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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.

J. B. Grau et al.

josemanuel.anton@upm.es

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Thanks are given to the referee that in general gives suggestions for further more detailed studies. There are natural hazards involved in the Chaco Salteño, and they are quite different in the six sub-zones. Let forget that just at West Los Andes is seismic zone as that is not relevant for agriculture, it is a matter to consider it when building. The latitude is around 21° S and they are monsoons, and in part winds are from South East with them, and from South West when humid (January to March), making climate colder than in Africa such as in Salta city (1200 m altitude, more than study area) nights

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are fresh and pleasant, with rains in January-April, and dry June-December. At west of the study zone there are pre-Andean elevations, with more rain, and rivers come from them and some of the South descend from West Andean valleys. These rivers are used for irrigation in study zone and in the larger Chaco Salteño that includes it, they have some dams and will have more. At East of them altitude is lower and rain also, and the Bermejo river comes from Bolivian Andes from North to South, and has enormous flows and sediments in January-April, inundating the East Chaco part of Salta Province, cutting the low level much dispersed roads of that poorly organized zone. The deposit of sediments increases the level of soils and has diverted the river to East recently. That large (much more than Belgium) East and South East area (where is Rivadavia sub-zone) is now with a wild flora and fauna, with snow wild pigs and goats, and Wichis Indian live dispersed into it, always peacefully and somehow integrated. The paper is focusing at a general planning level, the hazards are included in the valuations of the alternatives by the authors as experts, the solution of the many problems with rivers is for a further step about programming of solutions, mainly for irrigation and inundation, also for transport and services, that is civil or rural engineering. Depending on the terrain erosion during wet monsoon (January to March) has diverse importance, in cases (loess from Los Andes) with formation of gullies. The region has high extension and low population, transport is actually by roads, rain is limited. The agro productions are important, and depend much on international markets, that is a major factor of evolution of them. Initially that region had its varied special vegetal species, and also some special animal, and several dispersed kinds of Indians, low organized and vassals of Incas in time. New animals and crops were introduced from Spain (and vice-versa importing potato and tomato, etc . . .), and humans with a common distant Spanish culture integrating Indians at most by law (Leyes de Indias evolving from 1544). That society evolved connected with West world, and received Mediterranean immigrants around 1900, in a remarkable well running argentine human system that is occupying by steps the study area, that has centers in small towns or local centers and a main global leader point in the splendid Salta City. Argentina, having a surface

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5.5 times Spain or 10 times Italy and a moderate population of 40 Mhab, is a big food producer and has a currency that changes at low level and that do not exist abroad at present, due to a precedent high crisis in its sovereign foreign debt. There is an exportation tax for agro-products, to conserve food for interior such as in populated Buenos Aires area, at levels such as 35% that are a main discussion item in politics. In the study area and in all Salta province the human systems seems to go well, people is educated and seems to be employed and to work in order, in a coherent argentine identity. They depend in part from more organized distant Buenos Aires area that is 1500 km at SE. The level of schools or of machines is relatively good, there are two universities and a research centre of INTA for Agronomy. Imported items such as cars or agro-machines have relatively high prices, but they are abundant and good. They have excellent food for them, and export most of agro production at international prices that are high for them. The productions depend on markets and on the possibilities of terrains. But there are various very distinct alternatives on what to do with the agro terrains, and that has caused the research that is exposed in short in the present paper and to the models used to evaluate them in the present paper. The values of them depend really on a set of much disconnected criteria. If regional planning is wanted, the discrete methods of MCDM are a useful tool, they afford to look on what is really behind the decisions, real or without explicit planning, they are about how a modern human society occupies and use a non small part of the planet. The authors, that are in part from Spain (Grau, Antón, Tarquis), and from Salta Arg. (Speroni, de los Rios) and from Rio Cuarto, have tried later these methods for special restricted areas as La Colacha. In it they are considering special lower scale planning that depends more on available money, and here continuous methods are indicated for a second more detailed step of programming actions in the planning process. But at first the Chaco Salteño is a so big area, extending in large as Portugal, with the study area of a size similar to Belgium, and the first present problem of considering these much different alternatives is real and is what matters now for planning. The paper has to focus on it with the discrete methods. The length of the paper is limited, and the indication of a global research

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done is by focusing on the main items. They depend on assessment of values for alternatives in each criterion, and that was done by the authors as experts. The use of MATHCAD, instead of commercial software that contains hidden algorithms, affords to control what is really done, and to introduce for PROMETHEE weights inspired from ELECTRE and that brings a clearly better consideration of the criteria for alternatives. An indication can be added for these ulterior methods that are not possible in the paper that studies necessarily the general problem, in Theory of Systems the general system must be arranged first. To connect the text with the second referee, that has interesting observations of general nature for planning, it seems adequate to end 4.3 Comments with: “”It was necessary as a first step for a large planning process to decide between very different incompatible alternatives, and the discrete methods of MCDM used were adequate for that. For detailed action programming at a lower scale the authors have used also continuous methods, e.g. in smaller La Colacha basin, considering the level availability of funds for corrections of erosion, etc. . . , but that is to be used later in a local programming planning process to decide local actions, and will be for further studies and publications. “”

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