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Results of a project on development of agro-forestry systems for food security in Carrefour region, Republic of Haiti

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Abstract: Haity has a notable problem of food security, 48% of people have not sufficient food availability, food prices has doubled from 1980 and 1990 and further increased 5 times between 1991 and 2000. Water availability and quality is another problems to be added to food insufficiency.
Food deficiency is mitigated by natural food resources in rural areas where many different species are cultivated together but it can be extreme in the towns. Agricultural systems are not efficient and, at the same time, enhance soil and genetic erosion.
A development project has been implemented to increase food security over the long term in the geographical area of Carrefour rural area, this comprises a research aimed to increase national food production introducing complex agro-forestry systems.
The project has investigated problems and solutions, actions have been started to increase food production, including agronomic training of local farmers, organization of small farmers including legal protection on land tenure, introduction of low input modern agroforestry systems that can diversify food production through the year and reduce soil and genetic erosion.
After these results, an intervention project has been approved and funded by EU, then delayed due to the recent civil war, finally it is giving positive results now.
The same approach used for this project can be spread in the rest of the Republic of Haiti and, hopefully, to other world regions that have similar problems.

Keywords: food production, crop diversification, complex systems

Introduction

Food security means to guarantee sufficient quality and quantity of foods to populations, this is a main problem over large areas of the world. Haiti is the poorest country in the Americas, and it has alimentary deficiency. The 48% of Haiti people (3.8 million) is under the level of poverty and has not food enough. Poverty is the main cause of food deficiency, in fact 64.3% of the incomes rural families has to be expended to buy foods, the price of basic foods is doubled from 1980 to 1990, and increased other 5 times between 1991 and 2000. In the same period incomes remained roughly the same.

International aids and returns form migrants sustain the capacity to buy foods, but this system is obviously fragile and dependent.

Also food quality is poor because of little availability of drinkable water (available to 53% people of the capital town and to 45% people of rural areas) and lack of facilities for food conservation (refrigerators and electricity are present in just 10.5% of rural houses). There are not controls of food hygiene and consequently parasites and intestinal diseases are quite common (FAO/PAM 2004).

Up to 23% of children less than 5 years old has important reduction of growth due to chronic malnutrition, 5% shows dangerous malnutrition, 17% is underweight. The rate of insufficient nutrition in the rural areas (45%) is twice what it is in towns (15% in the capital). Food deficiency and uncertainty concerns 3.8 million people, that is 550,000 families, 74% of these are in rural areas (2.8 million people, 405,000 families), 15% in the capital town (575,000 people, 85,000 families) and 11% in the other towns (420,000 people, 60,000 families). Food deficiency is mitigated by natural food resources in rural areas where many different species are cultivated together (Watters, 1971; Ha et al., 1992) but it can be extreme in the towns.

A development project has been implemented to increase food security in the geographical area of Carrefour rural area, this comprises a research that has outlined an approach aimed to increase the national food production over the long term introducing complex agro-forestry systems (FAO., 1977; Pardini 2005; 2007). The research has been done within the intervention project ("Improvement of food security in Haiti" funded by EU within the fund line B7-201 Food Security.

Materials and methods

The *Carrefour* Province is in the *Departement de l'Ouest* of the Republic of Haiti, this area is classified prioritary for interventions on food security. The economy of the region is based on self-subsistence agriculture, sometime associated with family run livestock rearing with very little number of heads.

Carrefour is mainly a mountainous area, with enhanced seasonal differences of the climate. The annual rainfall (figure 1) is 1500 mm in the average of the area, but rainfalls are seasonal and they are frequently concentrated in short and heavy rainstorms (10–100 mm/h) that increase further the soil erosion that is favored also by steepy slopes (Conklin, 1963).

The project started with preliminary data collection about territory (slope and aspect, soil kind, groundwater availability), agronomy (characteristics of farm soils, crops, farming management, presence of trees associated to crops, tree plantations), livestock (animal species, livestock management, number of heads per family) and land suitability.

These preliminary data have been collected and elaborated with participative methodology, by interviews to farmers, technical associations, governmental and not governmental organizations, local institutions, all that work in the area of food security and agricultural production at a local, regional and national level.

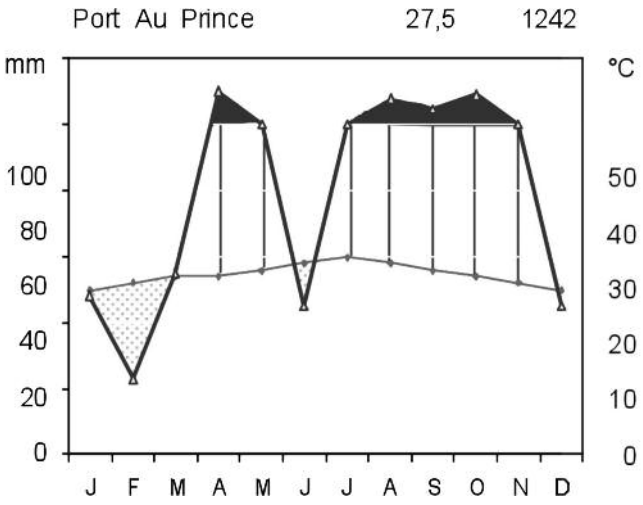

Figure 1 – Monthly rainfall and temperature in Port au Prince (graphic method by Walter et al.*, 1975)*

Results and discussion

Problems and possible *solutions* have been identified. On this base a *strategy* of intervention has been outlined and this is now under way, as second phase of the project, in the whole area.

The problems

The fundamental problem that causes low food security resulted to be an agricultural production too little for sale and even insufficient to guarantee food availability for families. This basic problem, in turn, resulted to be caused by several problems (figure 2).

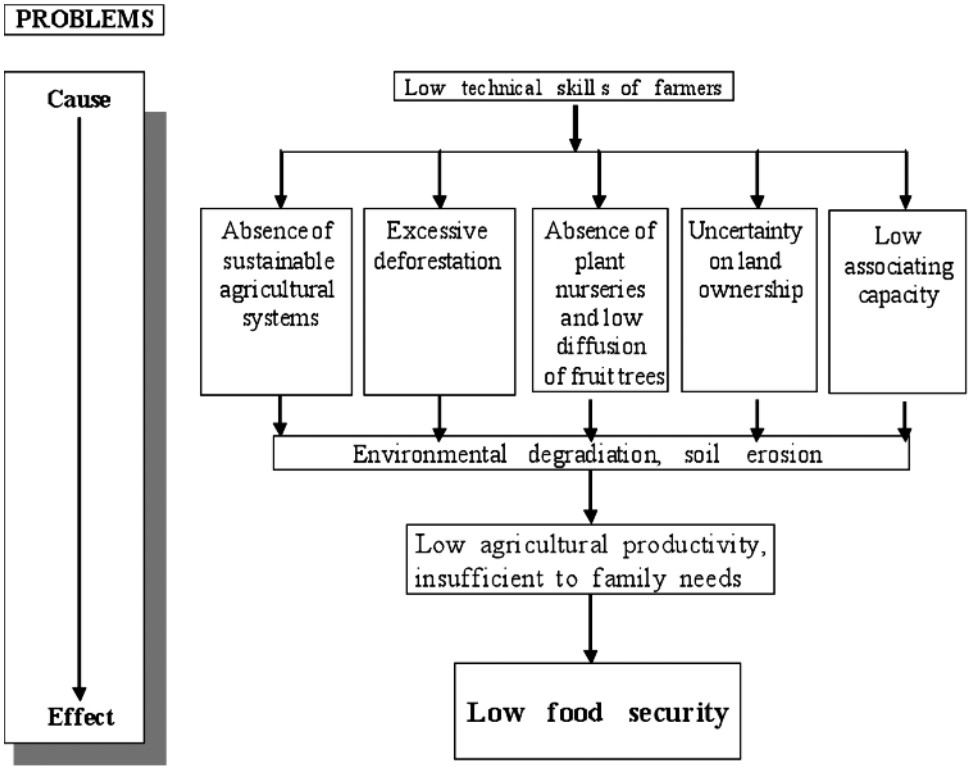

Figure 2 – Problems dendrogram in the agro-forestry sector. From above to below, the basic problems (causes) that originate other problems (effects)

Low technical knowledge of local farmers

Farmers have too little knowledge of crop management, soil fertilization, complexity of the farming systems. *Crop management* should be aimed to both high yields and soil conservation, instead the excessive forest clearing favors soil erosion and reduction of agronomic fertility, as a consequence local people passed in two decades from self-subsistence to high risk of food security. *Soil fertilization* should be based on organic resources available in place, consequently sustainable and cheap resources, instead expensive synthetic fertilizers are imported. The *complexity of farming systems* should be enhanced (agro-silvo-pastoral systems, agro-forestry systems) to reduce seasonal and annual variations of productivity, periods with excessive or too little availability of foods, sensibility to plant parasites and diseases, environmental risks, instead the farming systems are excessively simple and always based on few crops just rarely associated with few fruit trees.

The insufficient technical knowledge cause in turn 5 kinds of secondary problems, from agronomic to social.

Absence of sustainable agricultural systems

Self-subsistence agriculture is the main activity in Haiti but any wise tradition of these practices is lost. In fact such good traditional agronomic practices have been saved in the other countries of Latin America over generations, but they were lost in Haiti due to rapid extermination of the natives that was almost complete already in 1600. With this all the empirical knowledge that is normally sufficient to keep a native little population in balance with its environment were lost and replaced with methods based on modern agriculture which is not locally sustainable at the present conditions.

Excessive deforestation

Most of Haiti land was covered by forest, the natives remember that all mountains were still covered of forests up to 40 years ago. It has been esteemed that 30% of the country was still forested in 1930, forests were just 10% in 1970 and, nowadays, different esteems attest for 1,4% to 2% of forest land. The rapid forest clearing has been caused by timber exports and local fuel wood needs. 90% of the energy available in the country is from wood still at present, and forest destruction has increased at the same rate of charcoal demand in towns. These excessive demand of wood have been important to cause environmental degradation all over the Republic. Forest clearing is always complete and no trees are left even in plots on steepy slopes, this and the heavy rainfall have caused the almost complete erosion of superficial fertile soil and exposing the rock in less than one century.

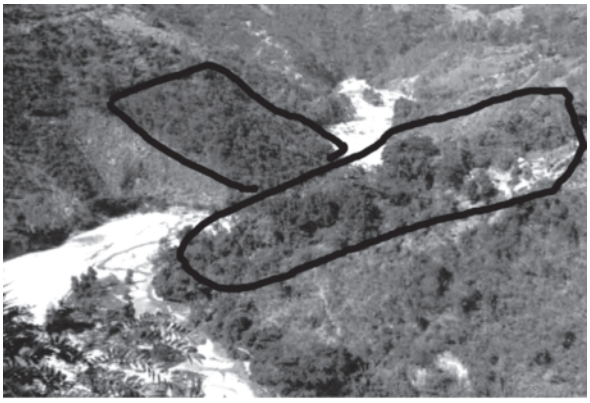

Figure 3 - Haiti, Province of Carrefour, Riviere Froide. The plots owned by the farmer (encircled black) have higher tree cover than nearby rented plots

Absence of plant nurseries and low diffusion of fruit trees

Tree seedlings are not easily available, especially regarding fruit trees that would be very suitable to this land and to the needs of its population. Formerly the Ministry of agriculture was taking care of production and distribution of such fruit tree seedlings, but this function cannot be carried on further for lack of monetary resources. The consequence is complete absence of plant nurseries and lack of tree plantations. In turn there is soil erosion, too little crop diversification, little resilience to climate changes an to market fluctuations. Farmers have shown interest to reintroduce trees only if these are fruit species that give incomes or food in the middle term.

Uncertainity on land ownership

Most lands are rented or shared and location contracts are not written, the owner can ask its land back after an improvement is done by the farmer, example after that fruit trees have been planted or after that practices have been done to limit soil erosion. Consequently farmers have little or no interest to maintain soil fertility in rented lands whose availability is not guaranteed for the next year, in this condition farmers manage well the few lands they own but do not care of the many others (figure 3). The farmers transfer organic matter to their home gardens taking it from rented plots, as a consequence soil fertility of most lands (rented) shifts to the few lands owned directly by the farmer, and the same trend is common on regard of tree felling.

Low associating capacity

Very few farmers associations have legal status. On the contrary, associations

could be very important for the development of the region. In fact the existing associations favor extension of good technical results, produce marketing and trading, mutual help of poor farmers. Such associations should be encouraged and supported.

The whole of these several problems causes in turn *Environmental degradation, low agricultural productivity* and low food security as shown in the dendrogram of problems.

The solutions

The analysis of the problems and participative talks with local people have brought to outline some possible solutions (figure 4):

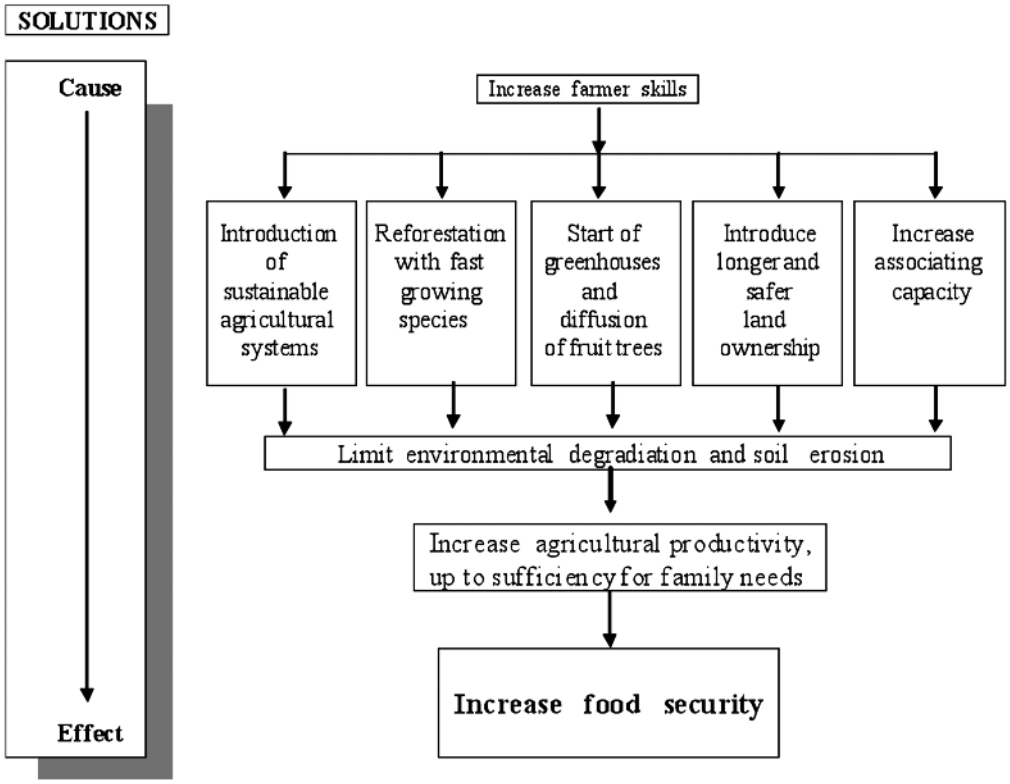

Figure 4 – Dendrogram of possible solutions for the agro-forestry sector. From above to below, the actions (causes) that can originate solutions (effects)

Increase farmer's technical knowledge

Techniques of agronomy and animal rearing will be thought to farmers by professional training and demonstrative plots showing agro-silvo-pastoral systems. A training course has been done to 54 farmers on soil management to limit erosion and on agro-silvo-pastoral farming systems. An exam at the end of the course has been passed by 91% of these initial farmers. All farmers that passed the exam have received plants and tools to apply in their plots what they have learnt during the course, so that their farms became demonstrative plots on agro-forestry techniques. The farmers have been supported in planning the new management for their plots, however this has been differentiated according to soil kind and topography, a very common technique introduced is the building of terraces of both green plants and rocks, these will reduce highly soil erosion and the project intends to spread them in all the country. The terraces are done with collective work of all farmers that participate the project, with self-organized work-turns, until the plots of all participants have been set for the new management. The initial 54 farmers should later on teach to another group of farmers.

Introduction of sustainable agricultural systems

Complex agro-silvo-pastoral systems will be realized associating 3 layers of plants, herbs, shrubs, trees. All plants introduced have high and immediate utility for the farmer as food, fuel wood, forage or other products for the market. Plants diversification is favored to reduce the negative effects of climate change, seasonal variations, pests diffusion, market fluctuations, and in order to stabilize the seasonal availability of food. The presence of many kinds of plants will favor also the rearing of little animals. Moreover the presence of 3 plant layers will increase soil cover and reduce soil erosion. The proposed agro-forestry system is a copy of a natural system but with native plants replaced by plants more useful to man and adapted to the same ecological environment like fruit trees, vegetables, medicinal plants (National Academy of Sciences, 1977).

Reforestation

Physical and social characteristics interact to make Haiti a very complex environment in which to work, positive results of any intervention are directly linked to the real and effective introduction of new and conservatory techniques by the local farmers, this application, in turn, depends on the perception of benefits in the short term. For this reason the possible benefits are explained

theoretically and shown in demonstrative plots. Visibility of rapid benefits has been seek introducing multipurpose plants, like *Leucaena leucocephala* a rapid growing shrub or tree that limits soil erosion, increases soil fertility with N-fixation, gives good forage, can be associate with many herbaceous crops and, at he end of the cycle gives timber and fuel wood.

The plots done on the land of the initial 54 farmers are now being evaluated collegially by farmers, personnel of the project and technicians of local institutions.

Building of plant nurseries and diffusion of fruit tree

Local associations of farmers have started 5 plant nurseries that will supply initially the demand of fruit and other tree plants that we want to introduce in agro-forestry systems. The plants are given as "credit in kind" and the farmers have to give back the same number increased of 20%, in periods of time that change according to the growing speed of the different species. The increased number will be useful also to replace eventual dead plants. Farmers are trained also in plant multiplication.

The associations of farmers take charge to control the restitution of plants within the given limit of time, this is possible as the associations help their members and consequently have social control on their work. This system can also give credits to the member farmers in proportion to hours they work for the group of farmers, this means that a number of hours of job given to the association can be paid with plants or animals. The correspondence of working hours and number of plants is fixed within each association with participative talks.

Introduction of longer and safer land tenure

The agro-forestry techniques that the project wants to spread require lot of work but they give many results over the medium and long term, consequently thy are convenient for only for the farmers that own the land or have long time rented contracts legally registered. In fact the farmers shall not work if there is not a written rental contract as the plots can be claimed back from the owner or the rental can be increased after improved. In fact improvements are actually present only in plots whose rental agreement is written and lasts at least ten years. For this reason the project is implementing the introduction of written contracts for 10-12 years rental and with supervision of project members and farmers associations in order to increase the level of land tenure.

Increase associating capacity

The strategy of the project is to improve and valorize local human resources by coordination and self-organization by the members of local communities. Periodical meetings of association members favor knowledge about the aims and potentialities of the project, the same meetings permit to start a system of self analysis about the problems and the needs of local farmers, the collaborations of local members and personnel of the project is favored too.

This participative approach that strengthens the links of the personnel of the project with the local population, the farmers associations and local institutions has the same duration of the whole project.

The actions organized within the project needs the support of local farmers associations, but these, unfortunately, are generally not legally recognized. Consequently a main task of the project is to start associations and to get them legally registered, up to now 11 associations have been legally registered (one in each municipal district), these are now asked to decide objectives (table 1) and coordinate participative actions (table 2).

Table 1 – Objectives of the project for the development of farmers associations

OBJECTIVES
Sustain the trade of produce from local farmers
Increase farmers collaboration
Increase women participation and solve genders problems
Give technical support to farmers wiling to adopt agro-forestry practices
Organize collective works for farmer's land management
Start, keepand manage plant nurseries for communities
Give technical support to livestock holders
Organize and manage veterinary service

Table 2 – Actions supported by the project

ACTIONS
Meetings with associations of local farmers
Selection / foundation of farmers associations
Legalization of farmers associations
Extension and technical support to farmers associations
Training course on legal aspects of associations (for 30 managers of farmers associations)

Conclusions

At this moment the project has given important premises for further interventions: problems and solutions have been identified, a preliminary survey of the territory has been concluded, the production systems have been investigated, training courses for 54 initial farmers implemented, demonstrative plots done, 11 farmers associations started and legalized, 5 plant nurseries started, complex agro-forestry systems introduced in several farms, finally the collection conservation and multiplication of local germplasm of important crops started.

After these results, an intervention project proposed to EU has been approved and funded within the line *B7-201 Food security*. The start of related activities has been initially delayed due to the recent civil war, nonetheless the new project was started 8 months after the planned beginning. The strategies of intervention (shown in the dendrogram of solutions) are esteemed to be giving positive results now. Hopefully positive effects the proposed strategy on food security and quality of life can be assessed shortly.

In case the results of this phase of the project are good, the same approach can be spread in the rest of the Republic of Haiti and, hopefully, to other world regions that have similar problems.

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