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Local Management of Water Resources for Farming in the Township Of Zê.

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SUMMARY

The mastery of the water cycle in the agricultural works has a very importance in these times of great climatic challenges when the food security is strongly threatened. But the Zê land's populations (84,92% farming) feel some difficulties and are often in margin of appropriate techniques of water management in agriculture. To lead this survey, documentation, investigating in real environment and the observation have been used like techniques for the collection of the data and information.

The efficient techniques of management of water are still very little known by the peasants of Zê. Those used currently are embryonic and inefficient. They use less than 22% and 8,33% the courses and plans of water respectively in the swampy regions and enclosed one. The rest of the needs is assured by the rains. These realities don't warn the climatic threats that hover on the future of the agricultural production.

Keywords: Local management; agriculture; pluviometry; climatic risks; gullies; Zê.

I- INTRODUCTION

The Township of Zê is situated between 6°32 and 6°87 North latitude and between 2°13 and 2° 26 longitude East. It has 653km² of surface and is the biggest township of the Department of which it occupies 19,88% of the territory with 72814 inhabitants (RGPH, 2003). The geographical position of this land offers him important possibilities of exchanges because of its neighbourhood constituted of great centers of consumption. The primary markets of Zê-Placque and Sékou are the main poles frequented by the populations of Allada, Sékou, Zê, Abomey-Calavi and Cotonou.

The predominant activity is the agricultural production (84,92%) with the cultures of corn, cassava, bean, pineapple in head. The transformation and the trade of these products added to the derivatives of cassava that are ''*gari*'', ''*tapioca*'' and the one of the pineapple that is the juice of pineapple are the other major activities that occupy the populations.

The success of all these activities is based on the efficient use of available water resources in the township. The Township has an abundant hydrography (KANHONOU, 2011) but has real problems relating to its bad management by the farming populations. It is obvious that the climatic risks can strongly prove the farmworks if the available river water is not normally managed into the farm. But what products do the peasants of Zê cultivate and how do they manage the water-agriculture's relation for the success of their activities?

II- BACKGROUND OR RELATED WORK

Several documents have been consulted and exploited in the setting of this article. The pursued objective is to get as very qualitative data as quantitative. The qualitative data are relative to the different cultivated products and the techniques developed by the peasants of Zê facing the local management of water resources in their land whereas the quantitative data consisted to the collection of statistics on the pluviometrical data and the results of the censuses of the population.

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Indeed, the topic of the interaction between water and agriculture has been the subject of an abundant literature through the world. It is the preoccupation of some world scientist: (BOKO, 2005); (NOUKPO, 2010); (NATA, 1988) etc. and of the organizations and international institutions as FAO, BM, ISESCO etc. The multitude of publications on this topic was about different aspects of the question. Thus, the majority of the authors estimate that the emergence of the agricultural production and the food security based on the mastery methods of water management in agriculture, especially in the Township of Zê where the analysis of all productive and generating sectors of incomes and jobs prove that the economy of the Township is dominated by the primary sector with most important activities such as : agriculture and the transformation of agricultural products. However, BOKO (2005) raises the insufficiency or the absence of the lasting development dynamics in the agricultural politics of Benin. For him the economic politics of Benin based on agriculture sins an insufficient taking care of the climatic variability in the forecasts of agricultural production and the projects of farming and agro-industrial planning. In these conditions the " climatic echoes " shake the whole economic system and the whole society. The dualism of this peripheral economic system is outgoing and, correlatively, its fragility make that its rhythms of development depends in a large measure on the climatic rhythms. Otherwise, the mastery policies of hydroagricultural cycle and exploitation of shallow for the expansion of the agricultural production in 1994 and 2002 raised to 35,92% of the private initiatives (FAO 2005). It is obvious that the sector of the present survey work knows these problems as on the national level. But the irrigation plays a considerable role in the agricultural production and the food security. On average, it is estimated that 18% of irrigated earths contribute for 40% to the world agricultural production (FAO 1997). It means that the irrigation is the glint of an agriculture which plays several functions. In first, it is the spearhead of an intensive agriculture that valorizes the factors of production and whose importance should grow in the future. It plays on the other hand, the role of promoter of the farming development when it appears like a regional development pole and that its social role takes the step on its economic role. Finally, it has a strategic role to play in the macro-economic level when it permits to reduce the dependence of the countries on the imports (OECD, 1994).

Thus, the survey of the local strategies of management of waters by the farming populations has a fundamental interest because of the influence of the climate which makes itself more and more atrocious and don't save any region in the world.

III- PRESENTATION OF THE MAIN CONTRIBUTION OF THE PAPER/SCOPE OF RESEARCH

In Benin, the agricultural activities occupy most populations (80%). However this sector which greatly depends of the climatic actualities, is seriously threatened by the climatic changes (Hounkponou and Al, 2008), especially in the farming regions where agriculture is practiced very much. The mastery of the water cycle in the farmworks has a fundamental importance in these times of great climatic challenges so the food security is also threatened. Much part of the resource cannot be mobilized for the human needs and flow out, either at the time of the abundance or the periods it is not very necessary. To this is added the under-exploitation of the available river. A real problem raised in this way when we note that the farmers don't use a competitive conscience through the good management of water resources, base of their prosperity and of the progressive modernization of their activity. It is important to make appropriate break on the way to the good management of water resources by the farming populations of the township of Zê. The present survey comes to make the state of the strategies of local management of available water resources by the agriculturists of the Township and evaluate the efficiency of these strategies.

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IV- PROPOSED METHODOLOGY AND DISCUSSION

The methodology of this survey includes two essential shutters: they are the bibliographic synthesis (background or related work) and the investigations.
The last one can, to our opinion, guide and to found the geographer's opinion.

4-1- Investigations

The tools of data collection used on the land are the individual questionnaires, the maintenance guides with the different actors (agricultural populations, populations living in peripheral areas, the local authorities, and the agents of the CerPa etc.) of the sector of survey. The individual interviews and focus group were the main used techniques. The sample has been determined by the probabilistic method, the uncertain choice technique and in proportion to the size of the households of every precinct. The size of the sample has been determined following the method of SCHWARTZ (2002). It has been calculated besides with a degree of confidence of 95% and a mistake margin around 5%.
$N = Zá^2 . P Q / d^2$ with
N = size of the sample by precinct
Zá = gap fixed to 1,96 correspondent to a degree of confidence of 95 %
P = number of households of the precinct / number households of the township.
Q = 1 - P
d = margin of mistake equal to 5 %
Proceeding like this by precinct, a rate of sampling of 5% is applied to the result to determine the exact number of households to investigate by precinct.
Therefore 210 households have been interrogated on the 13 458 that the eleven precincts of the township of Zè count, representing about 5% of the total households in the Township.
Besides the investigation of land, the direct observation permitted us to appreciate the real nature of the strategies developed by the peasants of the Township facing the use of water in their activities.

4-2- Discussion

Several insufficiencies are noticed on the techniques developed by the farmers of Zê. Indeed, the absence of marshes and considerable shallows in some precincts such as Adjan, Yokpo, Tangbo-Djêvié imposes to the farmers an agricultural calendar based on the pluviometry. These are exposed to the anguish of the climatic risks that make more and more enormous damages. The artificial techniques of mobilization and management of water are still rudimentary and scarcely inexistent. The producers of maize just put the seedlings again when after the first seed it doesn't rain for humidity anymore. It is only a sign of acknowledge of the peasant in terms of water mobilization to canned and enjoy rainwater in their farm. The holes of water are only ephemeral practices, because tributaries of the pluviometry and a feeble capacity of water retention. Otherwise, some days after the cessation of rains whatever is the intensity of these, the holes of water also dry up. The borings and wells only represent a very poor percentage in the agricultural system of the township because they are often used for the domestic use in first. A petty number is observed in the fields and is in a private capacity for most.
On the other hand, in the precincts of Zê, Dodji-Bata, Djigbé, Sedjè-Dénou… crossed by the temporary or permanent water it only exists very little or practically techniques of

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mobilization of these important waters for the success of the farming. While some peasants (22,33%) try to appropriate water by bowls and to water with of traditional watering-cans in the fields of truck farming to small surfaces (less than one hectar), others limit themselves to a pluvial culture as in the destitute areas and enclosed. Then, the courses and plans of water become useless and serve rightly to other activities as the fishing, the domestic uses. In the same time, others peasants has cruel needs of these indispensable resources emit to 50 meters from river waters. The peasant of Zê stagnates under the weight of the climatic warming up because of mistake of knowledge while next to him flows or sleeps the water that saves. But why not been inspired by the efforts operated by the swampy zones farmers?

The regions of the North and the East of the township don't suffer from the water lack. Nevertheless, it is necessary to know that laudable efforts are liveliness to be agreed. But these drained ground and these natural reserves are still under exploited, because of a lack of organization of the producers and manifest will of the concerned authorities. When some precincts lack natural reserves, of water (shallow, river.) to the South and to the west of the township, others have an excess of water reserves that often results in the seasonal rises in the water level on the other hand.

All these matters, as various as they are but common to the hydro-agricultural of the township, have a lot of possibilities to take the peasants of Zê out of their hydro-agricultural dwindle.

V- EXPERIMENTAL RESULTS

5-1- Physical setting

The sector of Zê' s climate is "soudano-béninien", marked by a feeble thermal amplitude (less than 5°C) and by a succession of four seasons: a long rains season from march to july, a small dry season from july to August, a small rains season from september to November and a long dry season from december to march.

The frequency of water's altitude has more and more disruptions during the last ten years (figure n°1).

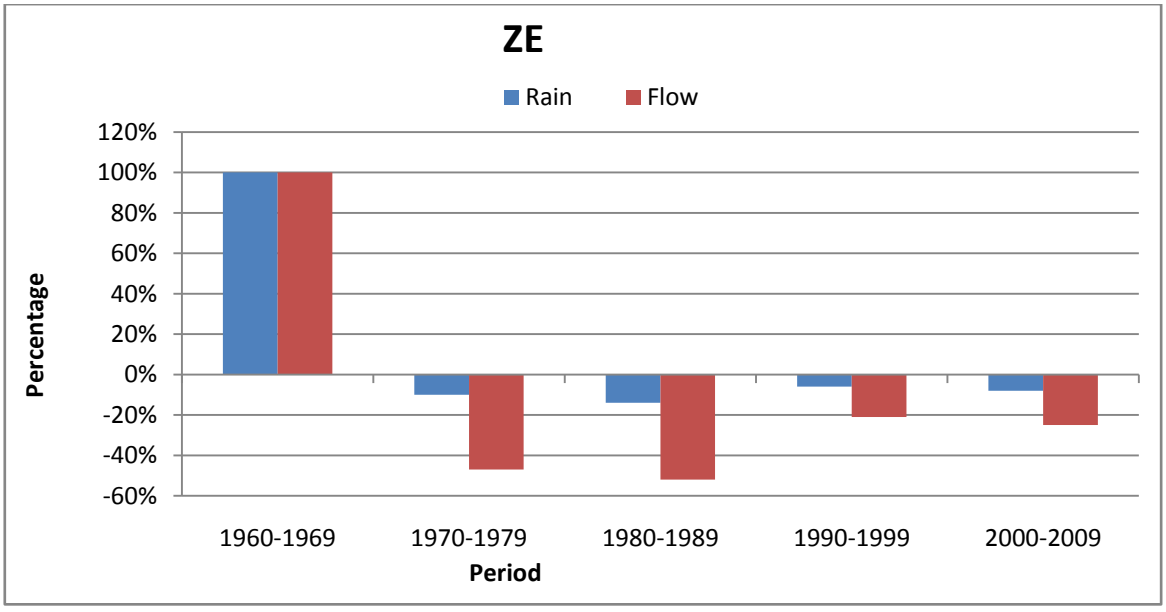

Figure 1: Curve of Zê's pluviometry from 1960 to 2009

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Source: ASECNA 2010.

The level of the precipitations fluctuated very much in the township during the last years. The analysis of the figure above shows that outside of the period of 1960-1969 that recorded an abundant and satisfactory pluviometry, there is a considerable fall. The most troubling situation has been recorded during the decade 1980-1989 where the pluviometry descended until -14% of the needs. It tends to go up between 1990-1999 (to 06%), but the following decade will have worse flows. The conditions of water frequencies often deteriorate during the 2nd season of culture. So, there was an irregularity in the spatial distribution of rains. In some regions the seedlings of the season can be made therefore to mid September; but rains sometimes continue until the 2nd decade of December. It results that during these last years, agriculture works lacked of water.

5-2- The agricultural production in the Township and its needs in water

5-2-1- Agriculture

The economy is essentially dominated by activities of agricultural production that is practiced on a total surface about 43 440 ha. The size of the agricultural exploitations (84,92% of assets with an important involvement of the women) is different from a precinct to another and the surfaces exploited are unequal. It is less than 50% in the precincts of Djigbé and Zê.

The main practiced cultures are in order of importance: the corn, the tubers (essentially of cassava), the pineapple and the tomato that respectively occupy 61,9%, 20%, 3,2% and 3% of the annual cultivated surfaces. There are after those the bean, the rice and the palm.

5-2-2- The endogenous strategies of mobilization and management of water

The peasants of Zê develop most techniques facing the management of water in their agricultural activities.

- **The rains waters**

To stock the rainwater, the inhabitants of the Township use the jars, plastics and the bowls. But some of them make cisterns to collect water thanks to the gutters that transport the rainwater from roofing to the cistern. But these techniques are in most case intended to serve the domestic needs of the households. The farmers are often impotent facing the retention of the rainwater in periods of superabundance and practice some methods little adequate. Indeed, the different enumerated systems above don't succeed in keeping water sufficiently to sprinkle important surfaces in drought period. The agricultural production therefore depends of the pluviometry. In some precincts of the township such as Adjan, Tangbo-Djêvié and Dodji-Bata, the peasants also tempt to collect the rainwater by digging gullies.

- **The Gullies**

The gullies are particular means of mobilization of the waters of rains by some peasants of Zê. These are simple holes (2 to 5 m) arranged by the farmers, often in the depressions and are into contact with the streaming waters. These water holes dug from local tools and very unequal measurements are used in the littoro-swampy area. This technique is practiced by a minority of peasants that exploits a land less than 2 ha. They also assure an unequal servicing

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to the level of the villages. Because of their configuration, taking water from the gullies is synonyms of sloping into the hole and thus in the water.

- **The modern Wells**

They are generally cylindrical shape with a diameter bigger than the traditional wells but with the same materials of drawing. The percentages in relation to the set of the modern wells are respectively of 4% and 2% for the littoro-swampy zone and for the tray. Their techniques of realization permit to capture deep tablecloths (from 10 to 40 m).

- **The Borings**

These are wells with less diameters and an equipment of pump to human motivity for the small needs in water. Their respective percentages on the set of the territory of the township are from 5% and 12% in the littoro-swampy zone and the tray's one.

- **Superficial waters and the drainage**

The peasant waits for the beginning of the rainy season to start their work. In the absence of rain their farming are exposed to the drought. The interviewed population constituted of farmers says that they suffer a lot from the water lack in dry season (88%) on the tray land and of temporary plans of water. They draw in the creeks or the rivers to water their fields. But it only is possible in the fields of less than 2 ha of surface. On the other hand, others irrigate their field while using the furrows and billons. In the regions of Awokpa, Djigbé, Houedota, Sèdjè-Dénou and Sèdjè-Houègoudo, the rice-growing and the market gardening are used in the shallows. But the lake of water mastery in the racks very often carries away the cultures. For this reason, the drainage of the perimeters serves them to evacuate water and to orient it toward the rivers in order to save the cultures.

5-3- Efficiency of the technique of mobilization and management of water resources

Most peasants of the precinct installed next to the rivers in the township irrigate their field to face the climatic inclemency. The set of all these works constitutes the means of provision in water of the populations. The figure 2 and the picture I present the percentages of exploitation of water resources in the township according to the texture of the soil and the efficiency of the means of water management in the agricultural perimeters of the Township. In the picture I, the gullies are classified into rains; borings and modern wells are compiled in the category " other ". Taken individually, their percentage is petty.

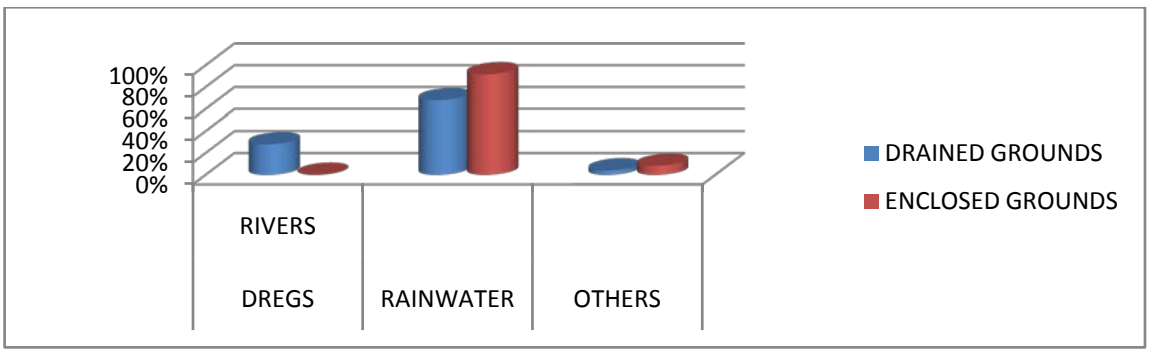

Figure 2: Mobilization of water by the peasants of Zê.
Source: ALIA, 2013.

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Picture II: Efficiency of the technique.

	WATER RESSOURCES MANAGEMENT'S METHODS			
Area	Drainage	Watering with hand	Motorised Watering	Rainwater
Drained Ground	medium	Mediocre	medium	medium
Enclosed Ground	none	Mediocre	None	medium

Source: Investigations, 2013.

The figure 2 shows that rain is the more used resource by the farmers of Zê, whatever the nature of the soil (68% and 91,67% respectively for hydromorphe grounds and those enclosed) in terms of mobilization of water resources. The other categories are only secondary. Otherwise, it is evaluate in the picture I, the efficiency of these different techniques. Indeed, after the rain that assures a middle distribution of water in the fields (because of the climate risks); the watering with the hand doesn't permit a sufficient watering. Water brought by the peasants doesn't fill still the needs of the plants, especially when the cultivated surface is superior to ½ ha. This situation can worsen again in dry season when rains don't exist anymore to fill the emptiness. The drainage and the use of motorcycle-pump in swampy regions of the township assure a more adequate and refined distribution.

VI- CONCLUSIONS

Agriculture represents the first activity that occupies the populations (farming) in Benin and in particular those of the Township of Zê (84,92%). Several agricultural products are cultivated there and are essentially composed of corn, cassava, pineapple, palm and the bean. The extent of the township is staked out an abundant by hydrographic network. The North and East regions of the Township are drained by the affluents of the Ouémé stream. That resources offer an important hydro agricultural potentials. However, the farmers of this township gnawed by the ignorance of the knowledge of insertion and management of water resources, adopt a pluvial agricultural calendar and are exposed to the damaged conditions of nowadays climate. This situation sets the food security into a troubling precariousness and obliges the population to import products whose natural potentialities exist. Realistic arrangements must be taken in order to assure a real lasting development to this inescapable activity.

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BIOGRAPHY WITH PHOTO

ALIA A. W. Rock is born by october 05th, 1988 at Abomey – Calavi (Bénin) where he followed his primary and secondary courses with the obtaining of the A'levels in 2008. Registered at the Department of Geography and Regional Development of the University of Abomey – Calavi (DGAT/UAC), he gets his Mastery level in January 2014 with the mention Very-Good on the topic " Mobilization and management of water resources for agricultural works in the Township of

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Zê ". Otherwise, he participates to the scientific week from June 23rd to 28th, 2014 in the institute of the Biomedical Sciences Applied (ISBA) by the presentation of a communication on the topic " Agricultural production and farming technical in the Township of Zê " and is interested by the scientific research. He currently continues his studies in English and in Geography at the University of Abomey-Calavi.