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IMPACT OF INNOVATION IN AGRICULTURAL PRACTICE. The case of Lake Alaotra, MADAGASCAR

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ABSTRACT

In the face of the many direct and indirect interventions by development players dictated by rural development policies, there has been no noticeable change in agriculture, and structural constraints continue to hold back the sector's development. However, faced with national and international economic constraints, economists in the rice-growing and agricultural sectors still tend to propose purely economic intervention or support measures, while agronomists and those who trust the motivations of grassroots producers still resort to the dissemination of new cultivation approaches with the aim of increasing productivity. But the question that arises is how innovation can bring about changes in farming practices. Assuming that the innovations introduced have only a partial impact on agricultural practices and development, this study looks at the changes brought about by the new techniques in the agricultural practices of farmers in Lake Alaotra.

KEYWORDS: Agriculture, Farmers, Technique, Innovation, Development

INTRODUCTION

Agricultural policies are the main sources of innovation, which farmers reinterpret to suit their objectives and available resources. The introduction of sustainable development policies in Madagascar is aimed at

improving living conditions in rural areas, opening up markets and making the most of available resources by protecting the environment. Major policy changes in the context of structural adjustment have led to institutional changes at all levels, including the agricultural sector and rural development (Le Coq J.-F., Ribier V, 2005). Over time, and taking into account the situation of family farms in rural areas of Madagascar, it can be said that successive agricultural policies have encouraged farmers to commit themselves more and more to a promise of performance. But given the national and international contexts, the national and regional development process is also marked by ruptures and inconsistencies between the objectives and expectations of the two players (development agencies or projects and family-run farms). The situation is repeated for a variety of reasons. Whether or not new, more efficient or more productive farming techniques are adopted is strongly conditioned by the changes they bring to farmers' living conditions. Hence the interest in examining the impact of new techniques on farming practices. The question that arises is how innovation can bring about changes in farming practices?

The purpose of this study is not to judge the quality of agricultural policies or the approaches or extension policies implemented. Rather, the aim is to establish an understanding of how the perception of Family Farming Enterprises (FfEs), a unit that uses production factors, has progressed in the face of the influence of innovations introduced in Lac Alaotra, a major investment zone targeted by most donors and accumulating substantial funding since the 1960s.

Development players and farmers are all seeking to achieve food security and cover other financial needs by adopting either intensification of production or diversification of income-generating activities. Acting within the same vision and within the same timeframe, family farms often opt to adapt production systems that they believe make the most of their available resources. But in relation to the economic and organisational steps taken through the various agricultural policies, farmers are evolving with their own strategies. In other words, farmers have their own strategies for allocating their available resources. As a result, the immediate effects and impacts of these series of interventions often differ from the initial objectives and plans.

Thus, based on the hypothesis that the innovations introduced have only partial impacts on current agricultural practices and development, various analyses will discuss the impacts of innovation on the agricultural policies of farmers in Lake Alaotra. Information gathered through on-site observations and statistical processing of data relating to farmers' situations will be used to validate the hypothesis.

I- CONCEPTUAL BASIS

Numerous actions and interventions have been carried out in rural areas, whether sector-based or integrated, with an environmental or global development focus. A number of NGOs and projects are

working in various fields, in particular to protect the environment and promote rural development. This situation is the result of the liberalisation of the economy and the State's disengagement from the productive sectors. The creation of the Regional Committee and the setting up of local structures such as districts and arrondissements ensure the grassroots ownership needed to implement the Regional Rural Development Programme with guaranteed "institutional" roots. Generally speaking, the approach of local development players is always based on the specific objectives of producers. It is also important to recognise some of the successes of the approach, such as the mechanisation of farming activities and the gradual adoption of new farming techniques. The dissemination of these new techniques calls for participatory responsibility on the part of the farmers, so the extension operators leave it up to the farmers to decide whether or not to adopt them.

As the participatory approach is currently in vogue, the approach techniques are considered more effective because they respect farmers' freedom of choice. Everyone (stakeholders and adopters) is made responsible for their choices. But taking into account the dimension of achieving extension objectives, it would seem that setting up coordination and monitoring-evaluation bodies, reoriented according to farmers' expectations, is not enough to ensure the development of agricultural activities. Whatever approach is adopted, farmers' strategic objectives are not well understood, making the objectives of the monitoring and evaluation bodies incoherent. Farmers' strategies appear to be responses devised by social actors - farmers and/or livestock breeders - to the challenges they face. But the response to these challenges may come from the social group itself, in order to reproduce or transform a way of life that is essential to their perpetuation as a social group and to their individual 'presence' within it. On a farm, the art of coordinating the factors of production results from the cohesion of the household around a common strategy.

Generally speaking, the integration of innovation in agriculture often turns on the mobilisation of available resources. For more satisfactory use of resources, this innovation can be technical. This is the case when the farmer develops a new seed variety, a water or soil conservation technology, a new grafting technique, etc. If farmers identify their expectations through innovations, they quickly plan their own steps towards adoption and adaptation. In this way, there are always voluntary changes, far from being encouraged by development players, and there are changes driven by the actions of local agricultural projects.

II- RESULTS

In relation to the objective of this work, the results focus on the impacts of the adoption of new techniques on the agricultural practices of farmers in Lake Alaotra.

2.1 Changes in farmers' strategies

The current knowledge, attitude and practice of the inhabitants of the Alaotra with regard to cultivation techniques (mistrust or lack of confidence) are interpreted as a consequence of the means used by development organisations imposed on farmers, later relayed by private companies, as a model for family farming.

The main factor determining decisions on new rice-growing techniques is the area under cultivation. The shortage of available labour in the face of the pressure of the usual cropping calendar explains the trend towards large-scale migration to the most productive areas, such as Lac Alaotra, from independence to the present day.

More than 60% of rice-growing activities have always depended on the availability of outside labour. This is a specific feature of family farms in Madagascar. This situation explains the trend towards large-scale immigration to the most productive areas of Madagascar, as in the case of Lac Alaotra before independence and up to the present day. It can therefore be said that the technical innovation that goes hand in hand with the use of additional labour is more likely to be ignored by vulnerable farmers: those with small areas and less available budget.

Despite the initiatives promoted by various public policies, in particular successive agricultural policies in the area since 1960, the rate of adoption of all new irrigated rice-growing techniques remains very low in relation to the availability of rice-growing land. Adopters select a part of the innovation that they consider interesting in relation to their experiences and their objectives or visions. On-site observations confirm that farmers only adopt some of the techniques introduced. The main reasons for non-adoption are threefold: the immediate lack of resources, inadequate follow-up by extension workers, and poor water and road infrastructure. Environmental pressures such as natural hazards, mainly drought, unstable annual rainfall and soil degradation, silting up of rice fields and drainage channels, etc. also discourage the adoption of new techniques, which often require a certain level of precision. Chemical fertilisers and plant protection products are accepted because farmers are convinced of their contribution to reducing labour, but because of availability and accessibility, they are used in insufficient quantities. The adoption of new varieties or high-performance seeds is often unanimous after a certain period of observation of the success of the "pioneer" farmers.

Despite the efforts and objectives of the players or promoters, farmers always impose their own approaches (strategic or tactical objectives). The dilemma is first social and then technical: often they continue as before with the usual rice cultivation in order to cover the maximum available surface area, but there are still cases where they agree to change and intensify by adopting working methods and/or

inputs in order to get higher yields with improved techniques. This trend is always seen in irrigated and rainfed rice, even if the reasons are not quite the same. But adoption of the entire innovation is very rare. According to the results obtained in this study, following the different intensifications of rice production in Lake Alaotra, farms are accustomed to using chemical inputs in irrigated rice production (traditional or improved system). All the farms in the sample use phytosanitary products. According to our results, farmers are influenced by the agricultural policies developed in the area. The results of these analyses show that there have been changes in farming practices in Lac Alaotra. However, the adoption of these techniques is not yet irreversible. The continuity of the adoption of this system is uncertain and it is possible that, without support, the dissemination of these new cropping techniques in Lac Alaotra will not be immediately successful.

2.2 Motorisation of agriculture

With regard to the motorisation of farming, agricultural development stakeholders have learnt their lessons over time from the use of tractors and bulldozers. Motorisation has only led to new factors that farmers cannot control, such as poor maintenance and the purchase of spare parts for agricultural machinery. For these and many other reasons, motorisation was probably no longer part of the intensification objectives of the local players. However, farmers took their own initiative by buying and adopting the use of Kubotas. This 'spontaneous' initiative is sometimes taken at grassroots level, where the challenge of dependence on technicians, development agencies and donors is taken up. In addition to this self-promotion of the development of alternatives relating to the reduction in the use of labour, still insufficient during the soil preparation period. Before motorisation, large areas required the use of large numbers of zebus during soil preparation. Mechanisation and motorisation thus increase exploitable resources: human, financial and temporal (capital and management). But the Kubota also ensures quality work.

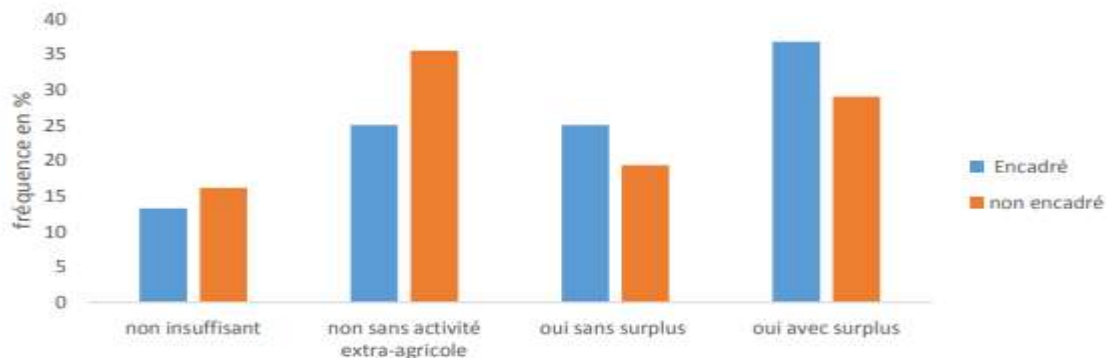
The collateral problems previously encountered with tractors are now fully under the control of the current tractor owners. Maintenance, repair, adaptation of spare parts or accessories are additional innovations. According to the farmers observed at the edges of the plots and meshes, specialist intervention is rare during diagnosis in the event of a breakdown and during the creation of new accessories. Active exchanges between owners improve local know-how and are other forms of socialisation and creativity. From a social point of view, the owners of large surfaces were often under threat of cattle theft. Adopting a Kubota is therefore an opportunity for them to reduce the risk of cattle theft. But at the same time, like zebu ownership, kubota and motorbike ownership is also an act of social investment and a symbol of prestige and wealth. This equipment is also used as a means of transporting goods and passengers for a fee. It is not uncommon for them to be used in wedding processions.

2.3 Membership of management and association structures

Rice-growing is the basis of all agricultural policies in Lac Alaotra, and the majority of rice-growers devote more time to rice-growing than to other agricultural and off-farm activities. Farmer satisfaction is synonymous with success for them, whatever innovations or changes they adopt. After the period of imposition (especially before 1980), the time came for liberalisation and a participatory approach, and acceptance of new organisations and technical innovation became voluntary. However, local development projects and players still set aside projects to accompany the innovations being popularised. Adherence to this new approach is also part of farmers' strategies (Olivier De Sardan J-P., 1990).

The following figure illustrates the relationship between farmers' satisfaction and their membership of the support structure. In relation to total rice farmers, four (4) indicators of self-sufficiency or not in rice can be drawn from the zone's operation. The first category in the table (not self-sufficient) indicates that rice-growing needs are not met even if income from other activities is added. The second (no extra-agricultural activity) groups together farms that are not satisfied with their level of rice production through non-agricultural activities. The third group (yes without surplus) is made up of farms that are self-sufficient in rice but have no significant surplus. The remainder (yes with surplus) are rice farmers who are self-sufficient in rice and have the possibility of saving.

Figure 1: Staffing levels and coverage of needs

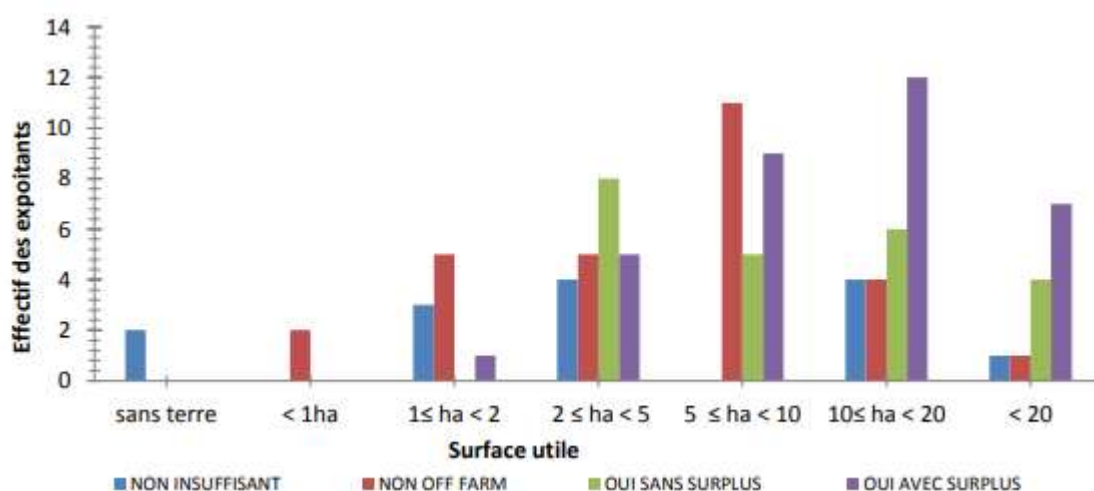


Source: Authors, 2023

According to this figure, farmers who are fairly satisfied (over 68%) with the coverage of their annual family rice-growing needs are the most attracted to support structures. Whether or not a farm is supervised has an impact on rice yields. If we look quickly at this result, it is synonymous with a positive impact of

agricultural policies on farmers' self-sufficiency in rice. However, according to the hesitations of the players involved, farmers' adherence to the support structures is rather linked to the spontaneous benefits of the advantages offered by the projects to those who accompany them in the process of popularising this or that technique (facilitating loans, facilitating collective purchases, etc.), because the following figure shows that often, the area under rice cultivation also favours or does not favour farmers' satisfaction.

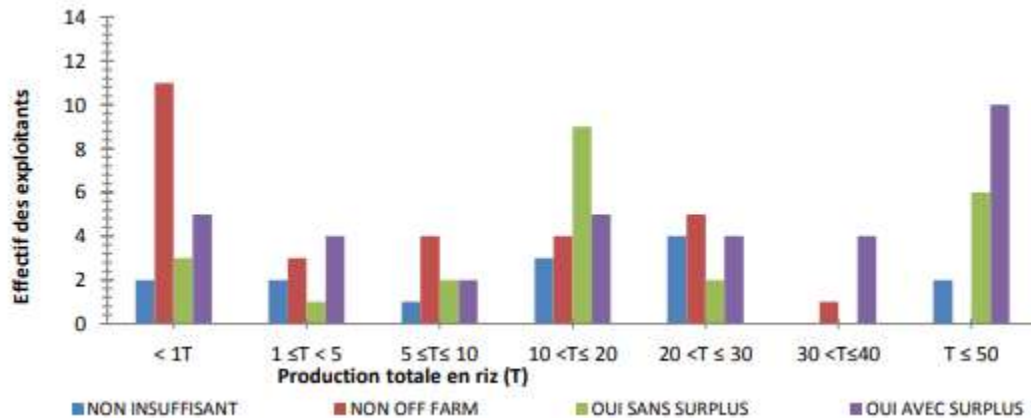
Figure 2: Trend in coverage of needs as a function of floor area



Source: Authors, 2023

This figure shows that the satisfaction of family needs is related to the useful area farmed. Farmers with small rice-growing areas (less than 1 ha) tend to supplement their family's needs with non-agricultural activities, which gradually decline as the usable area increases. Satisfaction without surplus" is observed from a usable area greater than or equal to 2 hectares. This is evident because rice-growing is considered to be the main source of agricultural income. The following figure shows that the more rice farmers have, the more satisfied they are with their production. The notion of yield per unit area (objectives of agricultural projects and policies) is not often considered.

Figure 3: Relationship between coverage of family needs and rice production



Source: Authors, 2023

According to this figure, the coverage of family needs improves with the total production of rice, although the latter is naturally more important according to the size of the cultivated area. Instead, satisfaction should be assessed in terms of yield in relation to the investment or effort made per unit area. However, this is not the case with the farmers, whose extra-agricultural activities deteriorate with the amount of rice available. According to the previous analyses, the majority (over 70%) of the farmers surveyed have a usable area of over 2 ha. The coverage of annual needs and usable area are interdependent. Apparently, farmers who already have the assurance that their objectives will be met are the ones most attracted to associative and supervisory structures. This could also explain the decline in adoptions after the withdrawal of support projects. Theoretically, unsupervised farmers do not have the same advantages over supervised farmers in terms of passing on quality information on new techniques in good time. However, the more vulnerable they are, because they do not own their own land, the less likely they are to benefit from the support structures.

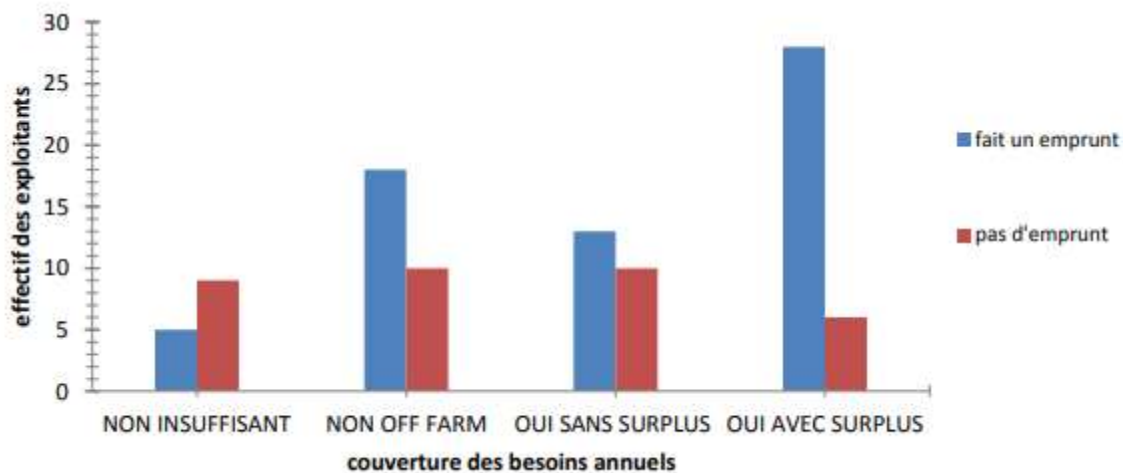
2.4 Orientation towards borrowing

Credit is one of the innovations that have been introduced in Lac Alaotra over the years. It is a sectoral policy included in the rural development policy. This approach is part of the Malagasy government's National Microfinance Strategy (SNMF) 2004-2009 (Adéchoubou M., 2004). Microfinance is now seen as a means of achieving the Millennium Development Goals, in particular halving poverty by 2015. With this in mind, the Malagasy government has committed itself in a "Microfinance Development Policy Declaration" to establishing and maintaining the necessary foundations for the development of the sector.

The institutional framework for microfinance is governed by the Ministry of the Economy, Finance and Budget and the Ministry of Agriculture, Livestock and Fisheries, which is involved in rural financing (Wagner E., 2004). A recent study carried out as part of the BV-Lac project (Wagner E., 2004) also showed that attempts to implement micro-credit systems in the Lac Alaotra region of Madagascar had most often ended in failure. Indeed, the Malagasy savings and mutual credit banks are moving further and further away from their primary aim of granting credit to the poorest people, and are becoming more and more banks aimed at the middle classes.

In micro-credit, farmers' approaches also justify that the adoption or rather the adoption of part of the innovation is only feasible if the priority needs of the farmers coincide in the content of the "pack". This trend is of interest in identifying the shortcomings of past and future approaches to innovation extension. According to the figure below, borrowing money for financing is related to the farmer's perception of annual autonomy. The more autonomous farmers feel (sense of security and performance), the more they borrow money each year.

Figure 4: Relationship between borrowing and coverage of annual requirements



Source: Authors, 2023

There is the possibility of credit from financial institutions, but this access is not always possible for all farmers despite the support of certain local development organisations. Some farms do not have sufficient collateral for loans, while others are afraid to take out a loan (because they are not satisfied with their level of production). The mere presence of financial institutions is not enough to meet the expectations of the

local population in terms of rural financing. The current credit system is not adapted to the weak negotiating capacity of farmers due to their relatively low level of education and their lack of organisation. In addition, the cumbersome procedure and administrative slowness involved in granting credit often disrupt work schedules. The release of funds is always late in relation to crop calendars. This situation is exacerbated by the inadequacy of extension and farm management structures. Difficult access to credit for most farmers limits the number of beneficiaries.

III- DISCUSSIONS

Since independence, those involved in Lac Alaotra have done their best by analysing the initial situation and intermediate developments before finalising the final intervention methods. However, the rate of adoption and the area under innovation are not significant in relation to the potential of the intervention zone, and old techniques or habits still predominate over innovative techniques. Technical change and the processes of intensification and diversification have often led farms to develop a certain degree of producer structuring in order to gain access to certain services: technical information, joint guarantee credit, water management in irrigated areas, concerted development of catchment basins, and have thus generated organisational innovations, the sustainability of which remains in doubt (Rakotofiringa A., Penot E., 2009). But with the withdrawal of the support structure, or rather the support structure, the risks of abandonment or backsliding, as in the case of irrigated rice growing, are highly likely.

By focusing the discussion solely on the most recent innovation introduced in Lac Alaotra, we have seen that farmers' experiences always take precedence over the objectives put forward by the stakeholders: politicians and development players. However, they are relatively successful, if the aim is to improve farmers' incomes while developing agro-ecological cropping systems, with better sustainability expected in the medium term and interesting economic results. This is because a large number of farmers (small to medium-sized) ensure their food security primarily through irrigated rice, with very high levels of self-consumption of farm produce and farm income derived solely from the sale of surpluses (Rakotofiringa A., Penot E., 2009).

Based on our on-site observations, we would like to put forward the following explanations, taking into account the logic of the farms studied: the adopters do not use the "complete innovation package" but adopt only part of the innovation, and this attitude can also be explained as being linked to the preservation of zebu breeding. After the harvest period, the fields and rice paddies are generally used by the community as collective grazing land, as the practice of transhumance on the tanety is becoming increasingly limited due to land pressure, insecurity and environmental degradation, which in turn leads to a scarcity of the zebu's usual food resources during the dry period. The good harvests of the 3 successive years are probably capitalised on in the form of zebu, as the zebu's place in society remains important. Like the kubota, the

company's estimation of a farm that has been able to buy a few zebus after the harvest is very important; it is a sign or indicator of success.

For the first 5 years after setting up, farmers buy basic agricultural equipment. Over the next 10 years, they look for performance and stabilisation. It is at this stage that the permanent installation marked by the construction of a permanent house (house + vala or zebu pen outside) and the purchase of equipment with both economic and social value are very frequent: carts, zebus, kubota, motorbikes, etc. The adopters of the innovation are generally medium-sized farms with at least 5 years' experience. So, after the sixth year, they are at the stage where the search for social distinction (a sign or indicator of performance and stability) is important. Buying zebus is part of their long-term objective.

The process of adopting farms does not always follow the logic of the projects. But whatever the interpretations of such situations, it must be admitted that any fight against poverty through an improvement in agricultural income will only have an impact on Malagasy farmers who obtain an effective income from their activity (Rakotofiringa A., Penot E., 2009). It can therefore be said that the innovations introduced have only a partial impact on agricultural practices and development.

In this study, the impact is also assessed in terms of farmers' satisfaction, since the intrinsic experiences of farms are among the determining factors in the decision to adopt or not adopt a given innovation. Farmers plan their own progress according to the opportunities (in the short or medium term) offered by the innovations to achieve their own objectives, i.e. in order of priority: to have a satisfactory production rate, social distinctions which are materialised by the following three points in order of priority: self-sufficiency in rice, family and social commitment: children's schooling, family festivities, social obligations, etc., and stability: equipment, house, land, zebus, kubota, motorbike, etc., and only in fourth place is stable economic growth envisaged.

CONCLUSION

The results obtained lead us to conclude that the success of technical innovations is determined not only by the strategies of the operators working on site, but to a large extent by the degree to which these techniques are adopted by farmers. The strategy of the organisations working on the ground is to increase yields and productivity by introducing new techniques in order to improve farmers' standard of living. They have the same objective, but with different priorities, as family farms have to satisfy both self-consumption needs and family income. So, the impact of innovation depends on the situation of each type or category of farm. Medium-sized farms are the most receptive to innovation.

BIBLIOGRAPHIY

Adéchoubou M., « *Stratégie Nationale de Microfinance 2004-2009, Draft n°1, République de Madagascar, Ministère de l'Economie, des Finances et du Budget* », 2004

Le Coq J.-F., Ribier V., « *Agriculture, environnement, nature et société* », 2005.

Olivier De Sardan J.-P., « *Principe de détournement* », 1990.

Rakotofiringa A., Penot E., « *La pluriactivité rurale au service du maintien de l'agriculture familiale : cas d'une commune du Vakinankaratra, hauts plateaux de Madagascar* », Document de travail SCRID/UMR innovation, 2009.

Wagner E., « *Etude et mise en place d'un système de crédit solidaire dans la région du lac Alaotra, Madagascar* », Rapport de stage DESS Géopolitique et Relations Internationales ; Institut d'Etudes Politique de Toulouse, projet BV Lac Alaotra, 2004.