Supplementary Table S1. Cases included in the review of Nature-based Solutions for agricultural groundwater management.

| | Case | Ref(s) | Region | Problem | Description of intervention | Benefits | Drawbacks | Traditional | Intervention point | | | NbS type | |
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| | | | | | | | | | *Sow* | *Store* | *Harvest* | *Hard* | *Social* |
| **1** | *Acequias de careo* | Martos-Rosillo et al. (2019); Pulido-Bosch and Sbih (1995) | Acequia de El Espino; but also all over Sierra Nevada, Spain (700km of acequias de careo, most from Medieval time period and most are still working) | Capture snowmelt for summer irrigation of crops | "Water infiltrated along the acequias de careo slowly flows downhill, through the weathered zone of the hard rock aquifer. During the dry season, it arises through springs located halfway down the hillside and/or through the rivers from which it was derived during the thaw, increasing its base flow (Fig. 3). In summer, the acequias de careo are no longer used and another extensive network of irrigation channels, located at a lower altitude, begins to divert water from the rivers to the agricultural areas" (Martos-Rosillo et al., 2019: p.4) | In 2014/2015 hydrologic year, the Acequia recharged 40% of the total Bérchules River flow (measured at basin outlet) and has generally increased mean groundwater runoff, reduced peak of the river hydrograph, and increased the river base flow → promoted livestock and crop cultivation → promoted centuries of settlement ALSO increased groundwater discharge along mountain slopes → increased vegetation → increased floral and faunal diversity | Links downstream irrigation and vegetation cover to upstream land management, relies on traditional practices and knowledge that is being lost | X | X | | | X | X |

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| **2** | *Ahar pynes* | Bhattacharya (2015); Cassin and Ochoa-Tochachi (2021) | South Bihar, India | Collect runoff from monsoonal rains similar to johads but in hillier, steeper areas with sandy soils. For use in agricultural fields | U-shaped, three-sided embankment | Captures water to use in agricultural fields and recharges groundwater | X | X | | X |
| **3** | *Albarradas AKA jagueyes, atajados or pataquis* | Marcos (2006); Cassin and Ochoa-Tochachi (2021) | Coastal Ecudaor | Region is semi-arid dry forest with gently sloping terrain, porous/sandy soils and sandstones, experiences short intense rains and prolonged dry periods | "Circular or U-shaped lagoons that slow and capture runoff behind earthen embankments following rain events…water trapped by the embankment sinks into the soils and permeable substrate, recharging the local aquifer. Water is then harvested from wells excavated to one side of the embankment or springs downstream" | Through the use of a complex system of albarradas, reliable groundwater resources were provided to the region. Thousands of years old in Santa Elena and Manabi provinces. | X | X | X | X |

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| **4** | *Amunas* or *mamanteos* | Apaza et al. (2006); Ribeiro (2021); Cassin and Ochoa-Tochaci (2021) | Huarochiran communities of Peru (San Andrés de Tupicocha, Santiago de Tuna, La Merced de Chaute) | Natural prolonged drought and El Niño variability | Artificial fissures in mountains used to transmit snowmelt into aquifers for spring recharge | Locals have reported substantial recharge of sometimes double or triple the discharge volume of springs. This has led to sustained production of crops, such as prickly pear and peaches in Santiago de Tuna. | Must be placed at the headwaters in mountainous areas and the presence of rocky surfaces overlying fissured aquifers. Can not be too many suspended solids or fine sediments, otherwise erosion and clogging is a risk. Also requires strong social infrastructure for maintenance. | X | X | | X | X |
| **5** | *Andenes* | Ribeiro (2021) | Wari culture and other peoples of south-central Andes | Natural prolonged drought and El Niño variability; mountainous terrain | "…man-made alteration of sloping land topography, with the object of making better use of natural resources…" (p.485) | Terracing to retain soil, improve percolation of rain/irrigation water, preserve soil moisture, and create/improve microclimates (provides protection against advective energy transfer → reducing temporal change and creating a greenhouse effect | | X | X | X | X | |

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| **6** | *Borrequiles* | Martin-Civantos (2014); Cassin and Ochoa-Tochachi (2021) | Sierra Nevada, Spain | Wetland management | Pastoralists "divert[sic] water from streams and springs with ditches or ridges to spread the water out" | Improved infiltration and soil saturation, higher water levels in wetlands, storage for release during dry seasons which helps to maintain downstream rivers and springs and foraging pastures | | X | X | X |
| **7** | Contour bunds and ridges AKA hafaer | Oweis and Hachum (2006) | Mehasseh, Syria | Very dry, Mediterranean climate, degraded land, people rely on sheep production fed by grazing | In 1995, a contour bunds and ridges project was introduced. Earthen bunds in a semi-circle, crescent or trapezoid shape are used to capture rainwater from upslope and Atriplex shrubs are grown in front of the bund where the water collects. | Planted shrubs on bunds had an over 90% survival rate whereas those planted without bunds had less than a 10% survival rate. | Unclear groundwater benefits, but expected to be some based on bund projects elsewhere. Technologically intricate, disputes over land and water rights, poor characterization of rainfall, ET, and soil properties | X | X | X |
| **8** | *Cuchacuchas* | Denevan (2001); Cassin and Ochoa-Tochachi (2021) | Central and Southern Peruvian Highlands | Pastoralists need to improve forage for livestock (alpaca, llamas, sheep) via increased soil moisture | "Small, circular, permeable ponds formed in natural depressions and/or excavated and deepened to enhance storage and infiltration". May have hundreds per hectare | Increases soil moisture and recharges downgradient springs | | X | X | X |

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| **9** | *Diques de champas* | Gonnet et al. (2016); Cassin and Ochoa-Tochachi (2021) | Northern Highlands, Chile | Fast runoff, leading to diminished wetland capacity, erosion, and less aquifer recharge | "Embankments, dams, and dikes constructed from transplanting sections of wetland soils, plants (seeds, rhizomes), and associated microbes to channel water to new areas and support growth of new wetland vegetation" (p.289) | Slows runoff and spread it across a larger area to improve wetland capacity, reduce erosion, increase soil moisture, dissolve more salts, increase infiltration/aquifer recharge, improve forage biomass, improve buffering soils and vegetation during dry periods | X | X | | X |
| **10** | *Dohs* | Bhattacharya (2015); Cassin and Ochoa-Tochachi (2021) | India | Need for increased groundwater for shallow wells for irrigation in a semiarid environment | Rectangular excavations in seasonal streambed s to capture and store runoffm used in conjunction with shallow wells (odees) | Enhances groundwater recharge | X | X | X | X |

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| **11** | Edwards Aquifer land purchasing and H2Oaks project | Miller et al. (2021); Milman et al. (2021); Singh and Zaragoza-Watkins (2018) | San Antonio, Texas | Rainfall variability combined with restrictions on groundwater extraction. "Pumping restrictions on the Edwards aquifer with no carryover provision; cost of imported supplemental water, endangered species protection" in Overview Table of Miller et al., 2021) | purchase of land over the Edwards Aquifer to improve infiltration by converting from agricultural to natural. The transfer of water from Edwards to Carrizo-Wilcox to support endangered species and create buffer for drought year, this also required the purchase of land above the aquifer. | Long-term results are not known because the project is more recent. So far, farmers have been able to lease the land that was bought above the Carrizo-Wilcox aquifer and can obtain water from the water authority. | Conflict over water storage and quality, monitoring recharged water. Could also reach storage capacity in Carrizo-Wilcox | | X | X | X | X | X |

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| **12** | *Eri and Kumans (tanks)* | Bhattacharya (2015); Cassin and Ochoa-Tochachi (2021) | Tamil Nadu, India | Monsoonal rain control | Tanks collect monsoonal rains and store the water into soils and shallow aquifers. Dates back to somewhere between 6th and 10th centuries. Similar to Sri Lankan tank cascades but without integrated protected forest-agroforest-agriculture system | Flood control, erosion prevention, groundwater recharge, drinking water, irrigation water. Has enabled rice cultivation in the region that wouldn't have been possible otherwise. | | X | X | X |
| **13** | Forestation in paddylands | Clark et al. (2021) | Central India Highlands | India plans to increase forested land to 33% of its national lands to create carbon sinks (for 2.5-3 billion t of CO2) and improve "hydrological services" (p.1) | Converting 3-5 million ha of degraded/marginal agricultural land to forest or agroforestry and improving tree cover in designated forest lands | Groundwater recharge increased by 3% (15.38mm) in models when reforestation was on non-agricultural lands and paddy agriculture was maintained because of the increased depression storage | Basin-level responses to forest cover were heterogeneous, with reforestation of 33% in CIH resulting in an overall net reduction in groundwater recharge of 1% (7.94 mm) if paddy is converted | | X | X |

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| **14** | Honghe Hani Rice Terraces | Yongxun et al. (2016); Cassin and Ochoa-Tochachi (2021) | China | Mountaintop forests capture water ("water recharge" forests) and are part of a forestry system that also has sacred forests, consolidation forests, and village forests (for timber provision to local villages). Channels direct water from mountaintop forests to permeable sandstone and then release the water as springs into complex, communally managed channels that spread this water into a huge terrace system in and between valleys. "HHRTS is a comprehensive system that includes not only natural elements like landforms, and natural organisms, hydrology, climate, but also man-made landscapes such | Transfers water from forests to groundwater to rice terraces | X | X | | X | X | X |

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| **15** | Ifugao Muyong Forests and Rice Terraces | Acabado (2012); Acabado and Martin (2015) | Philippines | “Integrated protection forests, agroforestry, and terracing to protect water sources, sow water from runoff in steep catchments in soils, groundwater, and terraces” (Cassin and Ochoa-Tocachi, 2021: p. 313), "In Ifugao, there is no formal irrigation organisation such as the zanjera, although there is a customary cooperative system of reciprocal labour (uggbu or baddang). Cooperation among those whose fields have to share a water source — common in the area — is apparent." (Acabado, 2012: p.506) | To supply water to paddy rice, wet-pond taro, and domestic uses | X | X | | X | X | X |

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| **16** | Johadi | Everard (2015); Bhattacharya (2015) | Alwar District, Rajasthan, India | Groundwater depletion followed by ecological and socioeconomic decline | Johadi built by TBS followed three generic designs that could be modified to suit "local needs, topography, microcatchment area, knowledge and budgets" (Everard, 2015: p. 128): 1) "concave earth-banked johadi in flatter topography", 2) "flat check dams (anicuts) on wider microcatchments with low slope", 3) "convex dams bulging upstream to intercept water on higher slopes" (Everard, 2015) | Groundwater recharge → improved soil moisture & nutrients & more water → food sufficiency & income from farm profits; Also improved social infrastructure (restored traditional village decision-making processes) and women empowerment; National water network and Water Parliament; in Bhattacharya (2015): 3000 johads were revived across >650 villages and the result was a rise of groundwater level, conversion of flashy ephemeral streams to perennial streams. "Johads are associated with protected sacred groves" (p. 291) | Potential for capture by elites, perceived as a threat to Indian government efforts to commodify water, challenges considering and measuring non-market values in reporting of effectiveness | X | X | | | X | X |

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| **17** | *Khadin system* | Bhattacharya (2015); Cassin and Ochoa-Tochachi (2021) | Jaisalmer, Jodhpur, Bikner and Barmer Districts, Rajasthan | Monsoonal rain control | Stores agricultural water from a catchment in a khadin bund or earthen embankment, storing it in the soils or shallow groundwater | Improved soil moisture buffers crops against seasonal drought | | X | X | X | X | |
| **18** | Lake restoration | Panagopolous and Dimitriou (2020) | Lake Karla, Greece | Groundwater overexploitation leading to deeper, more costly drilling, soil salinization, and saltwater intrusion AND intentional draining of Lake Karla caused social unrest, ecological collapse, and microclimate shifts that triggered land abandonment. | Restoration of a natural lake that is filled using diverted surface water, reducing groundwater use and also recharging groundwater | Groundwater recharge, reduced abstractions, reduced downstream flooding, restored microclimate, restored habitat for migratory birds and fish | Costly, requires effective management strategy | | X | X | X | X |

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| **19** | Managed aquifer recharge | Qadir et al. (2015) | Paphos, Cyprus | "All of the treated wastewater produced in the southwestern coastal city of Paphos in Cyprus is used for Ezousa aquifer recharge, which is subsequently pumped for irrigation through diversion in an irrigation channel . Irrigation with treated wastewater in the country is regulated by the Code of Good Agricultural Practice. The treated wastewater can be applied to all crops except leafy vegetables, bulbs, and corn eaten raw. " (p.160) | Can control risk of contamination better than unmanaged recharge. Supports cultivation of citrus trees, olive trees, fodder crops, industrial crops, and cereals as well as providing water for landscaping and the irrigation of football fields. | Risk of contamination is still possible with injected water, particularly if treated/untreated wastewater, and unexpected hydrogeologies in aquifers. | | X | X | X | X |

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| **20** | Managed aquifer recharge | Qadir et al. (2015) | Bolivar aquifer, Australia | Manage intra-annual water variability for horticulture when surface storage is prohibitively expensive and geology (thick clay at surface) was not viable for surface infiltration | Water is treated to the minimum needed for irrigation, retaining nutrients. Site was selected to protect drinking water supplies and tested after drilling and before operations, with monitoring put in place. | | Risk of contamination is still possible with injected water, particularly if treated/untreated wastewater, and unexpected hydrogeologies in aquifers. Expensive (0.06-0.14 AUD per cubic meter, but on par with groundwater extraction costs. | | X | X | | X | X |

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| **21** | Managed aquifer recharge | Qadir et al. (2015) | Limassol, Cyprus | "…wastewater generated by the southern coastal city of Limassol in Cyprus is collected, treated, and used for many purposes. During winter when the demand for water in agriculture decreases, treated wastewater is pumped to an irrigation dam for storage or recharge of Akrotiri aquifer. In 2010, about 15% of treated wastewater was used for the aquifer recharge." (p.160) | Can control risk of contamination better than unmanaged recharge. Replenishment of the Akrotiri aquifer has generated an estimated annual value of 1.182 million USD (in 2010 USD, or 0.20 USD per cubic meter). | Risk of contamination is still possible with injected water, particularly if treated/untreated wastewater, and unexpected hydrogeologies in aquifers. | | X | X | X |

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| **22** | Managed aquifer recharge | Qadir et al. (2015) | Mashhad, Iran | Injection of untreated wastewater into the Mashhad Plain aquifer via wells and release into the Kashafrud River catchment. Following contamination challenges, two treatment plants have been built (with a third underway) to produce treated wastewater for groundwater recharge, surface water release, or direct irrigation use. Their water recycling plan was reportedly to include allocations of 150 MCM to replace existing groundwater withdrawals, 95 MCM to stabilise groundwater levels and prevent mixing of saline and non-saline waters, and 8 MCM to supply water to industry and green spaces. | Has caused groundwater contamination, excessive pumping in the eastern part of the aquifer, contamination of surface water | Risk of contamination is still possible with injected water, particularly if treated/untreated wastewater, and unexpected hydrogeologies in aquifers. | | X | X |

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| **23** | Multiple crops in multiple ecological niches | Ribeiro (2021) | Peru | Natural prolonged drought and El Niño variability; mountainous terrain | Cultivate many different products in different ecological niches (as access allows) to avoid total loss and provide a cushion for survival into the next harvest | Protects against total crop loss, aids survival of farmers into next growing season when groundwater resources are poor. | Does not reduce risk of individual plot loss. Requires access to multiple niches, often only possible when farmers have land at multiple altitudes | X | | | X | | X |
| **24** | *Naada/Bandha* | Bhattacharya (2015); Cassin and Ochoa-Tochachi (2021) | Rajasthan (Mewar region of Thar desert) | Monsoonal rains | "A stone check dam constructed across a stream or gully captures monsoon runoff" and store it in natural silt deposits | Improved soil moisture and nutrients support crops, recharge connected aquifers | | X | X | | X | X | |
| **25** | *Negarim* | Oweis and Hachum (2006) | Jordan | Less than 160mm of annual rainfall means economic crops and livestock rely on limited groundwater resources | Introduction of both fruit trees (1987) and negarim (date not specified) (diamond or rectangular shaped runoff grid plots surround by low earth bunds) alongside the addition of polymers to increase soil water storage capacity and retain soil moisture through the summer | Indirect benefits to groundwater by alleviating demand. Storage efficiency in soil of 38-100% | Technologically intricate, disputes over land and water rights, poor characterization of rainfall, ET, and soil properties | X | X | X | X | X | |

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| **26** | *Paar system* | Bhattacharya (2015); Cassin and Ochoa-Tochachi (2021) | Rajasthan | Common water harvesting practice in western Rajasthan, not addressing a specific issue | "A relatively large depression surrounded by vegetation is used to capture rainwater runoff, which percolates into the sandy soil/shallow aquifer for storage. Stone wells within the depression then harvest the stored water for use" | Essentially a groundwater reservoir | X | X | | X | X |
| **27** | *Puna* | DiNapoli et al. (2019) and Hixon et al. (2019); Cassin and Ochoa-Tochachi (2021) | Rapa Nui | Brackish/saline groundwater from saltwater intrusion and lack of natural freshwater storage due to episodic rain and 'flashy' geography | Stone dam that discharges freshwater from coastal seeps into coastal aquifers | Stores freshwater in a 'flashy' environment prone to droughts | X | | X | | X |

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| **28** | *Puquios* | Schreiber and Lancho Rojas (2006); Ribeiro (2021) | Nazca desert, Peru | Natural prolonged drought (in 560 CE) in an arid environment | Subterranean galleries (horizontal wells) connecting the surface to groundwater and discharging into a small reservoir called a cocha or directly into irrigation canals. Along the gallery there are open holes (called 'eyes') that connect to the surface to facilitate cleaning | Enabled the Nasca society to access drinking water and develop agriculture to provide food security | X | X | | X | X | X |
| **29** | *Qochas (AKA albarradas, atajados, jagüeyes, pataquis)* | Denevan (2001); Cassin and Ochoa-Tochachi (2021); Martos-Rosillo et al. (2021) | Peruvian Highlands | Need for water storage for domestic use, livestock watering, and water sources for livestock forage | Depressions (larger than the cuchacuchas) deepened to increase water storage at the surface and recharge groundwater that feeds downgradient springs. Found in large numbers or pond fields | Provides surface water and recharges downgradient springs | X | X | | | X | |
| **30** | *Represas de limo, silt dams, artificial bofedales* | Lane (2014); Cassin and Ochoa-Tochachi (2021) | Andean highlands, Peru | Fast runoff, leading to diminished wetland capacity, erosion, and less aquifer recharge | "Small dam/embankment constructed across small streams and drainages to accumulate silt and water" (p.289) | Slows runoff and spread it across a larger area, improving wetland capacity, reducing erosion, increasing soil moisture, and increasing infiltration/aquifer recharge | X | X | | | X | |

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| **31** | *Sand dams* | Nilsson (1998); Cassin and Ochoa-Tochachi (2021) | Kenya | Ephemeral streams in arid/semi-arid environment | Stone/masonry/brush structures built across a stream and extended several feet into the streambed to build up a deep layer of saturated sands that store water and recharge aquifers | Water is available for domestic purposes, livestock, and crops | X | X | X | X |
| **32** | *Talabs* | Bhattacharya (2015); Cassin and Ochoa-Tochachi (2021) | Rajasthan | | Structures that increase the depth and volume of natural depressions to trap slope runoff and temporarily store water until it percolates into groundwater | Groundwater recharge for withdrawal in nearby wells and step wells | X | X | | X |
| **33** | Tapes | Martos-Rosillo et al. (2021; Alvarez (2006); Cassin and Ochoa-Tochachi (2021) | Ecuador | Rainwater management | "small walls built in the main channels of some streams and rivers of discontinuous flow, trapping the water during rainy periods. They favor infiltration of the water, which can then be tapped downstream through wells or draining galleries." (Martos-Rosillo et al., 2021; p. 490) | Collection of water and sediment during rain events | X | X | | X |

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| **34** | The *moku* system and *wao kele* | Winter and Lucas (2017); Cassin and Ochoa-Tochachi (2021) | Hawai’i | “Mountains to sea integrated land divisions and water management system in Hawai’i consisting of protected upland forests (including cloud forests) to capture and infiltrate precipitation, diversion channels, and terracing” (Cassin and Ochoa-Tocachi, 2021: p. 313); based on a pre-contact governance system and kinship norms. *Wao kele* within this system whose primary function was to maximize aquifer recharge, described as "An untended forest zone associated with core watershed areas (remote upland, wet forest below the clouds) that was left as a native-dominant plant | Brings water to agriculture via diversion channels and terracing, retains sediments (protecting coral reefs and their fisheries from effects of sedimentation) and slows flow of water to enhance groundwater recharge and sustain domestic and agricultural freshwater supplies on the coastal plain | X | X | X | X | X |

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| **35** | Unmanaged aquifer recharge | Qadir et al. (2015); | Mezquital Valley Aquifer in Mexico | Low annual average rainall (500mm per year) and low soil fertility is addressed through irrigation with treated wastewater. | Treated wastewater is applied in excess to fields and then infiltrates into groundwater, causing unplanned recharge approximating about 40-58% of applied irrigation water | Raised the water table in some places from 50m below surface level to the surface level, resulting in springs that are themselves a water source. Has improved quality of that water for some constituents (-95% for organic matter, 99% for over 130 organic compounds). | Increased groundwater salinity, helminth infections amongst children in wastewater irrigated areas is elevated. | | X | | X |
| **36** | Unmanaged aquifer recharge | Qadir et al. (2015) | Bangalore, India | Water transfer from Yellemallappa shetty Lake, which receives untreated wastewater from Bangalore, to dry Amani Doddakere Lake refilled the lake and caused seepage to groundwater | Groundwater seepage from the refilling of Lake Amani Doddakere increased the water table, bringing water back to existing tube wells that run dry due to over-extraction | Improved water quantity available to farmers and water vendors | | | X | X | X |

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| **37** | Village Tank Cascades | Geekiyanage and Pushpakumara (2013); Cassin and Ochoa-Tochachi (2021) | Sri Lanka | "Integrated protection forest, water tanks, and agricultural fields that protect water sources, sow water from seasonal monsoon rains in tanks, wetland soils, and groundwater" (Cassin and Ochoa-Tocachi, 2016: p.313) and "Four distinctive zones can be identified in a TCS such as (i) tank bund and tank bed, (ii) associated irrigation channels" (Geekiyanage and Pushpakumara. 2013: p.96) and "Analysis of TCSs shows that their management was largely done by the social system with established institutions and leadership structures with cultural and spiritual norms that respected life in its all | To supply water to rice fields, domestic uses, and livestock | X | X | X | X | X |

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| **38** | *Virdas* | Bhattacharya (2015); Cassin and Ochoa-Tochachi (2021) | Gujarat | Brackish/saline groundwater (from natural processes and geochemistry) | A shallow depression made in sandy soils or sandy dry riverbeds and lakes improves rainwater infiltration into soil, creating a lens of freshwater on top or brackish/saline and deeper groundwater | Collects water suitable for drinking and irrigation | X | X | X |

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| **39** | Wadi Terrace Systems | Beckers et al. (2013); Cassin and Ochoa-Tochachi (2021) | Tunisia; Yemen (*Ma'rib);* Spain; (Negev, Israel; Petra, Jordan; Matmata Mountain, Tunisia (Jessour); Libya; Andalucia, Spain (Cultivo de cañada) | Arid and semi-arid regions with flashy floods | Complex systems that might target groundwater, runoff, or floodwater, but many of which span a landscape and involve groundwater sowing, storing or harvesting. They consist of four components: catchment, conveyance/deflection device, storage facility, and target. "Terraced wadi systems consist of a series of small dams (check dams) that intersect parts of a wadi course (Fig. 7). The check dams lower the runoff velocity of the floods and thereby their transport capacity. In consequence the transported sediments accumulate behind the dams and gradually build a terrace or | Improved soil moisture and nutrients support crops, recharge connected aquifers | X | X | X | X | X |

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| **40** | Water banking | Clifford et al., 2004; Colby et al. (2010); | Some examples identified by Clifford et al., 2004): California Semitropic Groundwater Storage Program, Oregon Deschutes Groundwater Mitigation Bank, Edwards Aquifer Authority Groundwater Trust, Nevada Truckee-meadows Groundwater Bank | Unreliable water supply (dry seasons/years), unpredictable availability (dry future), need to incentivize conservation | "A water bank is an institutional mechanism designed to facilitate transfers of water on a temporary, intermittent or permanent basis through voluntary exchange" (p.1) which may be scaled from the local (e.g., urban area or county) to broad regions or even multiple states. Water banking includes surface storage in a reservoir and underground storage in an aquifer. Aquifers may be recharged in a planned or unplanned way. | Creates a more reliable supply, stores water for future, conserved water can be deposited into a water bank, can stimulate water markets by providing a storage mechanism (can be a physical purchase and transfer or the purchase and transfer of legal documents entitling a user to access a quantity), has resolved issues between sw and gw users and enabled compliance between US states over instream flows | Groundwater rights tend to be poorly defined, hard to enforce, and consequently often managed in the USA as an open access resource with varying degrees of success regulating pumping | | X | X | X | X | X |

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| **41** | *Zabo system* , or *ruza system* | Bhattacharya (2015) and Sharma and Sharma (2004); Cassin and Ochoa-Tochachi (2021) | Nagaland, NE Hill Ranges, India | "The zabo system has various components for water management such as: forest land as a catchment area, water harvesting systems like ponds with earthen embankments, cattle sheds and agricultural lands at lower elevations. The rain falls on a patch of protected forest on the hilltop; as the water runs off along the slope, it passes through various terraces. The water is then collected in pond-like structures in the middle terraces; below are cattle yards, and towards the foot of the hill are paddy fields, where the run-off ultimately meanders into collection systems. The maintenance of the whole system along | Recharging groundwater, terrace water for crops, paddy field rice | X | X | X | X |

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| **42** | *Zanjas de infiltración (imitates ancient cuchacuchas)* | Martos-Rosillo et al. (2021) | *Altiplanos (dry Andean high plans over 4000 m a.s.l) in Ayacucho, Peru* | *Cuchacucha: Small, circular (2-12m diameter, 0.3-0.6m depth) permeable earthen ponds maintained by local shepherds. Can be hundreds per hectare; MODERN zanjas: channels excavated (rectangular or trapezoidal) along altitudinal curves to intercept runoff and enable recharge* | Generate fodder for herds and recharge aquifers resulting in downstream spring recharge; MODERN zanjas: in addition to above pros, these also prevent erosion and, at lower altitudes, can be used to grow local vegetables (whose cultivation enhances the trapping of runoff and prevention of erosion) | X | X | X |