implemented separately and coordination is absent  No, there is no soil salinity/sodicity monitoring in my Country |
| **90** | How much is the contribution of ground water fluctuations on soil salinization/sodification in your Country? | It is a leading factor of soil salinization/sodification in my Country (please give an area affected and reference to the source)  It is a significant, but not the leading factor of soil salinization/sodification in my Country(please give an area affected and reference to the source)  It is an insignificant factor of soil salinization/sodification in my Country (please give an area affected and reference to the source)  There is no data or national assessments to report on it |
| **91** | Do the constructed irrigation systems work properly in your Country protecting soils from salinization/sodification? | Yes, they work properly in the whole area  Yes, they work properly in the majority of the area  No, there are large areas where they do not work properly (please give references to the source of data and list the main reasons for their inefficiency)  No, they do not work in the majority of the area (please give references to the source of data and list the main reasons for their inefficiency) |
|  | 1. **Agro-hydrological models to evaluate water management in SAS** | |
| **92** | **What agro-hydrological models** are used to **predict water status/stress** on salt-affected soilsin your Country or project/research? | Please give a name (if applicable), short description (including main variables) and reference to webpage or publication |
| **93** | **What agro-hydrological models** are used to **predict soil salinization or sodification** in your Country or project/research? | Please give a name (if applicable) and reference to webpage or publication |
| **94** | What is the **scale** of application? | Field scale  Farm scale  Catchment area  Regional scale  National scale  Other scale (please specify) |
| **95** | **What variables** are used in this model? | Crop type and characteristics related to water potential  Irrigation water composition (anions/cations)  Ground water composition (anions/cations)  Soil profile information (soil depth, soil layers etc.)  Salinity/sodicity level (grades of salinity/sodicity)  Electrical conductivity  Content of total soluble salts  Other soil conditions (specify which ones)  Weather data  Water management (method of irrigation, scheduling)  Boundary conditions (ground water fluctuations, etc)  Others (please specify which ones) |
| **96** | Do the models used in your Country to evaluate the **spatial variability of soil salinization at local/regional/national level** consider ground or surface water? | Yes (please provide reference or web-link)  No, but it should be included (please provide reference or web-link)  No, no need (please explain why)  There is no such models/predictions in my Country |
| **97** | Are **soil management practices,** **water quality and management** and **crop specifics** included into this model(s)? | Yes (please indicate in what way)  No, but they should be included (please indicate in what way)  No, there is no need (please explain why)  There is no such models/predictions in my Country |
| **98** | Are there national or more local **scenarios of water management** in your Country (full irrigation, deficit irrigation etc.)? | Yes (please give a web-link or reference) and they are used for decision making by governments and local authorities (please specify how exactly)  Yes (please give a web-link or reference), but they are not used for decision making by governments and local authorities  No, but they can be of great importance for efficient decision making  No |
| **99** | Is there any **risk assessment** implemented using hydrological models of soil salinization in your region/Country/project/research? | Yes, there is a program over whole country (please answer Questions #100)  Yes, there is a program over whole cropland area (please answer Questions #100)  Yes, there is a program over whole irrigated cropland area (please answer Questions #100)  Yes, there is a program over hotspot areas (most affected by salinity/sodicity) (please answer Questions #100)  No, but it is necessary to implement it (please skip Questions #100)  No, no need (please explain why and skip Questions #100) |
| **100** | Are there remote sensing proxies (e.g. SMOS or similar), climate data used in risk assessment? | Remotely sensed data (please specify which ones)  Projected climate data (please specify which ones)  Others (please specify which ones) |
|  | 1. **Leaching and drainage on salt-affected soils** | |
| **101** | What kind of drainage system is used in the region/research? | Surface drainage (shallow ditches)  Subsurface drainage (deep open drains)  Subsurface drainage (buried pipe drains)  Controlled drainage  Others (please specify) |
| **101** | What are the criteria to design the drainage system? | Soil parameters  Water parameters  Soil hydraulic/physical properties (infiltration, compaction, soil layers)  Others (please specify) |
| **102** | What is the type of leaching practice? | Flooding  Sprinkler  Drip  Others (please specify)  No leaching is performed (please explain why). Skip Questions #103-104. |
| **103** | How the amount of water for leaching is usually calculated in your Country/project? | FAO protocols (please provide a reference or link)  National protocols (please provide a reference or link)  Based on available water (provide some details to understand the approach)  Indigenous knowledge (provide some details to understand the approach)  Not calculated, but a standard amount is used (provide some details to understand the approach)  Other (provide some details to understand the approach) |
| **104** | When is the leaching practice done? | Before sowing/tillage  During growing season  After harvesting  Others |

**\*\*\*\*\*\*\*\*\* Thank you very much! \*\*\*\*\*\*\*\*\***

1. \* FAO-ITPS 2020. Protocol for the assessment of Sustainable Soil Management. Rome, FAO. <https://www.fao.org/fileadmin/user_upload//GSP/SSM/SSM_Protocol_EN_006.pdf>. The recommended indicators include: soil productivity (biomass in dry matter), content of organic carbon, bulk density and soil respiration rate. [↑](#footnote-ref-2)
2. \* According to: https://www.fao.org/3/s8684e/s8684e00.htm [↑](#footnote-ref-3)