

LANDOWNERSHIP, AS A STRATEGY FOR SUSTAINABLE DEVELOPMENT IN THE HIGHLANDS OF MADAGASCAR

Household optimization: Case of Analamanga Region

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Abstract

This study aims to show that by increasing landownership among peasants their incomes will improve, even as they continue to practice their agricultural methods in the same economic, technical environment. The farms located in the Analamanga region of Madagascar, have been created by the development of lowlands primarily for rice but also for a small amount of rainfall crops.

Currently too many farmers in this region can't obtain a fair income above the poverty line, despite the tendency to still use "tanety"¹. This situation is compounded by population growth and the inability of the peasants to expand their rice fields. The three selected irrigated areas of Ankazobe, Moriandro and Mangamila have similar irrigation systems, with features which are common to the Analamanga region.

This study also illustrates the peasants' perceptions related to their farmland. This study presents the methodology for optimizing farm production in this region through analysis of the risks peasants face in the creation of a practical approach to stimulate production capacity by income/area. The farming methods used for rice crops by the peasants will be analyzed showing Strengths, Weaknesses, Opportunities and Threats.

The expected result is the determination of which criteria will be best resolve the main trend of inadequate land production alongside of population growth. The recommendations will focus in particular on the possible structural changes regarding the holdings and management of cultivated areas. The implementation of the recommended structural changes should result in an economic boom to the peasantry of the Analamanga region and for sustainable development.

Key words: Madagascar-Analamanga region-optimization-structural changes

1. Introduction

It is noted that "non-possession of agricultural land in Madagascar is strongly linked to lack of other forms of productive capital (including education), which has the corollary that the poorest group of people consist of landless rural households. For landowners, the median household size is 1 hectare which is relatively low compared to other African countries "[4]

The Action Plan for Madagascar, "MAP, has a commitment for rural development the challenge of launching a Green Revolution in a sustainable strategy for expanding the area cultivated". [15]

¹ tanety is the area between the lowland and the hill, which can receive cultivation

The purpose of this study is to propose an approach for finding an optimal size for farms in Analamanga region. This optimization is necessary in order to reach rural poverty. The main purpose is to evaluate potential environments and determine the best areas for each type of operation. Faced with this complex situation, a systemic approach offers a way to find to solve the problems.

A systemic analysis of agro system in the central highlands of Madagascar, including the Analamanga region shows that: 1) the major constraint in the production system is the size of the farms, and 2) this constraint is coupled with the increase of the population and the decline of agricultural production. This is in part due to the inadequate use of land by an uneven distribution of population and the disparity of farms size and production levels.

2. Context

The current agricultural landscape in the region is the result of social construction. The social construction started in the time of the monarchy has changed following new political contexts. While its physical appearance has not changed, the organic relationships that drive this rural landscape have changed from population growth and other socio-cultural factors. Now, the situation of poverty versus wealth in the region is the result of global efforts to increase production and farm income of the poor farmers.

Land tenure determined by the size of farms has undergone change and characterized by the mode of inheritance. This change has lead to smaller farms which has a great economic impact. It can often be physically seen where what used to be one rice field or farm has been subdivided up between the various heirs. Though some farms continue to have rights to ancestral land, these changes have caused others to abandon these rights. The problem that results is that overcrowding can put too much pressure on usable land while other land is not farmed because of the status of its title (the owner no longer lives in the village or the title in process)

What then to do: Should the focus be continuing to intensify agricultural production or rather should one opt for extensification by enlarging cultivated area? Or perhaps a combination of both systems?

The two working hypotheses of this study are as follows:

- 1) farm size is the major constraint to increased production,
- 2) the natural resources of water and soil can be enhanced by the use of agricultural inputs.

The overall objective is to reduce rural poverty through a comprehensive plan for increasing poor rural farmer access to land

The specific objectives of this study then are:

- a. definitions of the processes, principles and conceptual framework for the optimization the rural household income,
- b. defining what size farm will produce adequate revenues for a rural household (keeping in mind the consequences of labor and environmental protection)

As mentioned above, the methodology used to increase farm income is also based on the analysis of Strengths, Weaknesses, Opportunities and Threats of the technical trends and production factors used by farmers in the Analamanga region.

3. Summary

31. Methodology

311. Modeling with socio cultural trend

Efforts to conduct research on the land have been done by predecessors who have had more resources than I. This study uses data from previous studies but looks at them from a different point view, mainly socio cultural identity and its relationship to the land.

312. Historic approach

A historical approach on land includes the major trends in the use and development of land in the Analamanga region. This approach describes also on actions for the intensification of production.

313. Peasant's perception

The study also consider three sites comparing natural resources, human capital, the level of equipment and the social capital that constitute the production environment. These three sites serve as collections of peasant perceptions in relation to land and production. They represent the Analamanga region in terms of the dynamics of land use and development. These sites are the irrigated perimeter of Mangamila in the north, the area of Moriandro and the irrigated area of Ankazobe.

314. Interview oriented to Land holdings at the Commune²

The study is supplemented by interviews in the rural villages in the region including the village elders, administrative authorities and local elected officials and more farmers with or without land. Only four communes could not be visited because of their remoteness.

315. Regional Workshop on Land holdings

A regional workshop on land, operating in focus groups, gathered the opinion of officials of Land administration and representatives of farmers from the peasant organizations. The results of this workshop have been translated in terms of actions to undertake in the short, medium and long term. It took place on 27 November 2007 under the auspices of the Analamanga region, the Working Group for Rural Development (GTDR). It was supported and recorded by the NGO SAHA.

The Plan of Action for Madagascar (MAP) was attended by representatives from the Analamanga region by ensuring consistency of actions and strategies of regional development plans and MAP commitments. Participants shared opinions on rural land development in terms of problem solve.

² Commune is an administrative and territorial unit grouping several villages led by a mayor

316. Data with Region and its structure

Monographs of districts are official documents managed by the Ministry of Interior. Data from these documents are available, from 2001 to 2005, in the Analamanga region with seven districts completed. These include the population size, the main activities, existing infrastructure and organizations involved in development in each Commune.

The Regional Development Plan (RDP) is a working document to identify strengths, constraints and strategies to be implemented for regional development. The development of this document has followed a course of consultation, data processing and writing. It is a tool for stakeholders in the development in the Analamanga region through strategic planning.

317. Bibliographic search

The series of National Institute of Statistical Works (INSTAT) include regional monographs published in 2004. The ILO project working with Cornell University collaborated with the National Research center Applied in Rural Development (FOFIFA), INSTAT and other institutions in a comprehensive rural survey comparing poverty in the Central Highlands of Madagascar. In using these sources of data, reference is made throughout the text.

Studies conducted with students at the end of their training cycle from the College of Agronomics Sciences and the Polytechnic School served to clarify certain topics about farming and the environmental behavior of irrigated areas.

Consultation of historical annals in the National Archive has helped in understanding the historical development of land use in the area of study. Search results from my Master's degree and publications from the International Conference on Contemporary Madagascar and the Millennium Development Goals as well as, others works were used in connection with this research.

318. Modeling methodology

A typology of the perimeter of irrigated Mangamila describes the characteristics of farms in terms of farming methods, size, number of assets and income. A clear relationship appears

between the area of operations (“tanety” and rice) and farm income. An adjustment gives a linear function to agricultural income on “tanety” and lowland rice for allowing evidence of this relationship. Only the view of majority practices with rice and cassava cultivation is taken into account regarding farm income. SWOT analysis gives an idea about the constraints for the formulation of principles of assumptions in the optimization.

This study leans on data published by INSTAT with the ILO project conducted by Bart Minten in, “Rice and poverty in Madagascar” in 2006.

The production system of the Central Highlands region studied includes Analamanga region. The climatic conditions are only slightly different for those in our area of study. The projection concerns the farm’s income which implies that the main indicator will be the income. This income corresponds with the area used by the farmers. So to be realistic, the assumptions come from a projection of the richest farm’s income in the current production system. The goal is to reverse the current parity between urban and rural area in favor of the latter by:

- hypothesis 1 is to double farm’s income
- hypothesis 2 is to triple farm’s income in both systems

All these assumptions support the need for a structural change especially in the factors of production, mainly the level of equipment and land use and will be contained in the explanation of results. The limit of this methodology is the limited sampling in this study which may not have the same results as Bart’s Minten data. However, this limit is overcome by the confirmation from the peasants’ perceptions of the production system in the region. The latter are not facts taken as data, but information that gives an assessment of socio-cultural factors in this study.

32. Results

321. History of Landholdings in the Region

During the time of royalty, especially under the reign of king Andrianampoinimerina, the land rights belonged to the sovereigns. In order to ensure an adequate supply of food for the growing population the sovereign's policy was to allow the suzerains to farm the land.

This system of land rights was not disputed, the production was enough and additional marshy land was developed for growing rice. This ongoing increased use of the lowlands was the dynamic that led to the expansion of inhabited spaces at this time. The development of the landscape for farming was designed and built by the whole community. The transmission of the rights to farm was allocated to managers as strongholds under the control of the royalty. This fact is observable on the irrigated perimeter of Moriandro Mahitsy and on the plain of Betsimitatatra whose toponymy suggests relationships between the land and the production system.

A competing system of land rights was developed during the colonial period.

The Rotival plan was not implemented in the Central Highlands. However, the planting of Eucalyptus on the Eastern borders of the Region was used as support for the operation of the railway line connecting Antananarivo to Toamasina. The system of land appropriation changed to follow the principle of domaniality which copied the model of the colonizer. [2]

To protect their land and appropriate more at the country level, the neocolonial power hastened to enact the 60-004 regulations governing ownership of land in Madagascar based on the rule of public domain rule. This law stipulates the inalienable rights of the land title for individuals which replaced the former system of sovereign land ownership and community rights. However, "certain communities succeeded in overcoming this state of affairs by a return to the ancestral land" [13]. The irrigated perimeters of Ankazobe and Mangamila describe better this phenomenon on the basis of Torrens principle: delimitation valorization and recognition of having rights. All is managed at the community level on an oral pact and changes are done by

consensual arrangements. In spite of the existence of the domanial procedure of acquisition of land, the community based management of land continues to function.

In 1973, the grace period for the regularization of land known as “tanindrazana” (ancestral land) allowed individuals who have farmed the land the right of acquisition following the normal rules. Community land managers and proponents of ancestral land rights have resisted this policy of the Lands Administration.

During the era of the socialist revolution, “the principle of land to those who work” was introduced for a green revolution in the countryside. Frank Muttenger said "From personal strategies, land is a mean by which men are economically emancipated and can have accomplished according to their full capability”. The principle, of “land to those who work” effectively, recognizes beyond the rights of descendants the value of all work in ensuring a degree of freedom to individual farmers”. [12]

This current of ideological change, in the era of the socialist revolution, did not bear fruit even on the farms that were nationalized. Both the individual approach as well and the co-operative community approach failed vis- à-vis the mode of customary rule.

The ancestral rule of land management leads me at least to reflect on the state of landownership in the vicissitudes of history. Current trends are not yet in line with existing law and suffer the consequences, but in spite of century of policies for strengthening private ownership of land there has been no real change. In fact, the peasant farmer has not actually improved his right to landholding even though the economic systems have been controlled by different forms of government.

The question before us is this: To whom does this Land ultimately belong? To a National Government or to the people who work the Land and are dependent on it for feeding their families? Cannot more of this Nationally held Land be made available to the individual farmer in the area? At least cannot some of the present time constraints be lessened to open up access to more land acquisition?

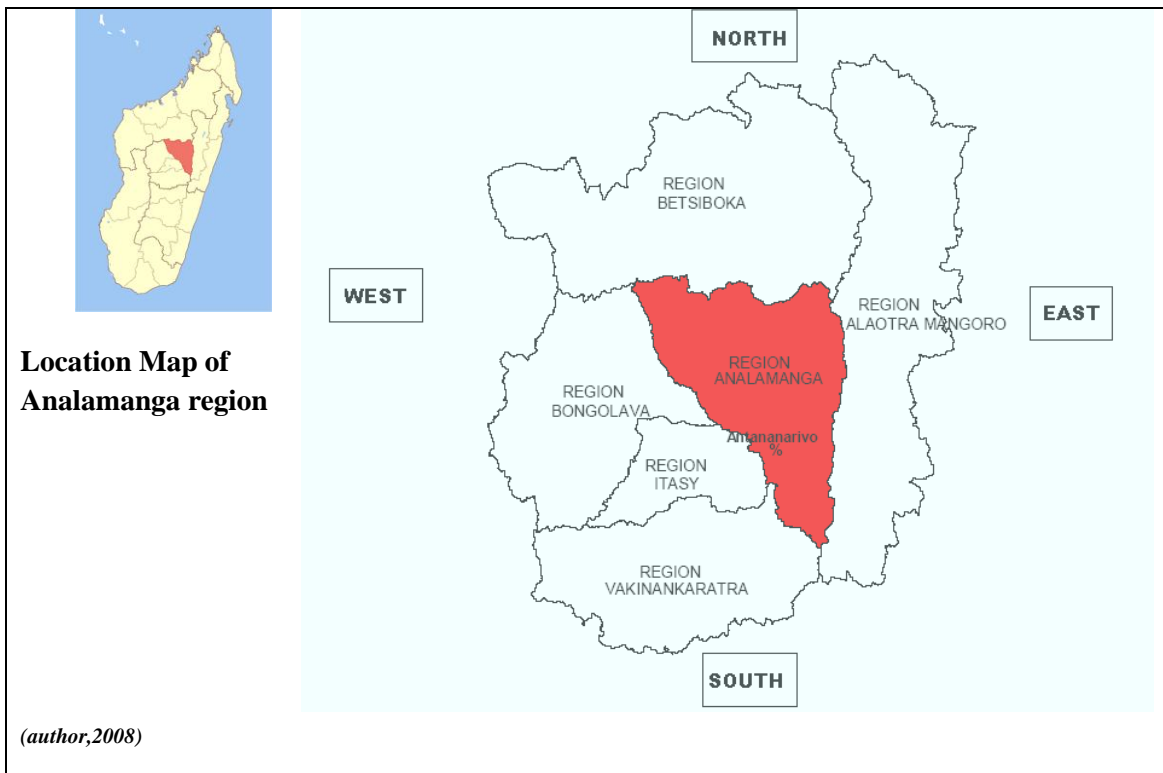
The state's failure to make adjustments is one of the reasons for contesting the primacy of the rights of ownership of land. This partly explains the peasant resistance to any form of official demarcation of large areas in the region.

The attempts to stabilize and to reform land rights in the administration are blocking the emancipation of the vast majority of the peasantry who suffer from the chronic lack land to use. This explains in part the state of poverty in rural areas.

Neither of two methods of land management has been successful in the utilization of land for the development of rural areas. But before deciding on the use of land as a sustainable development strategy, must we first approximate what an adequate farm size would be, by examining levels of income and potential for the Region?

322. Analamanga Region: mountainous landscape...

The region is made of a terrain ranging from lowland, to upland and mountains, averaging 1300 meters in altitude. The average temperature of the two seasonal periods is 10 to 38° C. The annual rainfall reaches 1300 mm occurring mainly during the hot season from November to May.



The Alaotra Mangoro region lies to the East, the Betsiboka region to the North, the two regions of Itasy and Bongolava to the West and in the South the Vakinankaratra region. The region of Analamanga includes Antananarivo the Capital covering about 17 453 square kilometers.

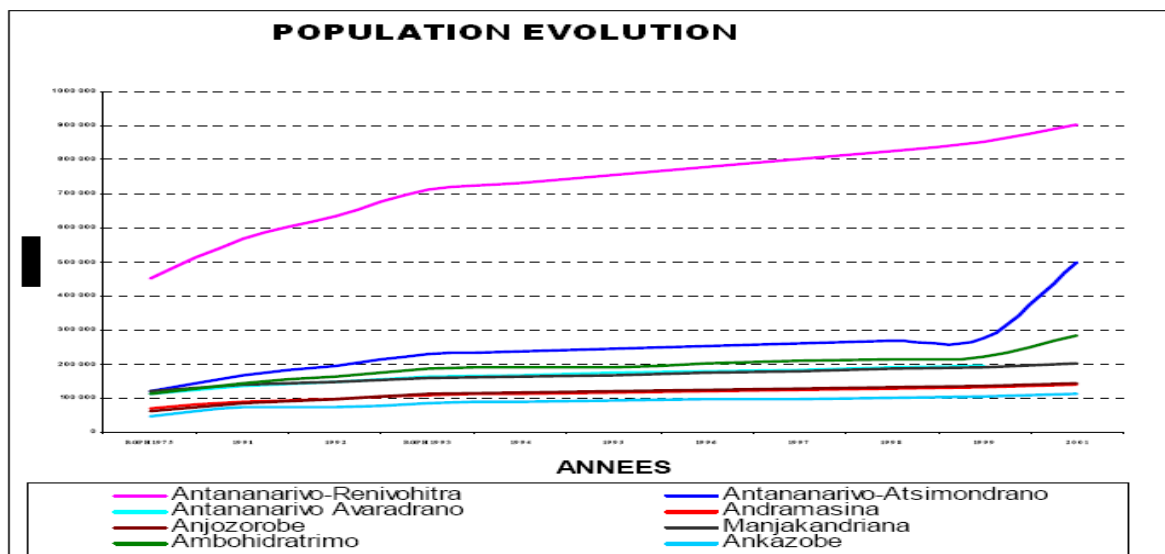
The highest concentration of people is located in the three districts surrounding the Capital. These are the districts of Antananarivo Atsimondrano, Avaradrano and Ambohidratrimo with 2.239.615 inhabitants or 75% of the Analamanga population. The area of these four districts is about 2627 square kilometers, accounting for 15% of the Region.

The lowest population density is found in the two largest districts of the Region: Anjozorobe and Ankazobe (11.294 square kilometers) representing 65% of the area of Analamanga. The amount of the population is 346.058 inhabitants about 11 % in the Region. [10]

The rest of the population is in the districts of Manjakandriana and Andramasina. The area of these two districts is about 3438 square kilometers (19%) with 385.423 inhabitants averaging 12% of the Region. The geographical distribution of population shows a wide disparity. The population is concentrated in areas near the capital that makes overcrowding. Districts that have potential but are not being farmed are the least populated.

The evolution of the population in the region is shown with the next graphic:

Graph 1: Population evolution in Analamanga



SOURCE : RGPH 1993 et DDSS- INST-AT 1999

323. SWOT analysis of the System

The analysis of Strengths, Weaknesses, Opportunities and Threats on farms summarizes the trends observed ranging from factors of production (land, labor and capital) agencies or institutions, and non -profit organization involved directly or indirectly. This table has been prepared on the basis of the opinions of farmers during our travels in-to the Commune from 2005 to 2007. The approach consists of introducing the regional development to farms’.

Table 1: Strengths, Weaknesses, Opportunities and Threats of Household in Analamanga region

PRODUCTION FACTOR		LAND			
Observed Aspects	Strengths	Weaknesses	Opportunities	Threats	Tendencies
<i>Soils potentialities and environment</i>					
1. <i>Soils</i>	. Presence of volcanic soils	. Erodability	. Partially mechanisable	. Wildfire	. Degradation by Wildfire
2. <i>Water Resources</i>	. Existence of rivers	. Poor utilization of water resource	. Annual rainfall > 1300 mm	. Problem of water rétention	. Using mulching system
<i>Type of tenure</i>					
1. <i>Owners</i>	. Acquisition by inheritance, no abandoned farm	. Subject to successoral rule	Presence of peasants for expanding area	. Declining fertility, decreasing production	. Low rate of fertilizers use
2. <i>Tenancy</i>	. Farming land low fertility by poor peasant	. Tiny surfaces	. Opportunity for landless peasant to work	. Share-cropping	. Common practice from the absentees land owners
3. <i>Share-cropping</i>	. Not frequent at region level	. Inequitable sharing	?	?	. Done clandestinely by the owners and paysants
<i>Land acquisition</i>					
1. <i>Inheritance</i>	. Over 80% for all households in the région	. Division of land with coheirs	. Continuity of farm activities, no abandoned household	. Dividing produce or land by the initial household	. Obligation to share the production with coheirs
2. <i>Buying land</i>	. Not put up for sale except in emergencies	. No formal process for land transaction	?	. Lacking a formal land market	?
3. <i>Acquisition by public domain process</i>	. Existence of large rural space	. Procedure for land acquisition by public domain rule too difficult for peasants	. Acquisition of farming the land with social acceptance	. Paperwork as obstacle to local initiative for farming	. Land conflict provoked by the 2 rules
<i>Using inputs</i>					
1. <i>Fertilizers</i>	. High productivity for land	. Intermittent supply market	. Improvement of productivity	. High prices for fertilisers Abandoning of practice for majority of peasants	. Using manure and compost . Low rate of fertilisers used
2. <i>Manure</i>	. Improving physical and biological aspect of soils	. Low rate of production at farm level	. Possibility to make compost	. Require time and investment	. Using mulching system
3. <i>Pesticides</i>	. Protection or treatment after endemic disease	. Intermittent supply market . Using low rate of pesticides	. Increasing yield	. Favoring the resistance of pests	. Using local knowledge
(author, 2008)	. Existence of new pesticides	. Dishonest of manipulating active matter	. Proximity of supply center	. Inefficiency from new pests	. Obligated to use in cases of endemic disease

Table 1(cont.):Strengths, Weaknesses, Opportunities and Threats of Household in Analamanga region

Observed Aspects	Strengths	Weaknesses	Opportunities	Threats	Tendencies
<i>1. Variety</i>	. Using local varieties having resistance to rusts and "pirculariose"	. Low yield	. No problem for finding seeds at the beginning of the campaign	. Decrease in genetic potential for seeds	. Local selection from previous harvest
<i>2. Cultural process</i>	. Mastering the local agriculture calendar	. Lack of inputs	. Existence of local knowledge	Decreasing productivity	. Using local knowledge : manure, compost
<i>3. Mastering water</i>	. Existence of traditional rules in water management	. Accentuation of lack of water shortage by climate change	. Mastering water retention	. No mastery of Land Husbandry	. Need to capturing more Water
<i>4. SRI</i>	. High productivity without agricultural inputs: fertilizers,...	. Quick abandon from the peasant	. Only on tiny areas	. Need a high input in labor	. Low number of users
PRODUCTION FACTOR	LABOR				
<i>Manpower</i>					
<i>1. Household chief</i>	. Primary level of education in majority	. Average age 50 years	. Experiential approach to the Household	. Problem of successors	. Verbal or tacite choice of inheritants
<i>2. Composition</i>	. Manpower available from poor peasant	. Children's working or landless peasant	. Temporary employment	?	. Mainly poor peasants and the rich peasant hiring permanent manpower
<i>3. Family hands</i>	. Immediately available	. More at poor peasant, lower at rich peasant	. From poor peasants	. Rural migration to the urban center	. Temporary migration to complement the financial needs for the campaign
<i>4. Agricultural salary</i>	. No permanent expenses in the salary system	. Fluctuation of wages in peak period	. Importing temporary manpower	. Difficulty of respecting the agricultural calendar	. Limited diversification
<i>Equipment</i>					
<i>1. Manual culture</i>	. Low investment for acquiring tools	. Need a lot of manpower	. Employment creation for landless peasant	. Difficulty to adapt in changing context	. No change for poor peasants
<i>2. Coupling system</i>	. Investment for acquiring plough, harrow and carts	. Overequiped for actual farmers	. Maybe be improved by increasing area	. Fluctuation of price of equipment	. Used only on farming works and transportation
<i>3. Mechanized system</i>	. Improve productivity of labor	. Need a large investment	. Area available for mechanizable farming	. Process to acquire public domain too difficult and long	. No projects for investment in heavy equipment
<i>(author, 2008)</i>					

Table 1(concluded):Strengths, Weaknesses, Opportunities and Threats of Household in Analamanga region

PRODUCTION FACTOR		CAPITAL			
Observed Aspects	Strengths	Weaknesses	Opportunities	Threats	Tendencies
<i>Investment</i>	. New households can afford the investment	. There are risks related to the rice's price	. Investment in reforestation	. Long-term investment	. Failure to invest financially due to risks factors
<i>Self-financing</i>	. No use of the credit system for those who have a finances available at the starting out	. Very few can afford the ongoing investment	. Transfer of money from families living in urban centers	. Farmers focused to borrow with usurious rates or crop before harvest	. Financial gap at the beginning of growing season
<i>Micro credit</i>	. Formalization of the procedures	. Unavailable in most palces . No collateral for poor farmers	?	. Interest rates too high	. Introduction of new system such as credit operation has low rate on input for rice cultivation
<i>Rural bank</i>	. Existence of medium-term loan with bank	. Bank products do not take into account natural hazards	. Crop insurance to reduce risks	. One bank operating in the Region	. Waiting for this option
PRODUCTION FACTOR		OTHERS			
<i>Institutional organisation</i>					
<i>1. Peasants ' Organizations</i>	. More option for guarantee to mutual financial institutions	. Farmers look only towards the individual interests	. Constitutes leverage to address the lack of funding the growing season	. Most of them are not functional	. Family preference for some organizations in order to have the support of a project.
<i>2. Non Government Organism (NGO)</i>	. Presence of several NGOs working in rural development	. Lack of funding sources	. Training in Land husbandry, farm management and ownership of land	. Risk of dissolution	. More of NGO are dormant
<i>3. Public service</i>	. Presence of Agricultural Service Centers at the district level	. Initiating the services	. May replace failing NGOs	. Paid services	?
<i>4. Agricultural Center for Training by Confessional</i>	. Involvement from the believers in the congregation	. Exclusive participants	. Presence in rural areas	. Lack of funding sources	. Development of partnership with the government, people of good will, and private and civil society
<i>(author, 2008)</i>					

The following table summarizes the results of the Mangamila area according to types [13]

Table 2: Economic results in Mangamila

Income and Area in Mangamila			
	Type I	Type II	Type III
Rice field area in ares	90	44	26
Tanety area in ares	70	65	60
Total area in ares	160	109	86
Income from rice production in ariary	439,023	230,456	133,756
Income from tanety in ariary	598,200	350,200	346,240
Total income in ariary	1,037,223	580,656	479,996

(author, 2008)

The results obtained by Bart Minten et al, in 2006, in the highlands gives, according to income, the size of farms from the poorest quintile to the richest[3].The income currency, in Ariary, is equivalent of 1900 Ar for 1 US Dollar and *are* is the equivalent of 100 square meter)

Table 3: Economic results on the Highlands

Income and Area on Highlands					
	Q1	Q2	Q3	Q4	Q5
Annual Income per person	28,680	54,895	86,552	128,144	334,275
Total rice field in ares	39.46	37.35	50.83	59.1	72.26
Household in ares	76.49	82.5	135.18	160.28	161.76
Person in Household	8.06	8.14	7.04	6.71	4.86
Total Income in ariary per quintile	231,161	446,845	609,326	859,846	1,624,577

(author, 2008)

The risks incurred by the farmers regarding intensification of the agricultural production are correlated by the physical environment of their land holdings. But the size of the farms remains the major constraint for a better profit from the agriculture.

Despite the physical aspect of the Analamanga region, it presents favorable economic and social environment occurred for development. The two contrasts: crowded area with pressure land and less populated of large rural areas, are also an asset that the region has in terms of human presence, level of education and know how. However, a formulation of policy for increasing production through making more land available area household is needed. Is opening up more idle area for farming what is needed?

The evolution of the agrarian system in the region must also take into account the erosion and land degradation due to wild fires. In this regard, the human presence lobbies against destructive acts. Indeed, the loss in terms of rice production is the main problem of the Region in seeking food self-sufficiency.

Finally, the agro system in the Analamanga region, formed by the features of Central Highlands of Madagascar, is currently in a critical phase due to population growth on the one hand and still an ongoing blocking of extension of land especially for rice on the other hand. This is why I argue for optimizing farm holdings.

324. Household optimization

By definition, optimization is seeking the best values of a function that can improve an initial state to a desired end. This improvement must influence the behavior of variables for a better result.

Primarily, the intention of this optimization is to consider the three objectives for rural development namely: 1) agricultural growth, 2) poverty reduction, and 3) the protection of the Environment. [17]

A measure of growth is explained by economic theories based on indicators of productivity. The performance of agriculture in the highlands and the region of Analamanga, based on rice, is up to present considered very low.

A sense of social poverty is expressed by farmers, according to our interviews, as a material shortage that cannot be overcome. The solution to the problem is to deal with land acquisition first and then to the equipment. This is confirmed by Bart et al, 2006, which indicates [4] “that 22 to 28% consider access to land as an obstacle to agricultural production and 33 to 40% for equipment”. Logic supports the predisposition of land before equipment, otherwise why don't farmers use rent of equipment and buy through existing mutual financial institutions. Even farmers who have an acceptable area for the option of acquiring the equipment don't do it. Furthermore the landless are still left with no solution.

And environmental protection is akin to a long-term or medium term as an investment. As Bart et al, 2006, say that “the approach to land conservation must take account of the most disadvantaged and economically vulnerable land” [4]. For example, this farming “tanety” without environmental protection methods is “the main cause of land degradation in Moriandro in settlements of villages that are not protected” [1]

To be successful at the social level, this optimization approach must be inclusive in relation to vulnerable groups and comprehensive for better social acceptance of innovations introduced by structural change. This structural change will be the engine driving increased activities.

The rural society in the highlands, particularly in the Analamanga region, operates in a context of social construction. This dynamic was working for a time, but presently, neither farms nor construction is observable.

The conceptual framework for optimization is based mainly on data, space and economic performance. It should be marked by the following.

Whatever the type used to describe the state of the peasantry of the Highlands, including the Analamanga region, the correlation of income / area of farms remains a constant that doesn't discriminate regardless financial status, social rank or status, of age or sex. In short, diversity supports the results of this social economic analysis.

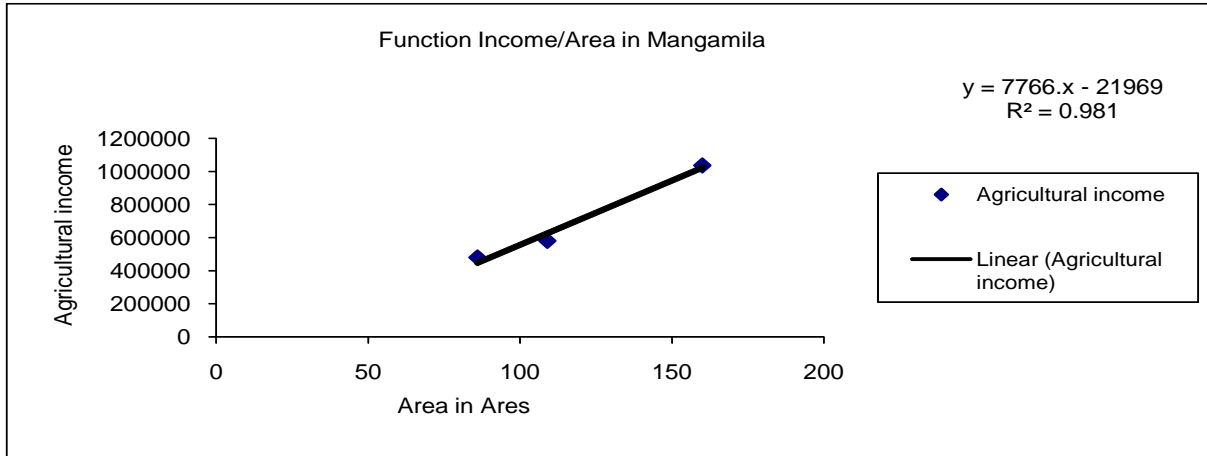
The context of economic and social holdings in the Analamanga region is clearly visible from population density and the diversity of farms size. It can adapt to results obtained in relation to the geomorphology of the land and especially the farming methods in progress. The current operators can reach their optimum by different means: local management of land, extension of proximity, purchase and / or barter ... And the landless, a favorable environment could hope to have their own land.

This optimization for economic viability does not depend only on land acquisition but also on creating a favorable environment for the use of natural resources and especially land with adequate infrastructure. Given this objective in relation to income, what is the area which results in two or three-fold increase of the current maximum income?

The social meaning of the farmers' attachment to land remains the most sensitive aspect for the development. Through discussions in the region, it appears that the economic plight of the participants is more opens for possibility of changes. The most sensitive districts are those with greater density and saturated land: Manjakandriana, Andramasina, and the two districts on the outskirts of the Capital Antananarivo Avaradrano and Atsimondrano. Social acceptance is finally acquired only by the consultation on the land utilization by concerned. Whenever innovation is suggested as a structural change, caution is necessary to understand and to deal the reactions. The change must never be too sudden, and should include voluntary learning and with a detailed analysis of actions and reactions for experiments of social engineering. This gives us finally, the social dimension of this approach for new economic and social development in the region.

For Mangamila, this chart is based on data in table 2 and a linear adjustment that has an acceptable correlation coefficient of R^2 as 0,981. The three types characterized the level of their income, the area of their rice field and tanety.

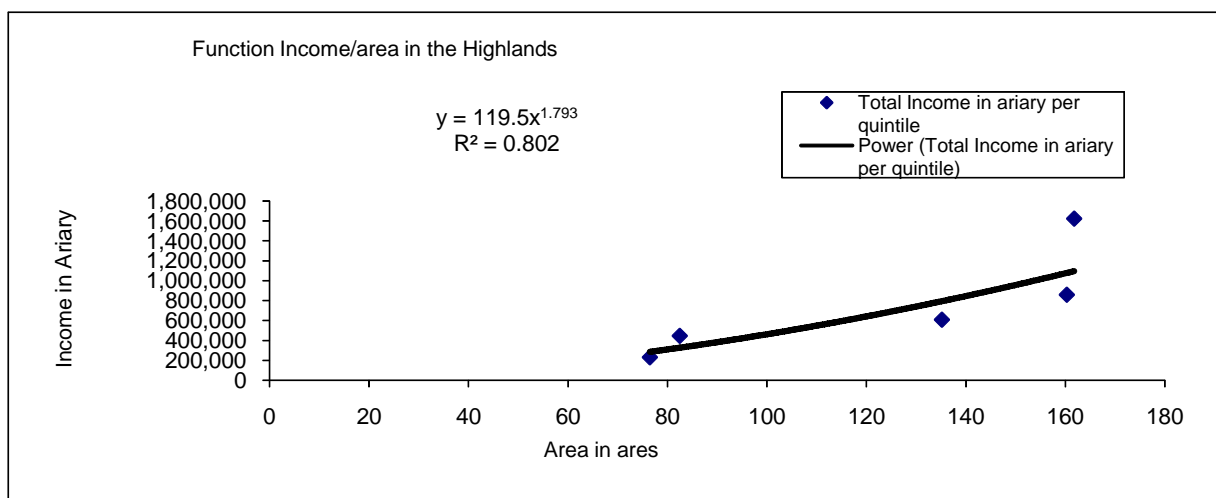
Graph 2: Function Income/area in Mangamila



author, 2008

The agro system in the Highlands has a power function with a correlation coefficient R^2 of 0.8024, which is an acceptable value compared to other adjustments. It is realistic to reflect on the two extremes observed. There is also in the typology three levels corresponding to the five quintiles. The two poor quintiles correspond to the type III in relation to the area and the two richest quintile lines with the type I area. Quintiles are only a subjective form of ranking based the equal division of five parts of the whole observations.

Graph 3: Function Income/area in Highlands



author, 2008

From these functions, size of farms is given below for the two systems.

Table 4: Recapitulation of Optimized Household

Recapitulation : Function Income/Area		
	<u>Mangamila</u>	<u>Highlands</u>
Type of function	linear	power
Fonction	$y=7766.1x-219695$	$y=119.58x^{1.7937}$
R ²	0.981	0.8024
Hypothesis 1 : Doubling the Income		
Income en Ariary	2,110,135	3,278,387
Area in ares	300	299
Hypothesis 2: Tripling the Income		
Income in Ariary	3,119,728	4,880,243
Area in ares	430	372

(author,2008)

For the first hypothesis, the results are similar. In hypothesis 2, the power function has the effect of reducing the fluctuation of the last two richest quintiles. This can also have a dampening effect on the outcome but we can use a result which would be the average of both.

The following table shows the dollar equivalent per day of income after optimization.

Table 5: Comparison of the economic results in US dollars

	Initial income in Ariary	Optimized Area en ares	Income after optimization	Equivalent in USD \$ 1 = 1900 Ar	
				total	per day
Hypothesis 1 :					
Mangamila	1,037,223	300	2,110,135	1,111	3
Highlands	1,624,377	299	3,278,387	1,725	5
Hypothesis 2 :					
Mangamila	1,037,223	430	3,119,728	1,642	4
Highlands	1,624,377	372	4,880,243	2,569	7

(author,2008)

Most important in this optimization is the structural change relating to the land. The ratio of increase in surface area compared to the current surface area location is very large. In the second place, this expansion in surface involves an increase in the manpower needs. This need can be fulfilled by hired labor or an increase in the use of farm equipment. This option can be encouraged by a help in the form of

subsidies for new farmers. Support could be provided for the first plowings and the antierosive systems by different projects.

The Region and the communes will have to work together on this new step. Their respective roles are defined in the statutory texts. The practice and the exercise of the rights of territorial collectivities will have to cooperate and be focused on this way of development.

Based on the experiments of migration in other geographical areas, the development for a new farm is five years. The lacks of facilities for antierosive systems together with the maintenance of soil fertility are the limiting factors. This applies especially to new settlement areas within the region. Rational and appropriate use of new lands in certain communes will need regrouping and prudent management.

This optimization aims at a better use of available rural areas with the addition of protecting the environment. The principle of free will is also required to keep this experiential and voluntary development.

This land access movement also incorporates free will and lifestyle choices. The acquisition of land can be done locally at the commune level where possible.

From the Regional Development Plan, the creation of Agricultural Investment Area is an effort to balance development in the region. It is important that the choice remains for a concerted action for development.

It's viewed from the RDP insightfully to resolve unemployment within the Capital city by creating jobs in newly opened areas for agriculture [11]. This implementation has begun. Optimization could help the managers at the region improve their approach for land most suitable for agriculture.

Sustainability at the farm level in the region is dictated by two complementary criteria; the rate of population growth and the viability of farms.

For the first criterion, the region shows a peak migration in 2003 especially in the capital. The rate of population growth was 2 to 3%. For an agricultural growth in the region at least 3% is necessary. This shows the need for a transition to a more efficient agriculture through the combination of improving productivity and increased land for farming.

This systemic approach to understanding the peasantry of the Central Highlands of Madagascar, including Analamanga region, suggests optimization as a reliable approach. The function $\text{Income} / \text{Area}$ of farms from both systems have similar results though were studied separately.

The parity between town and country is largely in favor of the rural area meeting the objectives of the development triangle. Using new methods in environmental protection is a must for all future farming.

This paper contends that structural change for optimization remains the main engine to reduce rural poverty. Optimization should be the basis for land management and rural planning and for considerations of organizational implementation.

33. Discussion

Our starting point is the economic reality of the rural world with its opportunities and challenges. Income is the best indicator to be used at all levels of analysis for the economic aspects. It's use is easily verifiable and the results are more reliable for comparison with conventional methods of evaluation.

Thus, this discussion suggests that economic realism taking in account in a social relationship offers the best basis for rural progress in the region.

331. Economic realism of rural world

According to Gallopin "Adequate population growth relative to production supported by a natural environment is a factor for sustainable management"[7]. But finding the balance in practical terms is another problem.

For the Analamanga region these two dynamics together with the present environment largely meet Gallopin's goal of sustainable management. The question is: how can agricultural growth be enhanced given the pressures of the expansion of the city and population growth?

Based on the agrarian system described earlier, the current situation is a reality which translates the result of the actions of people who live with their past, their condition, and their projects.

The trends of this system are to be considered in their entirety move from present state to a new social economic status. This move leads us to a deeper understanding in why the realities that have led to the peasant perception. The dynamics formed by the rice and the option of diversification has been a factor of increased wealth for a long time in the region for several reasons.

Antananarivo by its economic, social and administrative function is the main area to feed. The suburban space with its growth of its population of dwellings is an ideal location for processing the raw products of agriculture. Finally, rural peripheral areas offer support through agricultural production toward the total food needs of the region.

But the system of subsistence economy, for the farmers in the region, will only results in further poverty if no changes are made in their operations. Rural incomes have peaked at the current standard of living and peasants express disinterest in new agricultural activities because of limited option for diversification.

A challenge for sustainability is a necessity for the operation of “tanety” for increasing revenues. However, such land is subject to erosion by the anthropogenic condition and the water and devastating bushfires. The lacking of methods of land protection and sloping terrain combine for serious erosion of soil.

Given the current landscape the future sustainability of this production system is precarious. Continued farming of tanety, using the present methods, would increase the rate of erosion and also increase costs of maintaining and rehabilitating irrigation systems located downstream.

332. Perspectives and Economic Issues

The tradition of rice in the Analamanga region helped it to adopt the new crop of rain-fed rice. Indeed, since research has led to the practice of raising rain-fed rice, the region has already shown significant increase in rice production.

But this opportunity is hindered by the land acquisition problem. Additional land for agriculture is not being developed quickly enough. Even so, the practitioners of rain-fed rice continue to work with new methods using results of research from the FOFIFA, which is advocating this method. Problems persist primarily in the maintenance of soil fertility and in protecting the soil against water erosion.

This need for increasing rice production is shown by the existence of a shortage of ninety thousand tons per annum for the region. With learning and experience, farmers can master the rain-fed agriculture in a specified period of time through adapting technologies.

This system of rice production is an asset for the region in its development but appropriate regulations are required to protect the environment.

Two complementary technological steps need to be implemented, namely: 1) the mastery of increased water retention 2) the maintenance of soil fertility. [13]

Present tendencies to use “tanety” can only continue if the right actions are taken in managing soil fertility and reducing water erosion. The constraints are technical, financial and physical.

In fact, farmers do not have the technology to maintain soil fertility, though they experience of the loss of fertility on their farms. Field may fallow lie until a solution is found sometimes or will be abandoned completely.

For the majority of peasants investing in agricultural fertilizers remains unaffordable. But experiments show that land using mulch and soil cover retains water. But time is required to get and transport the mulch. Some have also adopted the production of compost at the farm level and this practice should become widespread. The crucial problem with rain-fed agriculture is the lack of water. This lack can be remedied by irrigation if terrain conditions are favorable. There are more areas that could be irrigated in the region through various processes of securing water.

Increasing productivity of labor is a consequence of the optimization of agricultural holdings in the region. According to Eric Roose, [16] it takes an average 700 to 1200 men/day/ha to construct antierosive system and for 50 men/day/ha to maintain the hedgerows. Endogenous development, based on the dynamic of peasants committed to a structural change, will also be a movement directed towards a change in land ownership and poverty reduction in rural areas.

Indeed, this improvement in labor productivity is stressed repeatedly at various regional workshops and consultations as a necessity for higher farm income. The shortage of equipment is second only to the land problem as a major obstacle to increase production. Two possibilities could meet this need: 1) the acquisition by individual means through medium-term loans from banks, 2) funding for the rental of mechanized units with a learning system and maintenance support.

As Population as increased, especially rural (2.8 to 3%) so too agricultural growth has steadily increased since the 1990s [6]. During this time, the main idea has been to increase rice production by intensification.

The measure of agricultural growth in agricultural production is oriented toward rice production in the first place [5]. This trend was expressed in the rural income / farm area. It is also has been a political and strategic issue.

Further, our analysis on the cost of imports shows that growing rice within the region benefits the peasants would be widely convincing to adopt this speculation. With self-sufficiency in rice, other industries will consider investing for development in the region. Without being too optimistic, agricultural growth will support economic growth contributing of other sectors such as tourism and manufactures.

333. *Socio cultural dynamic*

This structural change also affects the social aspects of rural life in the Analamanga region. A transition phase will be introduced in the form of campaign and political preference to the upland farmers. This option will also include action planning of the land utilization.

This restructuring of land needs the approval of social and administrative units and by the community. In fact, a social reconstruction of the future landscape can be the force for the development of potential land. The solution lies in opening lands for the achievement economic goals and prosperity for rural farmers.

Although this option is difficult, it is the primary hope for the economic viability of the region.

The pyramid structure of rural society still governs in its social aspect. The translation of this structural change leads to a rethinking of the rural region in terms of a peasant economy. The peasants' cultural attachment to land is sufficiently well-known by rural stakeholders. The key points of the current standards in rural areas will respected the process of change.

The increase of land for poor farmers would bring political and social alternatives changing negative attitudes. Improvements of living conditions of the poor should result in lessening the gap between them and the more wealthy rural groups.

Actual implementation of optimization calls for political decisions. Problems will continue to need to be addressed in refining future strategies. Rethinking of social relations for the region should come from the proponents and agents of rural development.

Surely there is an advantage for the population near the sources of information. Of course outlying areas and farms, where information and training is less available, pose a problem for a well balanced regional development.

Achieving extensive optimization for increased rice production offers benefits in other areas as well. The questions, however, remain. How can this optimization be realized? In what location will be it implemented? How much interest do local farmers have for this?

Answers to these questions should come through the process of rural development. Environmental management studies are developing National strategies for the region. Unfortunately this strategy has not been included in the Letter of Land Policy, nor the National Policy for Rural Development.

There are movements toward space management optimization, but there has been difficulty linking up policies between the Regional Zoning Plan and Local Communal Development Plans. Communal Development Plans do not take into account the management of space [8].

This suggests that Local Authorities must do more to accept the optimization process through deliberate consultative practices. The dynamics of land management should aid in an improved economy and environmental gains.

4. Conclusion

There is a direct relationship between structural changes in land ownership and the management on the one hand and the protection of the environment on the other. What needs to come first and foremost for sustainable development is the change in land management policy.

Optimization of farm land will result in a double effect: reduction of rural poverty using existing natural resources and increasing sources of employment for rural areas. These effects will be accounted for in terms of economic growth which will break the current framework of poverty mainly by the rural population.

The hypotheses can be tested and the answer found in the definition of the optimal farm size. Structural change is the key to reduce rural poverty as we now know it. Mainstreaming the fight for poverty reduction implies that there is a shared responsibility from the National Government and the local farmers. The government needs to facilitate greater access to land, and farmers need to adopt better management practices, namely maintaining, even improving soil fertility and protecting against soil erosion.

Seeing then that accessing increased tracts of land is the key to reduction of rural poverty, what can be done to make such access more transparent and less time consuming? The problem is the tension, yes, even contradiction between customary law and the "domanial right". It is the reason now-idle land remains idle thus blocking extensification with resulting increased production.

One suggestion for improving the land administration is to place the land offices to the communes. This remains a responsibility for local authorities.

Present statutes of communes and regions, state that the managers at the head of these entities have the difficult task of socio-economic development of their respective constituencies.

Communes must develop policies to promote development by managing space. The development advocated in the actual documents is mostly for infrastructure such as roads, bridges, canals and water systems. Funding needs to be found, the town-counselors must work together on this.

To provide this change in management for agricultural and economic growth there must be a new mind-set and the will to struggle. What are the legislation needs? What National policies should be adopted?

Positivism is an attitude of the peasants in their hard work to develop agricultural areas. The process of social construction already present constitutes an asset to the development of rural areas. I believe also the peasant farmers are ready for the changes that will bring development to the rural areas.

This study proposes the need to upscale the reasoning with the regard to land unit management through the communes and the region in order to articulate and to coordinate actions for sustainable development.

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