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The farming system sensibility of the Normandy in connection with the Climatic Change (2000-2100)

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The French agricultural economy is closely connected with weather-climatic conditions. For example, dryness caused by the heat-wave of 2003 seriously affected the vegetation leading to a significant slowdown of photosynthetic activity. This resulted in logical decrease of agricultural production, in particular for arable lands and fodders. The Global warming that has begun at the end of the 19th century and seems to continue and even intensify during the 21st century (GIEC, 2007) arises a question of farming system sensibility when faced with Climate Change in the future.

In France, recent studies (Cloppet and al, 2009) have conducted to the probable climate features spatialization on the national territory according to different scenarios. Whatever the scenario considered, it seems that the present Norman climate type is going to disappear by the end of century to be supplanted by a type of weather influenced by raising evapotranspiration, minimal and maximum temperatures as well as a raising speed of wind and solar radiation. Globally, this could emphasize agriculture soil dryness negative impact on large cereal land and pastures production (Butault, 2009, Ruget & Brisson, 2007). However, this climatic evolution could bring some production gain when the available water content of soils allows preventing or strongly limiting the hydrous stress emergence.

For the current period and horizon 2100, according to the scenario A1B of the GIEC, the evaluation and the mapping with fine spatial resolution of this pedo-climatic indicator present a capital stake to appreciate the sensitivity of the agriculture of the Normandy in connection with the climatic evolution announced for the end of the 21st century.

This exploratory work has been undertaken for the departmental territory of Calvados (5500 km^2). For that purpose, it has been necessary beforehand to work out a precise mapping of soils on the basis of 7514 soil boreholes. The treatment of the soil database has allowed to design a map of the available water content of soils for the 1:25,000 scale.

Thereafter, the modelling and the mapping of the local evapotranspiration conditions as well as the departmental mapping of rainfalls have permitted to elaborate a calculation algorithm of hydrological balance with fine spatial resolution. The estimate and the cartographic representation of the soil dryness (hydrous deficit) for the current period and 2100 according to the scenario A1B have been obtained then by requests of the pedo-climatic database.

For the current period, as far as Calvados is concerned, the results show that, the dryness of the agricultural soils of low intensity concerns a little more than 1100 km^2, which means one the third of the agricultural area (3500 km^2). The soil dryness of strong intensity appears very circumscribed since it extends only on 182 km^2 (approximately 5% of agricultural area). For 2100, the results are particularly alarming. They testify to a spectacular increase in the agricultural area touched by soil dryness with a strong intensity. These would represent

nearly 2500 km^2, which represents 70% of the agricultural area. If this kind of scenario was to be confirmed, it is all the agricultural economy of Normandy which would be deeply affected.