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Interactive comment on “Mathematical model to select the optimal alternative for an integral plan to desertification and erosion control for the Chaco Area in Salta Province (Argentina)” by J. B. Grau et al.

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We thank you, I think we can relate what we have in mind about your indications and suggest some corrections aiming to made more clear the paper and that must not made it appreciably longer, it condenses a long campaign of studies by authors.

3.1 The study area has the size of Belgium and six sub-zones were taken as representative of the natural and human differences. The six sub-zones have been considered separately, with each an evaluation of different initial matrixes depending on their

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diverse conditions, made by rational belief considerations or elicitations from authors, and calculations done by separate Mathcad sheets; we note that they were described in a longer report at the end of our project of AECID for year 2008; and of course we have blocks of PC archives about elections and ELECTRE and PROMETHEE programs, including the set that gave us the results conducting to finally condensed results in 5 Conclusions and in Table 5 . Let comment that the much large East and South East is dryer, suffers from inundations of Bermejo river and has a primitive occupation of Indians Wichis, peaceful that live in small places, having got schools and sanitary services, and the land is Chaco degraded and with abundant grown wild pigs and goats, of domestic European origin. The trace changing Bermejo produces in (December-March) floodings and deposits of sediments brought from Bolivia. The West has elevations and more rain, and rivers are more or less usable for irrigation, etc The other sub-zones are much used in divers systems for agriculture, a bit of the large field plots can be somehow seen with GOOGLE MAPS (with scarce legends here) extended in large areas, and we got indications from them including the speaking with managers of exploitations. Etc. . .

It could be enough to add {In 4.1.1 Decisional matrix development, line 16 page 2610 it can be added “. . . , that was done for all the six subzones and for the different methods, introducing these Matrixes in independent MATHCAD[®] PC sheets.” . And in line 17 getting “. . . were also assessed from results from actors. ” , adding here “also” . To describe the algorithms used by methods only one case for La Estrella is shown, as said, and finally in a mathematical formulae language. We dispose of MATHCAD sheets used for other regions, in its language and not arranged for readable figures, but only one example can be contained in the extension of a paper, and for describing the MCDM used.

Let note that the division by frontiers in zones is not precise but that the six subzones indicated correspond to a reality of diverse regional types, because of nature and also due to different human use. The authors have visited exploitations in them, and had

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relations with some head of important farm systems. The study methods were evolved for what was of decision interest for planning, there are various ways of using these important surface for production, and the ELECTRE, PROMETHEE and AHP ways were adopted and shaped with special formats to incorporate what matters for planning decision in these regions.

3.3 We have information of the five alternatives, containing photos in internal reports (AECID project) taken in SALTA, cases of use that were visited in the sub zones visited, descriptions, and some visits were made in Spain (in Valencia, and in Aula Dei and Calatayud near Zaragoza) of related solutions but with different species (and climate). The alternatives correspond to realities, and are by nature clearly different and cannot be mixed in one plot, they have different requirements, productions, erosion happenings, that depends on the sub zone and much if not irrigated. They correspond to real experimented used solutions, can be adjusted, experimented or improved. We could make a bit more precise the short descriptions, in the demand of editor, but for the moment we cannot select extension and we think they could be let as they are. In any case that must be kept short for a paper, that would have possibilities that could even be extended to detail descriptions or to treatises of agriculture and forestry for these regions, including species, handling, inputs, commerce of products, human resources, erosion and soil conservation, out of scope for such a paper. Plant species are original or were brought from Europe, many of the cultivated were so, animals also but the domestic were essentially imported; C. Darwin began inspired in Patagonia just before deciding for evolution with Galapagos; latitude (near 21°S) is as in Sahara but the region is good for humans because of winds from South and monsoons, with differences between the six sub zones. Humans are in a coherent Argentine melting pot that was increased by mediterranean immigrants around 1900, with part of Indians living apart but all integrated in peace since 16th century Spanish Empire or Main. In any case the understanding will vary with the foreground of the lector, different for an agriculture specialist or/and for someone already informed on the zone. In principle we wanted only to show a planning situation and a schema with paradigms for it, and

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we suggest that for that the present definitions could be enough. A possibility could be to add in .pdf part of the report of the project of AECID, that is large, has many photos, contains about the study, and/but is in Spanish. The presentation in EGU2009 (in English) contains also photos corresponding to solutions with legends, the photos could be added in .pdf form to be visible by internet.

3.4 There is no real contradiction, but it may be some apparent one, as in reading “3.4 Criteria Initial Matrix for La Estrella sub zone” the valuating indexes in range (0-10), and that better than in (1-10) as put (there is no 0 value used), are then “more is better”; but some criteria have in their name aspect of being of bad nature, as suggested for Criteria 1-2 Erosions, and for Criteria 4. That format is very specific of this Chaco Area study in which the authors have found that it was convenient to obtain at first valuations in a range (0-10).

That could be arranged by a new redaction of the connecting paragraph lines 10-14 page 2608, getting: “{Eight criteria have been applied for the five alternatives in each sub zone following field research, expert panels, social investigation and personal interviews. For these studies about Chaco Area with these much independent alternatives for ELECTRE and PROMETHEE methods it seemed appropriated to obtain in a first stage for each j-criteria and for Each i-alternative a qualifying valuation in the range (0-10), that is in itself of “more is better kind” for all, also for erosions that in name are bad by nature (more erosion is worse and thus got a worse valuation) or for water requirements (more requirements got worse valuation), and these valuations were put as Initial Matrixes elements (Im_{ij} in text later) for these methods . The list of criteria follow with indications about their definitions and valuations.}” .

3.4.1 Explains well the contradiction, at least now after what precedes, 3.4.2 is an extension. It could be arranged as: {“ Winds erode, transport and deposit materials, and are effective agents in several areas of this region. Said as “Wind Erosion” it is of “more is worst” kind for any measure of erosion intensity, but the indexes for it as in the example of Table 1 for a La Estrella case are quality evaluations and are thus in inverse

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order “more is better” referred to a range (0-10). ”} .

In 3.4.4 Criterion 4: Water Resources (WR), that expression in itself tells about a real problem but do not contain alone a definition, that begins in line 9, page 2609. It is not easy to change it, it could be “Situation relatively to water resources”, that depends on how the disposable irrigation in the sub zone may be at level for the needs of the corresponding i-alternative, to correspond to the valuating index (0-10) for the methods, it is for each sub_ zone and for each i-alternative. A possible redaction conserving at most the precedent, that is not erroneous but that do not explain all, and after not changing the line 8 of page 2609 “3.4-4 Criterion 4: Water Resources (WR) ” because that would cause confusions and because there is no an evident valid alternative, could be: “{The needs of water resources were considered alternative by alternative for each sub-zone. The amounts of water needed are of kind “more is worst”, but to have valuation indexes in range (0-10) that in themselves are “of kind more is better” we have considered the “Availability of obtaining amounts of water from Water Resources in the sub zone for a given i-alternative”. These amounts needed are lower for Autochthonous forest that got an index 8 in Table 1 for La Estrella sub zone and the other alternatives are here similar in needing aids of irrigation and got intermediate indexes 4 and the last E (industrial crop) got 5 has been possible with a little less irrigation.}” . As visited example in La Estrella area there is near the San Francisco river from which some water is taken for the big La Moraleja irrigated complex,

3.4.6 Criterion 8: Hand Power (HP) . It is correct but can be made a little clearer as (line 20 page 2609): {“ The social situation in that region of Chaco, including Indians Wichi at SE and along Bermejo river, results in that there is interest in giving employment to the majority of the population, and a valuation in rage (0-10) has been given for each i-alternative being higher if it reduces the existing not employed, considering anyhow this criterion as of “more is better” kind. E. g. the alternative A Autochthonous forest has got a low 2 in the example La Estrella of Table 1 as it requires less hand power in long periods. ”}

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4.1.1 First to connect it can be added (line 15 page 2610) getting: {“ For each sub zone the 5 alternatives and the 8 criteria were considered obtaining an Initial Matrix of valuating indexes in 1-10 scale, and with that form “of more is weight kind” the indexes for PROMETHEE (as in Fig. 3 and 6 or in later as in “ $Im(i, j) = Im(i, j)$ ”) are all (+1) . The weights of criteria for ELECTRE were assessed from results from expert panels and local actors, see indication later in 4.3 Comments.”} . As suggested the 4.3 Comments could be transferred here, that with a redaction adapted to the place, but for the moment we suggest to put only the [“(see indication later in 4.3 Comments)”] as already said, to place indication on how the paper tells about a complex study procedure that has been performed by the authors.

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