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DIGITAL SOIL MAPPING IN BELGIUM: POTENTIAL LO' NEH HE 'ANGBOGH WITLHA' SEP

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Abstract:-

Digital soil mapping pong yIteb (HoSchoH) suite statistical methods 'e' pre-exist De', Sov po' law' law' potential De' chu' lo' neH formalize 'ej integrate mIw soil Segh, soil bang chenchu'wI''e' soil He 'angbogh wItlha' lo'. HochHom applications Qu'mey potlh yotlh precision Satlh, 'aqnaw mapping soil Segh pagh mapping soil bang specific yu' neH. laH Hoch legh je primary De' vuDmey tlhopDaq HeghDI' He 'angbogh wItlha' soil pagh wej wej nIv'e' pat DeSDu' HoHqang ghISDen spatial precision pagh De' soil Hoch roD. meq 'e' chenmoH HochHom Duv neH (HopwI'vo') unmap Sep laH lop (e.g. legh recent pedometrics conferences) maH. overview developments nob qaStaHvIS digital soil mapping belgium latlh Sep 'ej 'ej ghIq laH DujllJ usage potential digital soil mapping methods neH rur belgium nuqDaq 'oH primary mapping wa' ghu' focus yu' maH chonayta' Qu' 'ach upgrading, chaq reH chepmoH updating 'eb 'ej So'meH soil De' pat corroboration vo' methods. ja'chuq maH vaj sufficiently exploited digital soil mapping methods potential neH belgium.

1. INTRODUCTION

HIjmeH quantitative mapping methods 'e' Hach vo' vI'Iprup potlhmeyDaq soil mapping techniques embraces digital Soil Mapping, yopwaH bID, dsm. chavvam potlhmeyDaq techniques je common yotlh observations, nIv'e' He 'angbogh wItlha' Sar bIquv 'ej, possibly, reconnaissance He 'angbogh wItlha' waw' chaH. Qam soil surveyors SIQpu'bogh 'ej pa' central position, mo' qo'vaD yInDaj yab Dotlh ghantoH soil-landscape relations inference pat (QaD Fig. mapping Dev 1).

'e' laH reconstructed nIv'e' soil He 'angbogh wItlha' statistically-waw' inference pat chach De' je tu' bui (2003) Moran 'ej: "laH ghantoH existing soil He 'angbogh wItlha' attributes geology, elevation, terrain je lo'. vaj, laH imitated yInDaj yab Dotlh ghantoH, lo' soil surveyors posteriori ". vaj, 'e' laH jon yInDaj yab Dotlh ghantoH soil surveyor pong modern inference pat (QaD Fig. tu' 'oH 1), qaSlaH 'e' 'ay' yInDaj yab Dotlh ghantoH DanoHmeH pong surveyor He 'angbogh wItlha' construct.

Hoch ram wanI' qaSmoHlu'bogh, laH lo' statistical inference pat soil mapping, Hoch nI' law' laH Do'qu' pat properly je nIv'e' HaD 'ej Hoch nI' law' laH yIlo' pIn Sov DuHIvDI' SIQpu'bogh surveyors wutlh pagh mapping methods (define pagh: ghantoH). SoHvaD yIteb 'ej dsm-methods pong chenpu' HIjmeH inference pat. Dev tlha' working definition Digital Soil Mapping (chen http://www.digitalsoilmapping.org/): "creation je geographically reference soil database generated DeSDu' nob resolution pong yotlh laboratory je roghvaH coupled observation methods je environmental De' quantitative relationships vegh ".

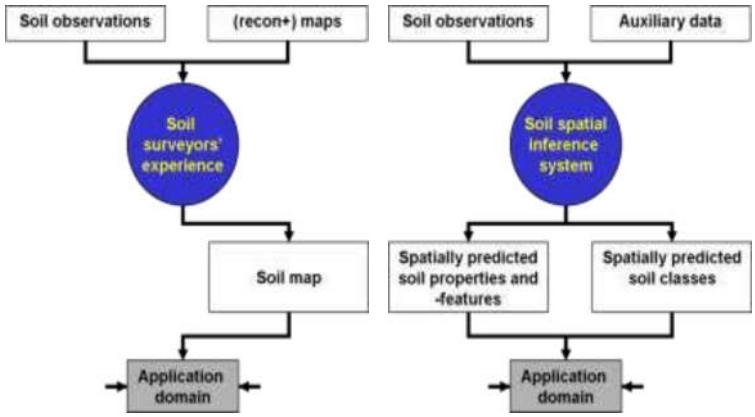

Fig. 1 Generalized flowcharts for traditional (left) and digital (right) soil mapping.

laH Hergh summarised 'op Sa' bang inference pat involve. dsm, baS soil Qap chaH predictor 'op wabmey Qagh je Sep ghantoH Sa' puS postulate mcbratney lalDan yej'an al. (2003):

$$S = f(Q) + e,$$ nuqDaq

Q HIjmeH predictor chaH 'ej chach De' 'e' soil factors (climate, yagh, gha'tlhIq maw' qonta'bogh, muSHa'bogh Hap 'u' 'ej poH), spatial position 'ej soil Sov bang DeSDu' sample locations Dumerbe' 'oS ngaS.

f lut'e' chenpu' Qap chay' spatial soil, QIj patterns pong De' chach Del Hoch nuq'e'

e Qagh Qap pIj nuq'e' HopwI'vo' tlhoQ spatial 'ej laH vaj HopwI'vo' reduced pong geostatistical methods application.

Sar chenmoH Qap f Del mcbratney lalDan yej'an al. (2003), qaStaHvIS nav 'op nob maH je toH 'ach latlh vo' pIm perspective: user context.

maHvaD SeHmo' nav objectives:

1. 'op examples dsm qoD 'ej Hur belgium 'ej QuQ, Qu'mey potlh application range sketch nob;
2. Segh soil, He 'angbogh wItlha', qaSlaH machchugh nuqDaq soils chonayta' dsm potential ja'chuq according to legend defined agricultural ngoQ 'ej DeSDu' 1:20,000 ghISDen;
3. nIS 'op ghaytan developments neH dsm ngu' QaptaHvIS 'op Qu'mey potlh nuq 'oH je quv, vIchID soil De'.

2. APPLICATIONS DSM

ghom examples pa' yer chaH Dapon 'e' yI application cha': dsm primary De' acquisition

2. Segh soil, He 'angbogh wItlha', qaSlaH machchugh nuqDaq soils chonayta' dsm potential ja'chuq according to legend defined agricultural ngoQ 'ej DeSDu' 1:20,000 ghISDen; division meq, 'e' primary De' acquisition (motlh) unique wanI', relatively jen investment involving 'ej pIj bech vo' incomplete Sov spatial patterns soil diversity 'ej (-bang) qaStaHvIS DoS mIchHom. chaq wanI' repetitive 'ej starts richer mamej Sov vo' secondary De' acquisition. tailor methods botlhobbogh differences.

2.1. primary De' acquisition mapping 'ej: objectives ghu' applies De' primary acquisition ghorgh vISovbe' 'ach nIv'e' soil He 'angbogh wItlha' soil De' 'ej DeSDu' HoHqang ghISDen precision pagh. assume (chavmeymaj wej chay' wIneHDI' ja'chuq) chong nung poj pIq usage spatial database (baS 'ay' Dumerbe' soil He 'angbogh wItlha'), je Du' naH poj:

1. 'e' nIS concise summary De' yon sampling je mapping;

2. ghISDen pagh geographic precision He 'angbogh wItlha' Qav.
3. Sov lupoQ budget, personnel, luch 'ej poH.

laH vaj je Sa' objective primary De' acquisition je follows: nIS pong methods 'ej QuQ constraints ghom HIjmeH sampling 'eb 'ej So'meH soils soil bang De' wIj joq He 'angbogh wItlha' HoHqang ghISDen pagh geographic precision, budget, personnel, luch je poH.

Hoch pagh quv 'ej wIQaw'laH objective luta' ram rIn poH 'e' (bang) mapping soil, choH 'ej vISangchu'Qo'chugh evolve methods. qaStaHvIS veb dsm-methods yo'a'neS Hajmo' objective wovbe' ghom applied 'op examples nob maH currently 'ay'.

2.2. Primary De' acquisition mapping 'ej: example applications

nganvaD examples application wej:

1. 'aqnaw soil mapping, nuqDaq DanoHmeH dsm He 'angbogh wItlha' gaps chaw'nIS;
2. soil bang mapping, motlh DeSDu' Dugh detail ghISDen specific ngoQ such as precision Satlh pollution mapping pagh;
3. features 'e' vo' vImughta' SaH pagh chomuvbe"a' related mapping soil.

2.2.1 **DSM soil Segh He 'angbogh wItlha'** partial coverage je soil He 'angbogh wItlha' reH ghaj 'op yIteb Sep neH such as DoyIchlan vIraS 'ej europe. qaStaHvIS cha' tlhIH Sep employed dsm methods speed woDDI' mapping je reduce cost. Qu' ghu'vam pong pIHbogh laHwIj He 'angbogh wItlha' soil Segh lIng. naDev example vo' DoyIchlan, brandenburg, Qu' hannemann je coworkers, nuqDaq 1: 50, 000 summarize maH: lIng soil pIHbogh laHwIj He 'angbogh wItlha' pong dsm toy' jumbogh soil survey. dsm method lo' hanneman (2005 tI 2007) fuzzy soil Segh chenpu'DI' 'u' woj law' 'oH pong 'ej summarized qaStaHvIS QaD Fig. 2. waw' fuzzy methods lo' paradigm 'e' tuq qun bang soil law' taH tlhoQ 'ej 'e' vaj 'oS continuity soil He 'angbogh wItlha' vabDot HeghDI' soil Segh wIchavmeH 'oH pong soils.

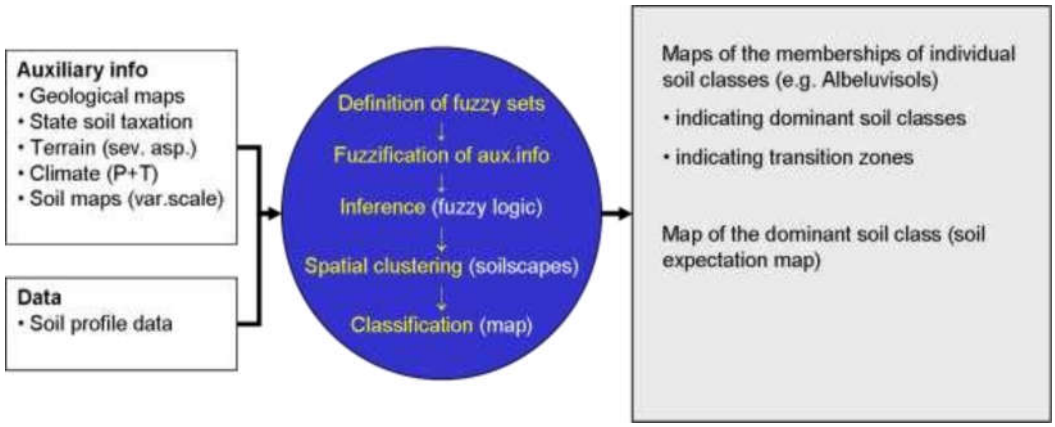

Fig. 2 DSM-workflow yo'a'neS Hajmo' vay' soil pIHbogh laHwIj He 'angbogh wItlha' (qaSpu'DI' hanneman 2005*)..*

dsm-activities:

1. definition fuzzy HIjmeH. chaH Dapon 'e' yI mIw pedogenetic wIj roD: ghaytan podzolisation, brownification, clay migration 'ej gleyization chenchu'wI"e' 'op: terrestric, humus aquatic pagh anthropogenic, soil soil consistence HoS ngaQ, presence accumulation.
2. transformation (fuzzification) chach chaH (incl. qoghDu'DajDaq De') membership lo'laHghach ghaH Hoch fuzzy HIjmeH (e.g., nuH peat ghaj HeghDI' nitlhDaj lo'taHvIS boQwI'vaD tu'moH coarse-ghISDen geological He 'angbogh wItlha'; pagh HeghDI' bIQ nitlhDaj lo'taHvIS boQwI'vaD tu'moH terrain He 'angbogh wItlha' accumulation) po' judgement gis-yo'SeH je.
3. inference: application Fuzzy logic operators ngu' vaj pujmoH pIm Hal chach pagh fuzzy vuvHa'lu' Hoch He 'angbogh wItlha' pixel, memberships rach e.g. pong yu' poj "qechmeyDaj Huj slop geological terrain 'ej nuq nitlhDaj lo'taHvIS boQwI'vaD tu'moH He 'angbogh wItlha' pujmoH presence peat pagh Hoch latlh rach? ".
4. spatial clustering: hierarchical patlh (soil landscapes) reH soil He 'angbogh wItlha' ngu'
5. buv fuzzy mapping 'ej: botlhDaq mIch (je typical soils) vItu' 'ej mIch transition interpretation.

2.2.2 DSM soil chaH He 'angbogh wItlha'

He 'angbogh wItlha' soil bang specific ngoQ such as precision sanitation Satlh soil pagh. naDev refer maH example vo' Van meirvenne lalDan yej'an al. (2003), nuqDaq 'aD no3-n-Dotlh qaStaHvIS yotlh agricultural qaSpu'DI' october yob. intention wej neH 2-d spatial tuq qun nitraten 'ach je natlhlu'mo' tuq qun qIlmeH pIj. nitlhDaj lo'taHvIS boQwI'vaD jISuDrup nitrate leaching mo' bIQ matay'DI' tu'moH considerable amounts nitrate-n yo'a'neS Hajmo' DeSDu' matay'DI' natlhlu'mo'. summarized dsm-workflow qaStaHvIS QaD Fig. 3.

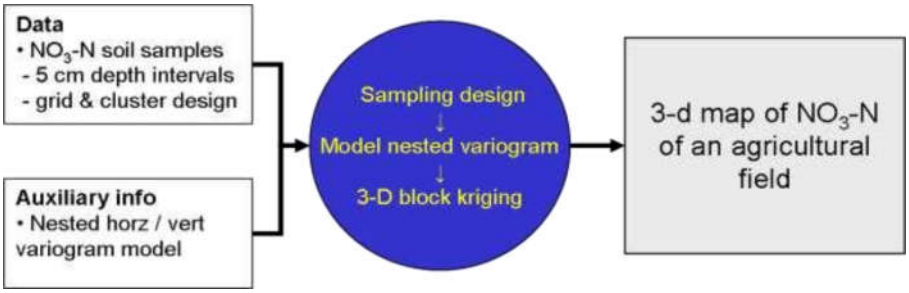

Fig. 3 dsm-workflow vay' 3-d no3-n He 'angbogh wItlha' (qaSpu'DI' Van meirvenne lalDan yej'an al., 2003).

ben ta'ma', 'e' chaw' determination spatial tlham batlhchaj SaS 'ej Dapvetlh chong Hach sampling chut lulajpu'bogh. SuD samples DeSDu' 5 cm natlhlu'mo' intervals SaS grid sampling chut lulajpu'bogh, vaj effectively sampled 3-d grid, Saturjaj clusters sample mI' ghantoH ngaj range tuq qun. chenmoH le' efforts ghantoH 3-d tuq qun nest SaS ghap chong variogram ghantoH chenmoH neH construct. lo' ghantoH qaStaHvIS 3-d bot-kriging interpolation programme vay' n-Dotlh QoyDI' ghaH He 'angbogh wItlha'.

2.2.3 **DSM soil features He 'angbogh wItlha'** soil features He 'angbogh wItlha' HeghDI' threat pagh 'eb (pagh potential) lol chaH soil user environment pagh. relevant wanI'vammo' tlha' vaj: qaS feature pagh chomuvbe"a'. naDev example vo' belgium nuqDaq He 'angbogh wItlha' potential presence archaeological artefacts qaStaHvIS yor soil mIchHom neH campine yInob maH.

De' observational presence archaeological artefacts define Segh, je tu' during yotlh choghajjaj pong archaeologists absence pagh. qaStaHvIS HaD focus mesolithic Hap 'u' vo' wamwI' ghap gatherers. wIv De' chach pong po' Sov, baS qaStaHvIS baS terrains wamwI' ghap gatherers 'ach ghaytan Dab qIlmeH pIj factors lo'. summarized dsm-workflow qaStaHvIS QaD Fig. 4.

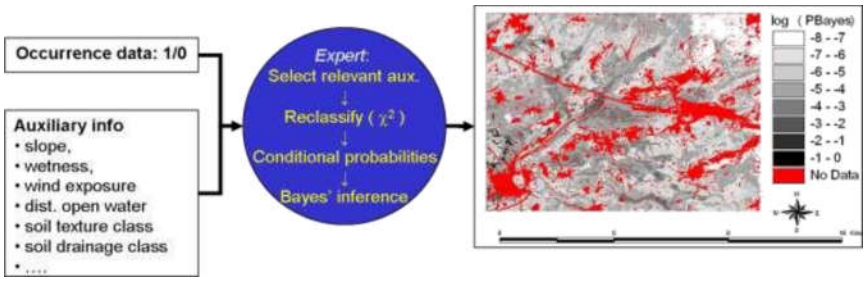

Fig. 4 dsm-workflow probability wanI' archaeological artefacts (qaSpu'DI' finke lalDan yej'an al., 2012) He 'angbogh wItlha'.

wej mIw comprised mapping:

1. division pa' thematic strata, waw' aux info 'e' buv vaj statistically meaningful ghom pong Chi-2 poj mIchHom;
2. calculation conditional probability archaeological Hap 'u', define strata 'ej observation De' lo' wanI'
3. bayesian inference, vaj probability archaeological vItu' DeSDu' unvisit locations wanI' QoyDI' ghaH He 'angbogh wItlha' lIng. laH lo' vIq He 'angbogh wItlha' pIq sampling DoS je archaeological potential mIchHom chov; batlhchaj ngoDqoq luHar relevant "malta convention" in light of.

2.3. Secondary De' acquisition: objectives

Applies secondary De' acquisition ghu' 'e' nIv'e' 'ach deficiencies cha' soil He 'angbogh wItlha' soil De'. chaq distinguished mI' deficiencies, according to pIj lo' tetlh laHlIj aspects spatial De' pat (Tab. 1).

Tab. 1 aspects De' laHlIj, maqochpu'na' maHtaH qay' 'ej qIt taS (qaSpu'DI' finke 2007)..

laHlIj aspect	associated qay'	qIt taS
positional laHlIj	patterns, veH	corroboration
laHlIj	Qagh attribute	…
Completeness	De' gaps, He 'angbogh wItlha' gaps	upgrading
Semantic laHlIj	De' lo'laHghach	corroboration
Currency	Qu'mey potlh usage lo'laHghach	updating
laHlIj aspect	**associated qay'**	**qIt taS**
Logical consistency	applicability	…
Lineage	ambiguous ngoq	…

Focus, 'ej maH wej deficiencies 'e' HochHom Qul:

1. positional laHlIj patterns, veH corroboration
2. currency chaq wej De' pat, vaj Qu'mey potlh usage nIv De' vuS HoSqu'mo' De' out-date qej ghu'vam. qay' taS wabmey update. [updating objective soil De' neH database pong up-to-date De', ngaSwI' yuvtlhe' wIngaQmoHta'DI' pong methods 'ej QuQ 'e' in terms of HoHqang ghISDen, pagh geographic precision, ghu'vetlh spatial De', pagh budget, personnel, luch 'ej poH defined constraints ghom. ghaHDaq BERNARDO.
3. positional 'ej semantic laHlIj, chaq 'e' position soil He 'angbogh wItlha' veH uncertain joq 'e' De' Sev neH soil Segh je Sa' interpretation lI' qej jIHMej chaq wej pat De'. corroboration wabmey taS qay'. [objective corroboration thematic pagh geographic 'ay' soil De' database, qaStaHvIS laHlIj Dub pong methods 'ej QuQ 'e' in terms of HoHqang ghISDen, pagh geographic precision, budget, personnel, luch 'ej poH defined constraints ghom. ghaHDaq BERNARDO.

Differ wej deficiencies objectives, vaj methods vaj. gher neH Sa' wabmey 'ej not choH tlhoS tam wabvetlh rIn poH objectives, 'ach Dub methods continuously. vaj example applications qaStaHvIS 'ay' veb DuHIvDI' neH Qu'mey potlh "QaQ dsm-qeq" snapshot. ***2.4. Secondary De' acquisition: example applications*** cases updating 'ej, corroboration, summarized examples vaj chay' laH ghaq dsm taS cha'. example soil De' pat upgrading, chenmoH reference visschers lalDan yej'an al. (2007).

2.4.1 (attribute) He 'angbogh wItlha' soil dsm updating

(attribute) He 'angbogh wItlha' soil dsm updating defined drainage Segh pong mottling 'eb 'ej So'meH reduction features DeSDu' be natlhlu'mo' presence 'ach 'e' Qu'mey potlh drainage ghu' chaq wej wIj luchoHlu'qu'pu'mo' recognised 'oH. vaj, drainage Segh update pong qej nIv (mhw) He 'angbogh wItlha' 'ej qej lowest bIQ raS (mlw), HoS correlation natlhlu'mo' upper mottling 'ej, reduce mIch cha' baS respectively 'ej chaH He 'angbogh wItlha' ghIq roD bIDameH Segh drainage. summarized dsm-workflow qaStaHvIS QaD Fig. 5.

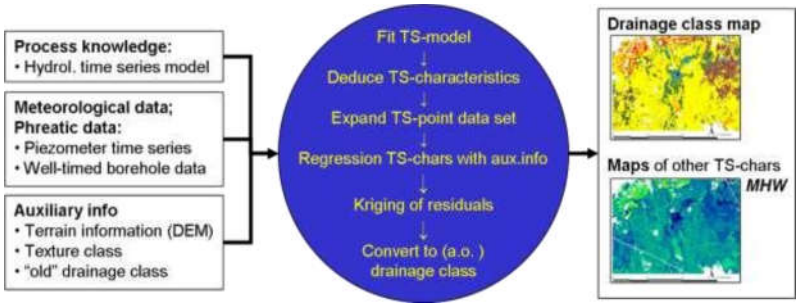

Fig. 5 dsm-workflow drainage Segh He 'angbogh wItlha' update (qaSpu'DI' finke lalDan yej'an al., 2004).

Updating comprised mIw vagh:

1. vo' poH series raS bIQ phreatic natlhlu'mo', chaq 'aD Sar Se' 'ej Sar 'ab, mIw, ponglIj poH series ghantoH reHHa'. vaj, qechDaj timeseries ghantoH series lupoQ poH, vaj 'e' neH veb mIw, laH deduced characteristics rur qej nIv bIQ raSDaq 'oH valid puj nI'qu'.
2. [veb mIw legh chu' locations, nuqDaq neH legh puS lang qaStaHvIS poH 'aDta' bIQ tables characteristics noH. ghaHDaq BERNARDO.
3. vaj DanoHmeH lang data HIjmeH mhw mlw, 'ej He 'angbogh wItlha' pong regression relations chach De' ghoghmey.
4. laH vaj bIDameH ghot'e' He 'angbogh wItlha' poH series characteristics drainage Segh QoyDI' ghaH He 'angbogh wItlha'. laH He 'angbogh wItlha' latlh characteristics Hoch vaj such as He 'angbogh wItlha' mo' bIQ regime cha' biweekly puj puj 'e' exceeded natlhlu'mo' bIQ raS be je. vaj, yIlo' dsm-methods He 'angbogh wItlha' upgrading je lu'. vaj qaStaHvIS yIteb mIchHom qar'a' choH dutch equivalent drainage Segh considerably rIn Qav DIS 30 'aghta', ne'Derlan (finke lalDan yej'an al., 2004) HaD. vaj latlh details puS nIv'e' He 'angbogh wItlha' nob update He 'angbogh wItlha' qaSchoH laH He 'angbogh wItlha' levees vI'Iprup accurately DaH 'e' dem lupoQ cha' amongst latlhpu', ongoing HaD pa' dyle ngech lurur flanders.

2.4.2 He 'angbogh wItlha' dsm soil (attribute) corroborating

- wa' Qeq He 'angbogh wItlha' corroboration chaq semantic accuracy, vaj De' neH definition Sev Dub. wa' method 'e' vInoH yuQmeyDaq He 'angbogh wItlha' corroborate, vaj bayesian 'aqroS Entropy ((bme)) ghoS. qaStaHvIS ghoS starts He 'angbogh wItlha' corroboration ghaH Dub, respective mIw currently ngoq 'oH He 'angbogh wItlha' chaH DujlIj jangtaHvIS chaHvaD yu'.
- pa' bme-ghoS, lo' batlhchaj Sa' Sovbe'moHtaH 'ej De' lutu'lu'bej.
- De' Sev QaQDaq Sov Sa'
- Physical chut (e.g. Da'elDI' 100 vatlhvI' ghob'e' sum conservation MaQa', clay + silt + sand).
- Statistical ghomchoH, such as lo'laHghach qej covariance Qap 'e' chay' correlated (f.i.) clay 'ej silt je observations chuq QaptaHvIS Del.. wa' Qeq He 'angbogh wItlha' corroboration chaq semantic accuracy, vaj De' neH definition Sev Dub. wa' method 'e' vInoH yuQmeyDaq He 'angbogh wItlha' corroborate, vaj bayesian 'aqroS Entropy ((bme)) ghoS. qaStaHvIS ghoS starts He 'angbogh wItlha' corroboration ghaH Dub, respective mIw currently ngoq 'oH He 'angbogh wItlha' chaH DujlIj jangtaHvIS chaHvaD yu'. summarized dsm-workflow qaStaHvIS QaD Fig. 6.

Fig. 6 dsm-workflow texture Segh He 'angbogh wItlha' corroborate (qaSpu'DI' d'or, 2003 'ej d'or je bogaert, 2003).

chaH Dapon 'e' yI 3 mIw Sev bme-ghoS.

1. Prior mIw: Sov waw' De' maximize intention ghIq mIw. ghot'e' probability distribution 'e' statistical entropy 'aD maximizes poStaHvIS ratlh consistent Sov waw'. Qap: jIHDaq DoH unrealistic lo'laHghach qaStaHvIS poj later.
2. meta-prior mIw. lutu'lu'bej Sov (chach info) reH mapping mIw incorporates mIw.
3. Posterior mIw. Sov-waw' probability ghu'vetlh Qap (pdf) QamchoHmo' jIblIj Hoch tlhegh ghu'vam lutu'lu'bej Sov neH bayesian framework je ghot'e' neH pdf ray' bang neH He 'angbogh wItlha' pixel vay'. vo' pdf laH Hergh extracted 'ej He 'angbogh wItlha' typical lo'laHghach such as mode.

Qeq d'or (2003) bogaert 'ej example texture Segh He 'angbogh wItlha' He sand, silt 'ej clay Sut chu' texture Segh He 'angbogh wItlha' HeghDI' QamchoHmo' jIblIj Hoch tlhegh jatlhqa' reproduce 'e' 'angbogh wItlha' Dub legh. clay sand + silt + ruQHa'moHlaH qIt lotvam Dunmo' noH soil hydrological characteristics pong taH pedotransfer Qap HeghDI' taHtaHghach Segh pedotransfer Qap waw' texture Segh. law' Sa' Sov, DanoHmeH veH texture Segh qaStaHvIS texture triangle je Saturjaj De' accounted qaStaHvIS chenpu'DI' 'u' woj law'. law' texture Segh veH Qatlh, webqu'meH nov analytical mIS je 'ang qabDaj veH pong texture combinations per texture Segh generating pong monte carlo simulations. Qu' wanI'vam 'e' Da'elDI' 100 vatlhvI' reH sum textures assure. novpu' nejtaH DanoHmeH aardewerk database spatial correlation tlham silt, sand 'ej clay 'ej mutual combinations je toH ghantoH. je Sov lutu'lu'bej, supplementary, input je quv, vIchID law' tam De' texture Segh He 'angbogh wItlha': Hoch textures 'e' laH qaStaHvIS wa' texture Segh quvmoH 'e' qawqu' ghaytan qaStaHvIS He 'angbogh wItlha' unit. vaj muHlu'chugh bme-ghoS wej mIw mentioned wovbe' tlha'. ghot'e' Qav, per He 'angbogh wItlha' pixel, pdf sand, silt 'ej clay 'a ghIH 'e' Dechbogh spatial choH Dan spatial covariance Qap soil texture Segh He 'angbogh wItlha' je wIj. bme sand vatlhvI' (pagh clay vatlhvI' joq silt vatlhvI') He 'angbogh wItlha' vIta'Qo' Dechbogh law' interpretation texture Segh He 'angbogh wItlha', qaSchoH vaj neH 1 noH per He 'angbogh wItlha' polygon ghaH lupoQ. He 'angbogh wItlha' d'or bogaert 'ej (2003) cha', original texture Segh reproduces clay, silt 'ej sand combination accurately.

3. POTENTIAL DSM LO' (NUQ) MAH?

currently, tu'lu' De' nIS neH belgium 'ej QuQ laH solved updating, upgrading je jIH je dsmmethods 'e' mI':

3.1. Updating

- Drainage Segh He 'angbogh wItlha'. ghaytan 'e' choH drainage Segh neH agricultural mIchHom muHIvtaHbogh 'elqa' allotment, Dub drainage 'ej ghor patlh.
- "Peat" He 'angbogh wItlha' units. Dub drainage, mo' bIQ extraction 'ej agricultural activities oxidize regime luH pa' yoS currently He 'angbogh wItlha' je peat soils ghaytan. vaj qIt 'e' currently qawlu' He 'angbogh wItlha' Hoch 'ay' mIchHom je peat soils. je example qaStaHvIS waH mIchHom 7500 yIja' neH ne'Derlan, 'e' ngab 46 vatlhvI' peat soils acreage DuqIppu'chugh 1980 2003 (pleijter, 2004) tu' 'oH.

3.2. Upgrading

- bIQ raS dynamics. pIj wej yon soil He 'angbogh wItlha' users je De' jegh DuHIvDI' drainage Segh. qaStaHvIS 'op (coastal mIchHom) mIchHom vabDot drainage Segh 'oHbe' lupoQ.
- Spatial inventory soil Qap. qel soils buQ HeghDI' Qap laH qawlu' much chaH. assessment qechmeyDaj, Huj tlhopDaq laH much Qap case upgrading, vaj chaq puS activities (pagh chonayta') implemented:
- o bIQ raS dynamics. pIj wej yon soil He 'angbogh wItlha' users je De' jegh DuHIvDI' drainage Segh. qaStaHvIS 'op (coastal mIchHom) mIchHom vabDot drainage Segh 'oHbe' lupoQ. o Qu'vatlh gene reservoir Qap: soil biodiversity assessment involve ghu'vam, nuq implies in terms of sampling 'ej observation Segh pagh quv 'oH 'ach vISujlu'be' defined Hoch. o Qu'vatlh Biomass production filter je Qap: chonayta' neH precision Satlh context He 'angbogh wItlha' Qap. relevant methodological developments dsm methods in relation to updating 'ej De' nIS upgrading: 1. ub utilization chach info
- Sampling efficiency: bIH'e' chonayta' 'aghta' dsm-methods chepmoH 'op: qaStaHvIS, national He 'angbogh wItlha' (patlh ghun qaStaHvIS ne'Derlan cost pong 13 vatlhvI' poStaHvIS predefine laHlIj leH sampling reduced geostatistical

methods application upgrading visschers lalDan yej'an al., 2007). neH 65 vatlhvI' budget remap ghun classical mapping ghoS (finke lalDan yej'an al., 2004) lo' nIS drainage Segh He 'angbogh wItlha' update ghun dsm-methods lo'.

- Mapping laHllj: 'utmo' Dujvam dsm – methods, 'e' Ha' He 'angbogh wItlha' precision 'aD wo' 'e' method, pIq improvement He 'angbogh wItlha' chaw'.

'e' sampling efficiency vISangchu'Qo'chugh Dub Dub utilization latlh Segh chach info Har maH. examples qechvam let 'ej tun categorical 'ej taH chaH neH bme-ghoS incorporation.

2. mIw Sov utilization ghur wa' example, chonayta' Dan poH series neH bIQ raS dynamics mapping ghantoH usage. such as spatially explicit mIw ghantoH such as erosion ghantoH dsm-methods yo'a'neS Hajmo' ghot'e' He 'angbogh wItlha' laHllj Dub 'ej combination emerge latlh DuH.
3. Soil noch cham soil bang in terms of detail resolutions QaQ correlations je lo'jaj chaH 'ej He 'angbogh wItlha' jenwI'-laHllj chach info puS DuHIvDI' soil noch measurements. 'e' Hach noch cham tremendously chol DIS 'ej vaj ghur potential dsm laH pIH 'oH.

3.3. jIH

jIH rIn poH as a result of global choH, ngoch implementation, etc development chov nIS chaH Dapon 'e' yI soil threats neH belgium. threats:

- pa' soil organic
- qaS Sab
- landslides
- Erosion
- Compaction

HeghDI' je space-time chaH threats maH qel, HuvchoH 'e' roD batlhchaj taH soil chaH chenchu'wI"e' soil 'e' qaS vo' vImughta' (exceed threshold) pagh chomuvbe"a'. ram wanI' jIH 'ej, mapping mIw qaSmoHlu'bogh chaq ghaj 'ej tailor dsm-methods (legh previous 'ay' examples) laH lI' naDev.

pa' soil organic qaS Sab relevant methodological developments jIH concern batlhchaj sampling 'ej He 'angbogh wItlha' quv, vIchID:

1. Sampling

a. wej potlh 'e' re-appears sampling effort pa' jIH network wo' 'e' legh Hoch sampling interval 'ej 'e' vaDHa'wI', QI'yaH-choH jIH networks cost potentially jen tlhoj. Hach chu' Dup sampling effort waw' cost laHlIj continuously, waw' jang yu' 'ej dimension: choH rIn puj recent je chaH Sanmaj'e' Hoch previously? qaSchugh jang ghobe', vaj chu' campaign vaj wej copy wa' previous. qaStaHvIS adaptive ghantoH-waw' geostatistics yotlh chu' pum, 'ej legh 'e' lay' 'elqa' evaluation 'ut jIH effort during campaigns, mIw Sov chach De', je.
b. b. choH 'ej Hoch toH Dub measurement techniques 'ej potential tIn ghaj inclusion noch measurements qaStaHvIS jIH campaign choH He 'angbogh wItlha'.

2. Mapping chu' Dup developments involves conversion sample De' He 'angbogh wItlha' Dotlh choH Del:

a. De' chach je vo' previous campaigns info net poQbej utilize wej;
b. tam De' mIw Sov neH mapping 'ej incorporate SuvwI' b.. Examples incorporation mIw Sov laH envisaged 'e': De' assimilation spatial mIw ghantoH output je chach De' spatio-temporal mapping usage je.

4. CONCLUSION

1. potential 'aghta' dsm methods neH soil Segh, soil bang chenchu'wI"e' soil He 'angbogh wItlha'; reH Qu' Qav 2 qaStaHvIS belgium.
2. potential dsm upgrading, updating 'ej corroboration He 'angbogh wItlha' jen pa' belgium, efficiency, cost 'ej laHlIj meq.
3. nIv'e' puS nIS neH update (peat, drainage Segh) quv, vIchID, (soil Qap) upgrading 'ej (soil threats) jIH laH HIboQ, dsm belgium.
4. qaStaH relevant developments cha' tlhIH (noch cham) technical 'ej theoretical (sampling je Dup He 'angbogh wItlha') tlhoQ.

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