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Integrated management of rural sector resilience to climate risks in Burkina Faso: Theoretical approach

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Basically, for the people of Burkina Faso (Sahel region), the threat pose by climate and environmental changes is a loss of developmental achievements and prospects. In managing this threat, special attention should be given to the rural sector. It is a preponderant pillar of the national economy, by the proportion of the employed population and the contribution to the gross domestic product (GDP). About 40% of GDP comes from agriculture, livestock and the exploitation of natural resources, which are economic sectors and resources particularly concerned by climate change.

This bulletin proposes a theoretical approach for a management of the resilience of the rural sector to climate risks which integrates the interactions between the production systems and natural resources. In this approach, a three-component vector (e) is associated with the rural sector, such as:

e1 = agriculture;
e2 = livestock;
e3 = water resources

The specific case of one climatic risk (r) affecting (e) is considered.

In the case of a non-integrated assessment of the impacts of climate risks, the subsets of de1, de2 and de3 are considered: a) de1 the subset of the direct and indirect impacts of r on e1; b) de2, the subset of the direct and indirect impacts of r on e2 and c) de3, the subset of the direct and indirect impacts of r on e3.

The elements of de1, de2 and de3 come respectively from the three impact chains ce1, ce2 and ce3:

ce1 ≡ e1do, e1d1, …, e1dm ;
ce2 ≡ e2do, e2d1, …, e2dm ;
ce3 ≡ e3do, e3d1, …, e3dm

As indicated in subsequent publications (www.cres-edu.org), in a chain of impacts, eido is the direct impact of the risk on the component ei (i = 1, 2, 3); b) eid1, the first order indirect impact and eidm, the indirect impact of order m.

In an integrated assessment of the impacts of climate risks, the interactions that the various components of a system have between them are taken into account. These interactions generate variations of the subsets of impacts of climate risks.

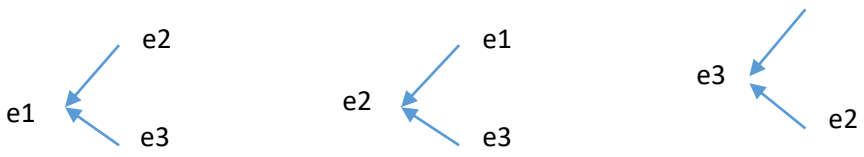

Figure (1): Schematic illustration of the interactions between e1, e2 and e3

1/ Variation of de1

The interactions of e2 with e1 and e3 with e1, as illustrated by the figure (2), induce a variation δe2e3(e1) of de1.

Figure (2): Schematic illustration of the interactions of e2 with e1 and e3 with e1

Practically, δe2e3 (e1) results from the combination of two subsets, de2e1 and de3e1. They are the two groups of adverse consequences that are generated respectively by e2 and e3 for e1.

Specifically:

- de2e1 elements are the adverse consequences of the elements of de2 for e1. They are e2doe1, e2d1e1, ..., e2dme1. By definition, e2dle1 is the most significant immediate adverse effect of the impact e2dl (l = 1, 2, ..., m) for e1.

- the adverse consequences of the elements of de3 for e1 are the elements of de3e1. Those are respectively e3doe1, e3d1e1, ..., e3dme1. An element e3dpe1 is The most significant immediate consequence of the impact eidp (p= 1, 2, ..., m) for e1.

2/ Variation of de2

The interactions of e2 with respectively e1 and e3, as illustrated in figure (3), they produce a variation δe1e3 (e2) of de2.

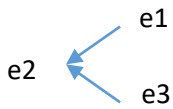

Figure (3): Schematic illustration of the interactions of e2 with e1 and e3

To establish δe1e3(e2) , two subsets de1e2 and de3e1 are specified:

- de1e2 includes the adverse consequences of the elements of de1 for e2. They are e1doe2, e1d1 e2, ..., e1dme2; e1dke2 is the most significant immediate consequence of the impact e1dk (k = 1, 2, ..., m) for e2.

- de3e2 refers to the adverse consequences of the elements of de3 for e2. They are e3doe2, e3d1e2, ..., e3dme2; e3dpe2 means the most significant immediate consequence of the impact eidp (p = 1, 2, ..., m) for the e2.

3 / Variation of de3

The variation δe1e2(e3) of de3 results from the interactions of e3 with e1 and e2, as illustrated by the figure (4).

Figure (4): Schematic illustration of the interactions of e3 with e1 and e2

In practice, δe1e2 (e3) is the combination of two subsets de1e3 and de2e3, which are :

- the elements of de1e3 are the adverse consequences of the elements of de1 for e3. They are e1doe3, e1d1e3, ..., e1dme3. By definition, e1dle3 is the most significant immediate adverse effect of the impact e1dl (l = 1, 2, ..., m) for the e3.

- the adverse consequences of the elements of de2 for e3 are the elements of de3e1. Those are respectively e2doe3, e2d1e3, ..., e2dme3. An element e2dpe3 is The most significant immediate consequence of the impact e2dp (p= 1, 2, ..., m) for e3 .

The theoretical approach proposed in this bulletin can be easily extended to cases where several climatic risks have to be considered.
For drought, the analysis shows that the elements of δe1e3 (e2) are negative changes for the livestock sector, in particular a decreaseof public financing of this sector development.