Metadata of *data_tarpin_x.csv*

What is this document about?

This document presents the meaning of – and details on – the column-variables of the '**data_tarping_x.csv**' table, that is the *raw dataset* used in this study. This *raw dataset* was assembled from the answers of the tarping survey launched in 2020 or from comments made by the respondents in the survey or during follow-up e-mail exchanges we had with them afterward.
Note that for binary variables, "1" always means yes and "0" always means no.

Details and meaning of the column-variables

General information regarding the tarping operation

- ***manager_id*** (*factor*) = indicates the identification number of the respondent.
- ***xp_id*** (*factor*) = indicates the identification number of the tarping operation. This ID is unique.
- ***site_location*** (*categorical variable*) = indicates the locality in which the tarping operation took place (as reported by the respondent, that means with a varying degree of accuracy).
- ***country*** (*categorical variable*) = indicates the country in which the tarping operation took place.
- ***latitude/longitude*** (*binary variables*) = indicate the approximate latitude and longitude (in degrees) of the site where the tarping operation took place (geodetic system = WGS84).
- ***elevation*** (*positive binary variable*) = indicate the approximate elevation (in m a.s.l.) of the site where the tarping operation took place.
- ***tarping_date*** (*discrete variable*) = indicates the year during which the tarping operation started.
- ***planned_duration*** (*discrete variable*) = indicates the duration initially planned for the tarping operation. If no duration was planned, a value of 99 is given.
- ***goals*** (*categorical variable*) = indicates the intended goals reported by the managers for starting their tarping operation. It could be one – or a combination – of the following goals: "eradicate" (i.e. kill the plant), "limit dispersal" (i.e. limit the dispersal of the plant's propagules), "limit expansion" (i.e. limit the lateral (clonal) spread of the plant), or "vigour" (i.e. reduce the vigour of the plant (e.g. lower its ramet density, growth rate, height)).
- ***restoration*** (*binary variable*) = indicates whether the tarping operation is part of an ecological restoration program. This information, unasked directly in the survey, was gathered from the comments, mail exchanges and the presence of cutting plantations within the tarped area.
- ***operation_type*** (*categorical variable*) = indicates the type of tarping operation: "construction work", "crushing tarping trial" (i.e. operation where the knotweed biomass is first crushed before being covered by a geomembrane or geotextile), "management trial" (i.e. the operation is an attempt at controlling knotweed through tarping as part of the regular management of the plant), "research trial" (i.e. the operation was part of a scientific experiment).
- ***multiple_ops*** (*binary variable*) = indicates if the respondent gave an "average answer" to report his/her experience with several tarping operations.
- ***freq_monitoring*** (*discrete variable*) = indicates the mean annual number of times the tarping set-up was physically inspected as part of follow-up monitoring. It should be noted that some managers do some monitoring the first few years and then stop afterwards. We do not have a way of taking that into account.

Environmental characterisation of the site

- ***slope/difficulty_access/shade/forest/ruggedness/granulometry/obstacles/flood*** (*ordinal variables*) = these variables are scores from 0 to 10 (Likert scales – with 0 = not at all; and 10 = yes, extremely) evaluating,

respectively, the slope steepness, difficulty to access, shade, woodiness, terrain ruggedness, soil granulometry, proneness to be filled with obstacles, and proneness to be flooded of the sites in which the tarping operation took place. For "granulometry", a high score indicates a very coarse soil mostly composed of rocks and backfill.

- ***environment*** (*categorical variable*) = indicates the type of environment in which the tarping operation took place. It could be one – or a combination – of the following environment: "garden", "grassland", "parking lot", "railway adjacent", "riverside", "roadside", "urban park", "wasteland", "wetland", or "woodland".

Characteristics of the fabric(s) used during the tarping operation

- ***fabric_type*** (*categorical variable*) = indicates the type of *tarping fabric* used to cover the plant: "agricultural geomembrane" (i.e. regular farming plastic sheeting), "construction geomembrane or geotextile" (i.e. fabrics used in construction works), "liner geomembrane" (i.e. liner used for the creation of pools or ponds), "mixed" (i.e. a mix of different fabrics was used), "mulching geotextile" (i.e. biodegradable farming mulching geotextiles, such as coconut mats), "PLA geotextile" (i.e. biodegrabable geotextile derived from corn starch), "truck tarp" (i.e. tarps used to cover truck loads), "unknown" (with or without precision regarding the *nature* of the fabric: geomembrane or geotextile), "weed geotextile" (i.e. a geotextile specifically designed for the control of invasive alien species: e.g. Plantex ®, RootBarriers ®), "woven geotextile". As a reminder, *geotextiles* are permeable fabrics that can be biodegradable (e.g. PLA, coconut, hemp) or synthetic, woven or not, while *geomembranes* are always synthetic, unwoven and impermeable.

The following seven columns (***geomem***, ***geotex***, ***agri_geomem***, ***liner_geomem***, ***woven_geotex***, ***mulching_geotex*** and ***weedsp_geotex***) are binary variables indicating if the used fabric belongs to the aforementioned categories (as a fabric can belong to multiple categories).

- ***other_unknown*** (*binary variable*) = indicates whether the used fabric was of unknown or very uncommon type (e.g. construction geotextile).
- ***grammage*** (*continuous variable*) = indicates the grammage of the used fabric (in $g.m^{-2}$). Note that comparisons are difficult as it depends on the material that composed the fabric.
- ***thickness*** (*continuous variable*) = indicates the thickness of the used fabric (in mm). Note that comparisons are difficult as it depends on material that composed the fabric.
- ***resi_punc*** (*continuous variable*) = indicates the resistance to puncture of the used fabric (in N for some geotextiles and in $g.\mu m^{-1}$ for others recognisable by their much lower values). Note that this variable should not be used as is since units may differ.
- ***resi_trac*** (*continuous variable*) = indicates the resistance to traction of the used fabric (in $N.mm^{-2}$ for geotextiles and in $N.mm^{-2}$ for geomembranes). Note that this variable should not be used as is since units may differ.

Information regarding the preparation of the site prior to tarping

- ***season*** (*categorical variable*) = indicates the season during which the site was prepared for the fabric installation, that is notably when the knotweed's aerial organs were destroyed or flattened to enable the laying of the fabric strip(s).
- ***maxveg*** (*binary variable*) = indicates whether the preparation of the site and the destruction of the knotweed's aerial organs took place during the time when the plant was at its maximal vegetative height (ca. from June to mid-August), i.e. when the plant is done using its belowground reserves and starts storing them again.
- ***preparation*** (*categorical variable*) = indicates the type of preparation prior to tarping that was undertaken: "crushing" (i.e. stems and/or rhizomes were crushed), "excavation" (i.e. mechanical excavation of stems and shallow belowground organs), "grazing" (i.e. grazing of the aerial organs), "mowing" (i.e. mowing of the aerial organs), "none", or "sparying" (i.e. spraying of herbicides on the aerial organs).

- ***levelling*** (*binary variable*) = indicates whether soil was flattened and levelled prior to the installation of the fabric strip(s) (usually with a power shovel).
- ***stand_surface*** (*positive continuous variable*) = indicates the approximate surface area of the knotweed stand being tarped.
- ***age*** (*ordinal variable*) = gives an approximate age class to the knotweed stand being tarped: "1" = between 1 and 3 years old; "2" = between 3 and 10 years old; "3" = older than 10 years old. Unfortunately, this variable is not very reliable as respondents usually guessed the age of the knotweed stand.

Information regarding the installation of the fabric strip(s)

- ***fully_tarped*** (*binary variable*) = indicates whether the targeted knotweed stand was partially covered or entirely covered by the fabric strip(s): "0" = only partially covered; "1" = entirely covered.
- ***distance*** (*positive continuous variable*) = indicates the distance (in m) beyond the visible edge of the knotweed stand covered by the fabric strip(s).
- ***multi_strips*** (*binary variable*) = indicates whether several fabric strips were used to cover the targeted knotweed stand.
- ***strips_overlap*** (*positive continuous variable*) = indicates the distance used to overlap the strips together (in cm), only if several fabric strips were used to cover the targeted knotweed stand. Note that "NA" may indicate either that a single fabric strip (= sheet) was used or that we do not know the overlapping distance used.
- ***strips_fixation*** (*categorical variable*) = indicates the method used to fix (= connect) the strips together, only if several fabric strips were used to cover the targeted knotweed stand. It could be one – or a combination – of the following methods: "staples" (i.e. strips were attached together using big staples); "backfill" (i.e. strips were covered with backfill); "tape" or "double tape" (i.e. strips were attached together using one or two bands of adhesive tape); "geotext" (i.e. strips were maintained by the weight of other fabric strips laid across them to form a lattice); "glu" (i.e. strips were glued together); "heavyobj" (i.e. strips were maintained together by the weight of heavy objects, such as logs or rocks); "thermoweld" (i.e. strips were thermowelded together); "refold" (i.e. strips were maintained together by refolding one over the other to make a fold of fabric); "*taped_overlapband*" (i.e. strips were maintained together by an additional band of fabric taped on top of the junction of the strips); "wired_stakes" (i.e. strips were attached together by stakes *sewed* together using a metal wire); "overlap" (i.e. strips were simply overlapped with no additional fixing).
- ***staples_distance*** (*positive continuous variable*) = indicates the distance between staples (in cm), if several fabric strips were attached together with staples or in the case where fabric strip(s) were attached to the ground using staples.
- ***fabric_fixation*** (*categorical variable*) = indicates the method used to fix (= attach) the strip(s) of fabric to the ground, regardless of whether there was one or several strip(s). It could be one – or a combination – of the following methods: "staples" (i.e. the fabric was attached to the ground using big staples); "sedicover" (i.e. the fabric was maintained to the ground by being covered with sediments or backfill); "wired_stakes" (i.e. the fabric was attached to the ground by stakes *sewed* together using a metal wire); "trench" (i.e. the fabric was maintained to the ground by burying its edges in trenches); "*skrewed_metalband*" (i.e. the fabric was attached to the ground by applying a metal band on it screwing it to fixed objects such as walls or pillars); "heavyobj" (i.e. the fabric was maintained to the ground by the weight of heavy objects, such as logs or rocks); "glued_spikes" (i.e. the fabric was attached to the ground by glued spikes); "plantation" (i.e. the fabric was maintained to the ground by planting tree or shrub cuttings).
- ***tarpfix_multimethod*** (*binary variable*) = indicates whether several methods were combined to fix the fabric to the ground. The idea was that using several methods would be more robust as relying on a single method increases the odds of having the fabric sheared, blown away, etc.

- ***sedicover_height*** (*positive continuous variable*) = indicates the height (= thickness) of the sediment layer used to cover the fabric strip(s) (in cm), only if a sediment (or backfill) layer was used to cover the tarped area. Note that the actual effect of the layer strongly depends on the type/coarseness/density of materials used (e.g. sand vs backfill).
- ***trench*** (*binary variable*) = indicates whether a trench was dug around the tarped area (e.g. to bury the fabric edges or to install a root barrier).
- ***trench_depth*** (*positive continuous variable*) = indicates the depth (in cm) of the trench dug around the tarped area, only if a trench was dug. If no trench was dug, the value is 0 (not NA).
- ***pierced_tarpinstall*** (*discrete variable*) = indicates the estimated frequency of holes involuntarily pierced through the fabric during installation, from 0 to 10 (Likert scale).
- ***plantation*** (*ordinal variable*) = indicates whether plantations were made during the fabric installation or quickly after installation: "0" = none; "1" = herbaceous seeds were sown; and "2" = tree or shrub cuttings were planted.

Information regarding the follow-up measures or observations made after fabric installation (i.e. during the duration of the tarping operation per se)

- ***repairs*** (*binary variable*) = indicates whether repairs were made to the tarping set-up after installation (i.e. from installation to the end of the tarping operation or, to the day the managers answered the survey for ongoing operations).
- ***add_control*** (*binary variable*) = indicates whether additional control measures (e.g. knotweed mowing, uprooting, crushing, cutting) were required after installation (i.e. from installation to the end of the tarping operation or, to the day the managers answered the survey for ongoing operations). E.g. this was the case when knotweed pierced the fabric, grew around it (regrowth on the edges).
- ***add_control_type*** (*binary variable*) = indicates the type of additional control measures applied, only when such measures were required. It could be one – or a combination – of the following methods: "crushing" (i.e. stems/shoots were crushed), "salting" (i.e. aerial organs were salted), "uprooting" (i.e. stems were uprooted), "mowing" (i.e. stems were mowed), "none", or "spraying" (i.e. spraying of herbicides on the aerial organs).
- ***degradation*** (*binary variable*) = indicates whether the tarping set-up experienced degradations during the duration of the tarping operation.
- ***pb_fixation*** (*binary variable*) = for operations where degradations after installation were observed, this variable indicates whether the degradations were related to fixation problems.
- ***pb_durability*** (*binary variable*) = for operations where degradations after installation were observed, this variable indicates whether the degradations were related to the durability of the chosen fabric (e.g. UV wear and tear, weak mechanical resistance).
- ***pb_trampiercing*** (*binary variable*) = for operations where degradations after installation were observed, this variable indicates whether the degradations were related to external elements that had pierced the fabric (e.g. stamping, fallen rock or tree branch, plan rooting).
- ***pb_vandalism*** (*binary variable*) = for operations where degradations after installation were observed, this variable indicates whether the degradations were related to vandalism.
- ***regrowth_during*** (*binary variable*) = indicates whether knotweed regrowth(s) were observed within or around the tarped area, during the duration of the tarping operation.
- ***reg_staples*** (*binary variable*) = indicates whether any knotweed regrowth managed to sprout at the level of staples, for operations in which staples were used.
- ***reg_overlaps*** (*binary variable*) = indicates whether any knotweed regrowth managed to sprout at the level of strip overlaps, for operations in which several fabric strips were used.

- ***reg_obstacles*** (*binary variable*) = indicates whether any knotweed regrowth managed to sprout at the level of obstacles, for operations in which obstacles were found.
- ***reg_holes*** (*binary variable*) = indicates whether any knotweed regrowth managed to sprout through existing holes in the fabric, for operations in which holes existed or were deliberately made (but holes that were not made by the knotweed regrowths themselves).
- ***reg_plantations*** (*binary variable*) = indicates whether any knotweed regrowth managed to sprout at the level of plantations, for operations in which plantation were made.
- ***reg_pierced*** (*binary variable*) = indicates whether any knotweed regrowth managed to pierce the fabric.
- ***reg_edges*** (*binary variable*) = indicates whether any knotweed regrowth managed to sprout at the edge of the tarped area (< 2m from the outer limits of the tarped area).
- ***reg_nearby*** (*binary variable*) = indicates whether any knotweed regrowth managed to sprout in the vicinity of the tarped area (> 2m from the outer limits of the tarped area).
- ***untarped_regrowth*** (*categorical variable*) = indicates whether, at the time of the removal of the fabric (i.e. at the end of the tarping operation), any knotweed regrowth was found: “tarpedarea” (i.e. within the formerly tarped area = beneath the fabric); “edges” (i.e. at the edge of the tarped area (< 2m from the outer limits of the tarped area)); “nearby” (i.e. in the vicinity of the tarped area (> 2m from the outer limits of the tarped area)). Only concerns operations that ended (and not those that were still ongoing or for which no fabric removal was planned).

Information regarding the situation at the time of the last visit to the site (latest updates)

- ***tarping_abandoned*** (*binary variable*) = indicates whether the tarping operation was interrupted before the date initially planned (project abandoned).
- ***tarping_completed*** (*binary variable*) = indicates whether the tarping operation has been completed, whether the fabric was removed or not. It thus includes operations having reached their planned duration but for which no fabric removal was intended.
- ***tarping_ongoing*** (*binary variable*) = indicates whether the tarping operation is still ongoing (i.e. their manager considers them as being not completed).
- ***tarping_duration*** (*positive continuous variable*) = indicates the effective duration of the tarping cover at the time of the last observation of the site (in growing seasons). For operations still in progress, this corresponds to the time since installation. For abandoned operations, this corresponds to the time until abandonment. This variable is thus not very reliable as is.
- ***latest_condition*** (*categorical variable*) = indicates the estimated condition of the tarping set-up (fabric and fixation system(s)) at the time of the latest visit of the site: “good” (i.e. the set-up is still in good condition), “bad”, “destroyed”, “stolen” (i.e. the fabric was stolen), “unknown”.
- ***latest_regrowth*** (*categorical variable*) = indicates whether, at the time of the re latest visit of the site, any knotweed regrowth was found: “tarpedarea” (i.e. within the formerly tarped area = beneath the fabric); “edges” (i.e. at the edge of the tarped area (< 2m from the outer limits of the tarped area)); “nearby” (i.e. in the vicinity of the tarped area (> 2m from the outer limits of the tarped area)).
- ***latest_months*** (*continuous variable*) = indicates the approximate time (in months) since the last visit to the site.
- ***eff_expansion*** (*ordinal variable*) = indicates whether, according to the respondents, the tarping operation was effective to limit the local lateral expansion of the targeted knotweed stand (“0” = not at all; “10” = yes, extremely).
- ***eff_dispersal*** (*ordinal variable*) = indicates whether, according to the respondents, the tarping operation was effective to limit the dispersal of the plant’s propagules to other locations (“0” = not at all; “10” = yes, extremely).

- ***eff_vigour*** (*ordinal variable*) = indicates whether, according to the respondents, the tarping operation was effective to limit the vigour of the targeted knotweed stand (e.g. ramet density, growth rate, height, biomass) ("0" = not at all; "10" = yes, extremely).
- ***eff_eradication*** (*binary variable*) = indicates whether, according to the respondents, the tarping operation was effective to eradicate the targeted knotweed stand (e.g. ramet density, growth rate, height, biomass): "0" = no, some regrowths are still visible (= some ramets are still alive); "1" = yes, no visible regrowths. Note that some respondents indicated in their comments or e-mails that they answered "yes" while a few live ramets were still present (but in such low abundance that they could easily be killed with additional control efforts).