

## The diversity of yam-based production systems in the commune of Léo as a factor of resilience and sustainability of this speculation

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## Abstract

Farms are subject to permanent and unpredictable changes resulting from internal and external pressures. This variability of the socio-technical and ecological context induces a system dynamic that is perceptible in the analysis of the farm's trajectory and in turn makes explicit the operating logics of producers and their effects on yam cultivation. This article contributes to the understanding of the logics underlying the functioning of production systems that emerge from the coevolution of farmers' perceptions and practices with the context in which they cultivate. Using a systemic and comprehensive approach, the study is based on in-depth interviews with 38 yam farmers; it analyzes the diversity of farms and the strategies implemented to sustain them. The typology of production system functioning illustrates seven adaptive strategies in the farms encountered in three archetypes linked to levels of prosperity: the "Effort" group, made up of rich farmers, endowed with productive resources, whose perception of success is their own; the "Mutual Assistance" group, moderately rich, relatively well endowed with resources, and advocating collective action; and finally, the "Hope" group, corresponding to the poor, limited in resources, and whose farm success is dependent on an external source. Producers from the first two groups are more integrated into networks than those from the last group. A minority of yam producers use extension workers. The resilience of yam is linked not only to the capacity of diversification of activities, intensification of social capital and creativity of maneuvering room of producers but also to the biodiversity of yams.

**Keywords:** production system, sustainability, perception, strategy, diversification.

## Résumé

Les exploitations agricoles sont soumises à des changements permanents et imprévisibles résultant de pressions interne et externe. Cette variabilité du contexte sociotechnique et écologique induit une dynamique au système perceptible dans l'analyse de la trajectoire de l'exploitation agricole et explicite en retour les logiques de fonctionnement des producteurs et leurs effets sur la culture des ignames. Cet article contribue à la compréhension des logiques sous-jacente le fonctionnement des systèmes de production émergents de la coévolution de la perception et des pratiques des agriculteurs avec le contexte dans lequel ils cultivent. Par une approche systémique et compréhensive, l'étude se base sur des entretiens approfondis auprès de 38 producteurs d'igname; analyse la diversité des exploitations et les stratégies mises en œuvre pour durer. La typologie de fonctionnement des systèmes de production illustre sept stratégies adaptatives dans les exploitations agricoles rencontrées dans trois archétypes reliés à des niveaux de prospérité : le groupe «Effort» constitué d'exploitants riches, dotés en ressources productives dont la perception de la réussite lui incombe ; le groupe «Assistance Mutuelle» est moyennement riche, relativement assez doté en ressources et prône la collectivité dans l'action; et enfin le groupe «Espoir» correspondant aux pauvres, limités en ressources et dont la réussite de l'exploitation relève d'une source externe. Les producteurs des deux premiers groupes sont plus intégrés dans des réseaux que ceux du dernier groupe. Une minorité de producteurs d'ignames fait appel à des vulgarisateurs. La résilience de l'igname est liée non seulement à la capacité de diversification des activités, d'intensification du capital social et de créativité de marge de manœuvre des producteurs mais aussi à la biodiversité des ignames.

Mots clés: système de production, durabilité, perception, stratégie, diversification

## Introduction

This research was conducted in the commune of Léo, Center-West region of Burkina Faso. In this area, agriculture underwent major changes in the early 1990s following the implementation of economic and institutional reforms, including the Structural Adjustment Program applied to

agriculture (PASA). These years were chosen as a starting point, because a number of fairly homogeneous farms were created as part of an agrarian reform program given that the PASA offered several opportunities to family farms (F.F). These feasibility spaces have highlighted their adaptability. Agricultural systems became more diversified with the arrival of immigrants in the 1970s and 1980s following

drought and famine (Drabo,2000). Indigenous producers have gradually integrated cash crops, speculations prized by migrant communities and promoted by the agricultural policy of maize, rice, sorghum and millet to the detriment of root and tuber crops such as yams, sweet potato, and cassava. These actions had as a result contributed to different regions specialized in the production of different types of crops. They have also led to the institutionalization of promotional days in order to intensify their productivity. Thus, the Center-West region from 2009 was adapted the promotion of roots and tubers crop production through the restructuring of the traditional yam festival into promotional days of roots and tubers (MAAH, 2015).

These facts were followed not only by an intensification in the production of certain crops but with the increased search for agricultural inputs as well as the improvement of the the management of FFs with the involvement of women in market gardening and lowland rice production. This also contributed to the introduction of perennial crops in the 2010s. Nowadays, the yam-based cropping system is itinerant and extensive, thus can be qualified to as space consuming. There is a diversity of farms linked to the availability of labor (OM), natural, physical and financial resources on the one hand and to the individual and collective strategies of the farmers on the other hand. However, this culture has been devoid of any type of technical and social supervision for more than two decades (Kohio, 2017). Consequently, a strong degradation of natural resources and the maintenance of extensive practices in the cultivation of yams have recently drawn the attention of the authorities to these environments related problems (Adebiyi et al., 2019). It also highlights the lack of knowledge of FFs based on yam cultivation in Léo Administrative Division.

Léo Administrative Division is located 164 km from Ouagadougou the capital of Burkinaabé and 13 km with Ghana. It is located in the Sudan-Sahelian zone between the 900 mm and 1100 mm isohyets (Lejeune et Saeed, 2019). It constitutes a ground-breaking frontier in the field of yam cultivation in Burkina Faso. The extension of crop areas allocated to yams continued to expand since the 2010s. This led to an increased pressure on land with severe land degradation. However, this extension was not accompanied by an increase in the quantity of yams produced.

In the FF, the production management and decisions on the factors of production are combined. Its operation is the result of a chain of decision-making by the farmer, while being confronted with a set of advantages and constraints in order to achieve one or more objectives (Malaval et al., 2011). Structural and operating mode variables make it possible to identify heterogeneity at farm level. This diversity of agricultural situations is fundamental to understanding production systems. Several tools have been implemented, including typologies that illustrate the diversity of FFs. In other words, producers in a given environment produce in several ways (Mbétid-Bessane et al., 2003). The FF is perceived as a complex system because it includes strongly interconnected economic, social, territorial and heritage

dimensions. It evolves in time and space in a very changing context. Operators are forced to reflect on the strategic methods of managing their EA in terms of orientations and decision-making (Gafsi, 2017).

The evolution of constraints and policies since the 1990s has given rise to work on the strategic management of farms (Allain, 1999; Hémidy et al., 1993). Authors have analyzed the relationships between strategic issues and farm sustainability (Gafsi, 2006). In the West African context Gafsi et al. (2007) present three main functions of the farm management cycle: precision, implementation and control. The vision and strategic management of the farm are the two parameters of its strategic management (Aurelle de Romémont, 2014), which make it possible to follow the different sequential stages of formulation and implementation. In the short and medium term, the operator regulates routine and tactical decisions. Few studies focus on the long-term strategic management of the farm where the farmer constantly adapts in order to survive and develop.

Several studies have been carried out on the dynamics of the complex behavior of operating systems and their transformation processes following the co-evolution of feasibility spaces in space-time (Sossou et al. 2013; Schiere et al., 2012). The aim of this work is to build a range of farms by focusing on the efficiency and specialization of producers. In the West African context, few studies had been carried out to analyzis the diversification, proactivity, coordination and interaction between activities in order to understand the long-term capacity and strengthen the resilience of production systems. What parameters of the evolutionary paths of yam-based production systems explain the sustainability of yam? The typology of yam-based production systems varies from one farmer to another; however, the long-term dynamic aspect of its management in relation to the level of speculation sustainability is less supported in previous works. This study aims to contribute to the production of knowledge. Starting from a qualitative methodological approach. The empirical study integrates the temporal dimension and the trajectories of farms in the process of identifying the levers on which producers act to manage their system. Yam producers, despite sharing the same environment, use several strategies during their diverse evolutionary trajectory to ensure the sustainability of yam cultivation. The hypothesis underlying the analysis states that: *farm management strategies highlight the diversity of yam-based farms and reveal the operating logics of producers.*

The first part will present the analytical framework comprising an analysis grid of the concepts underlying the object of study. The second part will specify the modalities of its operationalization. The third part will present the empirical results of the structural diversity of farms, the typology of production systems based on the current functioning of farms but also on their trajectory to end with a discussion of the possible evolutions of yam cultivation in terms of sustainability and resilience and a conclusion.

## Analytical framework

### *From practices to the activity system*

The interest in human action leads to differentiating the concept of technique, which is an intervention whose characteristics are standardized by research and development (Barbier et Goulet, 2013), from the concept of cultural practice. The latter is the way farmers act in their specific context of action located both in space and time and which is more or less rich in interaction between farmers (Darre, 1999). The cultivation practice is linked to the farmer and in particular to the specific conditions in which technical operations are carried out (Milleville, 1999). Practices are the result of the intention of the producer, which depends on his objectives. The producer's objectives allow him to respond to the constraints and seize the opportunities facing the production activity. Within a farm, it is observed that the combination of various cultural practices, and the regulation and adaptation mechanisms are used to preserve this combination in a fluctuating environment. These practices refer to the cognitive and relational capacities of farmers which allow them to play the organizational game of cooperation and conflict (Friedberg, 1992). These practices make it possible to analyze the functional performance of the farmer's production system, hence the notion of a system of practices.

The production system is a harmonious combination, in space and time, of certain quantities of labor power and various means of production with a view to obtaining different agricultural products which make it possible to satisfy the objectives of the farmers. In this definition, "space" explains at a given moment the form(s) of the organization of production in relation to its real environment; while "time" refers to the types of transformation that occur within the organization of production and identify the factors, the reasons for this dynamism. The term "combination" clarifies that the components of the system are not only juxtaposed but interact and affect its efficiency and performance (Roca, 1988).

The logics and management strategies of agricultural production systems are apprehended as a whole which integrates, in addition to agricultural activities, non-agricultural activities (Paul et al., 1994). They are procedural (Gafsi, 2017). This complex reality of farmers led to the conceptualization of the "activity system" (Gasselin et al., 2014). It designates the complex way of producing diversified animal and plant goods. It refers to the way of combining different activities, hence the use of the word "activity" in the singular (Vaillant, 2014). This concept induces a global and non-agricultural-centered approach to agricultural projects (Terrier et al., 2010).

### *Perception of the nature and functioning of the production system*

The postulate of perception is a central parameter that appears in the theory of adaptive behavior which allows an

integrated understanding (i) of the existing coherence between the means and the objectives of the producer, (ii) the finalities of his system endowed with the project which can be more or less explicit of the producer's system corresponding to his "family-farm" and; (iii) his real situation which includes the factors which stimulate the producer into action – the assets – or which limit his possibilities of action which are the constraints. Therefore *"it is the actor's perception of his situation and not the situation itself that determines his behavior. It is useful to distinguish between the objective situation, that is to say the set of constraints independently of the idea that the actor has of it, and the perception that he has of it"* (Brossier, 1987). The perceptions of the actors are essential to their decision-making and the conduct of actions within the operating system. The knowledge, beliefs, skills or habits of social groups can vary perceptions by giving them a contextualized character (Baccar Ben Lamine, 2017). Perceptions refer to the concept of social representation (Moscovici, 1984) since each producer living in an environment needs to adapt to it, to realize it, to behave in it, to adjust to it, to identify and solve the problems he poses and finally "physically or intellectually masters" the world around him (Jodelet, 1989; Rateau, 2000; Lecordier-Ferlay, 2012). Producers continually interpret their environment through a mental process to construct their reality. This construction creates social representations of the world around them.

### **The strategies**

The complexity of contemporary farms in time and space has led to a strategic reflection among producers in the definition of orientations and in the methods of strategic decision-making. Farms that had concerns of a technical nature have seen their strategic concerns take on the greater scope since the 1990s to those of farm sustainability (Gafsi, 2006). To identify and understand the strategies of farmers, the definition of Chandler (1962), (the founding father of the analysis of business strategy), appears essential. For Chandler, strategy is built around two parameters, namely the goals and the means, in these terms: "Strategy consists of determining the long-term goals and objectives of a company, adopting the means of action and allocation of the resources necessary to achieve these objectives" (taken up by Gafsi, 2017). Later, other works added the business environment as a third parameter to be integrated into the understanding of strategies. They stipulate that the environment is a source of constraints, and challenges but also favorable opportunities for the company. For agricultural businesses emerging Gafsi et al., 2007 and Gafsi, 2017) have proposed a strategic analysis grid which distinguishes four poles, two of which have been grouped into one. The pole which are: the goals in connection with the vision for the strategic management of the operation; the environment of the farm which is made up of the immediate environment and the global environment finally, the situation corresponding to the internal elements of the farm whose

diagnoses explain the strengths and weaknesses of the latter.

Strategic thinking is therefore a process and to understand its dynamism it is necessary to analyze the strategic vision of farmers through their proactivity (Aurette de Romémont, 2014) in order to understand the methods of defining their "projects". Or their project "bridles", the perception of their situation and their power over the environment and the strategic actions they implement to ensure the sustainability of the yam.

### ***Representation of farm diversity***

Farming is seen as a system driven by the producer and his family. We characterize the diversity of farms on the basis of the parameters defined by Capillon and Sébillotte (1980). Based on the work of (Laurent et al., 2003) we understand the consistency of the farm beyond the agricultural production system alone. The activities selected are agricultural production (crops, livestock), and non-agricultural and para-agricultural activities. Non-agricultural activities are those that directly use the territory or the means of production of the farm to earn additional income and para-agricultural activities are those remunerated off the farm. The household corresponds to all the members residing on the farm while highlighting the unit of residence, which constitutes it (Gastellu, 1980). The representation of the diversity of farms then involves a cross-typology between activity systems and agricultural production systems in relation to their level of prosperity.

## **Materials and Methods**

### ***Sampling and data collection***

Sampling was carried out using the so-called "multi-stage" method or choice of nested sampling scales where the primary unit is the village and the secondary unit is the agricultural holding. In the first stage, an exploratory study was carried out to help produce the study sample according to the MARP approach in the villages. It made it possible to select two villages (Nadion and Taga) from the three explored. The selection criteria are (i) population density, (ii) ethnic structure; (iii) yam-based production systems and (iv), yam value chain structure. This exploratory study was supplemented by quantitative surveys. These led to the development of an identification sheet to identify production unit managers (RUP), i.e. 218 in Nadion and 317 in Taga in response to the lack of a database on agricultural holdings in Léo. In the second stage, a random choice of 40 managers of production units per village was made and, subject to a classification by level of prosperity with the help of resource people, men and women from the villages, who have a perfect knowledge of the farms they classify, according to the classification by level of prosperity developed by Barbara Grandin (1988) ranging from the wealthiest to the poorest. This typology is carried out according to the perception of the farmers of the similarities

and the differences of their exploitations. It reflects the reality of the village producers. From this classification, all the managers of production units (38) based on yam were retained, i.e. 21 in Nadion and 17 in Taga for in-depth studies in order to understand the diversity of operating logics of the farms. Finally, 11 life stories were carried out with the FFs in order to refine the typology of operation and allow an understanding of the past dynamics of farms, representative not only of the most decisive evolution trajectories. These trajectories trace the processes of accumulation, learning and the individual strategies implemented to meet the challenges related to the uncertainties and the risks that their farms are facing.

The empirical method adopted is inspired by the approaches allowing the construction of types. We start from the assumption that there are different operating logics of farms. The operating logic designates the consistency established in the decisions and practices that the producers combine to meet their goals, taking into account the multiple constraints linked both to the structure of the system and to the characteristics of its environment and which highlights the diversity of practices in yam cultivation. We have chosen to combine operating criteria and operating structure criteria.

The method made it possible to collect data through two main stages, namely the exploratory study and the in-depth study phase. Qualitative surveys were done in both stages. The in-depth phase was carried out with yam-growing FFs using quantitative and qualitative surveys. Quantitative data was collected from all the managers of production units surveyed using survey questionnaires to characterize the activity system of manager of production unit and available resources. As for qualitative data, group interviews, semi-structured interviews and free interviews were carried out with yam-based FF managers and resource persons. These data relate to the variables identified during the interviews with the resource persons, but also the variables identified in the documentation and deemed important for the typology of FF operation (Jamin et al, 2007). Namely: the history, objectives, strategies, strengths, constraints and practices of the farms. They make it possible to understand the production and decision-making processes on farms. The structure variables provided relate to: (i) the characteristics of the farmer (age, sex, marital status, place of residence, level of education and main economic activities of the different members of the farm, family with the operations manager); (ii) the structural characteristics of the farm (in particular the cultivated area and land tenure); (iii) the choice and combination of production activities including rainfed (cereals, tubers, legumes, etc.), irrigated (cereals, vegetables), arboriculture and livestock farming. The numbers of cattle, goats and sheep were recorded according to their local breed; (iv) the various agri-food transformations carried out; (v) the nature of the tangible and intangible assets of the operation, including the means of transport; radio, corn mill, solar plate, level of social integration; and (vi) the choice of the main crops produced according to the market, the needs in cash or food and the management of the seeds, the capital and the labor

available; the types of rotations / operating methods; the yam production objectives and the place of the yam in the farm.

### Data analysis method

We proceeded, as the data were collected, to a continuous comparative analysis between the preceding and successive information. The cross-checking between the different sources of raw data made it possible to recreate units and categories of analysis in order to recursively specify the strategies implemented by the FF in order to ensure or not sustainability in the cultivation of yams in the FF. The diversity analysis consisted in qualitatively constructing two typologies: one concerning the classification by current level of prosperity of 40 managers of production units per village and the other concerning the current status of the 38 yam producers of the two villages in 2018 and their evolution since 1990 with the advent of PASA. This classification by level of prosperity combined with structural variables has made it possible to identify three archetypes which are differentiated in the history of farms by their decision-making system and their operating system. The survey made it possible to quantify certain variables and link them to the objectives and strategic choices of the producer. The revenue ratios were estimated from the pebble game over a period of five years from 2014 to 2018, i.e. five years. The area was only used to distinguish between two types of subsistence and rainfed farms. Thus, the types of yam-based production were described according to the data collected within each farm.

From the archetypes, the analysis of the patterns of evolution illustrates typical trajectories of the operation of yam-based farms. The analysis focused on the objectives pursued and the strategies of yam producers. The various paths of agricultural development have been grouped based on a reconstruction of the individual journey of each farm

from the 1990s to the current farm situation. The 1990s were chosen as the starting point. The FFs which were once almost homogeneous have undergone transformations due to PASA in technical and organizational terms. The trajectories of change in long-term practices not only make it possible to construct a simplified representation of the trajectories of evolution but above all to apprehend in depth the changes induced and to identify the sources of motivation and the triggers over a long period of time. They reconstruct the stories of producers and their farms while identifying ways to change practices in pursuit of their objective. The model focused on the life stories of eleven yam producers identified during the construction of the functional typology of production systems. These stories were articulated with an analysis of the changes in practices, techniques, and organization on the one hand and with a mobilization of the available documents for a better understanding of the farms on the other hand. Drivers internal to the farm (land ownership, labor, equipment, and production) and external drivers of change were characterized by comparing farms within a trail type and between trail types. while considering the historical context shared by all FFs.

## Results

### Profile of yam-based farms

Cross-checking their activity system parameters and resource availability revealed homogeneity in prosperity groups. Three classes of prosperity level of production unit managers are emerging, namely the "Effort" type from the class of the most prosperous producers, the "Mutual Assistance" type from two classes, namely the class of the rich and the moderately rich; finally, the "Hope" type comes from the poorer and poorer classes. Table 1 illustrates that 50% of yam producers were in the "Mutual Assistance" type.

**Table 1:** Distribution of farms by type and level of prosperity

EA Archetypes	Frequency (%)	Effective
Type A : Effort	18,43	7
Type B : Mutual Assistance	50	19
Type C : Hope	31,57	12
<b>Total</b>	<b>100</b>	<b>38</b>

**Source:** Made from field data, December 2018 - March 2019

The average age of farm managers were 42 years old overall with the average ages by group almost identical (46 years old in the "Effort" group, 44 years old for the "Mutual assistance" group). and 35 years for the "Hope" category). The youngest, identified among type C farmers, were 18 years old and the oldest, 76 years old, is type B. Experience in yam production varies greatly from one group to another. However, type B has the highest number of years of

experience. The average age were 27 years for type A with a minimum of 15 years and a maximum of 42 years. As for type B, the experience were 29 years with a minimum of 19 years and a maximum of 55 years. The average age of years of experience of type C were 18 years with a minimum of 6 years and a maximum of 45 years. Type A and B have more dependents than Type C.

The proportion of farm managers who declared having received a formal education at the primary level is 16%, 13% have benefited from literacy training in the Nuni language and/or French for adults called "Bantare school" and 71% have no formal education. However, 35% of the 71% received a Koranic instruction. The distribution is almost indifferent from one type to another. Farmers belong to various organizations in the area. On average, a farmer is a member of at least (02) formal or informal groups or associations. Membership is more regular among type A and B. Type A producers have more positions of responsibility in these organizations (1.2 on average). Five producers out of seven for type A and ten producers out of 19 for type B mentioned outsiders, and support organizations in their network (public services, projects, associations). Five of the fifteen producers cited the supervisors as a resource person in the event of problems

with yam cultivation. Others use family or more experienced producers as primary contacts. Type C FFs are poorly integrated into networks and benefit less from technical and organizational support. Their low accessibility to information would reinforce the low capacity for diversification of activities and cultures within them.

### **Type of operation of yam-based EAs**

In the villages of Taga and Nadion, Table 2 illustrates seven (07) management strategies that the CE and his family group develop in the operation of the EA based on yam cultivation coexisting in the three classes of prosperity, in order to achieve the objectives pursued for the agricultural operation. Yam producers have developed strategies based on their environment.

**Table 2:** Type of operation of AEs in Nadion and Taga

Farm types		Taga	Nadion
Type A1	Farming with a strategy of maintaining symbolic capital	11,8 %	0,00 %
Type A2	Farming with a para-agricultural strategy	23,5 %	4,8 %
Type B1	Yam-intensive farming	17,6 %	9,5 9,5 %
Type B2	Farming with a strategy of risk distribution between activities	17,6 %	28,6 %
Type B3	Farming with a customer-centric strategy	11,8 %	14,3 %
Type C1	Farming with social capital management strategy	5,9 %	23,8 %
Type C2	Farming with orientation strategy for new cash crops	11,8 %	19,1 %

**Source:** Made from field data, December 2018 - March 2019

Type A "Effort" corresponds to farms with high means of production although the family labor (FL) is low. 71.4% of operators are proactive and 28.6% are reactive. In reality, the reactive were not opposed to the proactive, it is the temporality of the action that distinguishes them. Reactive farmers act in the medium term. Two types of EA coexist there, namely type A1 and A2 (see Table 2). More than 70% of farmers are multi-active in addition to food and rainfed production. All the producers in this group have plantations of cashews and mango trees. They mainly practice cattle breeding and account for 63.81% of the animals in the cattle herd. They carry out non-agricultural and para-agricultural activities such as trade in agricultural and other products (4 producers out of 7), associations and jobs (parents' association, association of religious groups, and representative of community services). These farmers have diversified agricultural activities (4 crops in Nadion and 5.5 crops in Taga; 3 to 7 varieties of yams produced; 2 to 4 types of livestock per farmer and on averages 2.5 processed products). For financial resources, six producers out of 7 have access to agricultural credits, of which a quarter on average are diverted to meet the needs of yam cultivation from the First Microfinance Agency in Burkina Faso or from Village Savings and Credit Banks; two producers use the informal financial system. These various activities constitute an additional source of income and greater security in the face of shocks.

The social and economic characteristics explain the integration of yam cultivation in these two types of farming. Type A2 farms are in the majority compared to type A1. The latter (A1), present only in Nadion, describes producers who perceive yam cultivation as "non-intellectual" knowledge. Indeed, for them it is a question of a practical mastery of tacit knowledge in the technical sense which becomes a major source of the accumulation of symbolic benefits such as honor, reputation, the "visibility" of the producer, and the rank social. They claim that this symbolic capital intrinsically represents yam cultivation. It is very fragile and must be maintained by yam cultivation during each campaign while respecting the rituals of its production since they have a deep belief in its cultivation, *"The yam is sacred, you have to take care of it like a woman to keep it near you because it is thanks to it that you have honors in the community, which other cultures do not give; moreover, it makes you a respected person, it easily enriches the producer when you respect the requirements of his production"*(N27, 42 years).

In Taga, type A2, i.e. 23.53% of producers cultivate yam in order to contribute to the socio-economic development of the rural commune of Léo, through their active participation in root and tuber promotion activities, mainly yam against only 4.76% of Nadion's FF. In turn, they ensure the improvement of their living conditions. These are FFs who have benefited from several training courses in farm

management in general through the intervention of development projects and programs.

In types A1 and A2, the management of the main holding is highly independent of the management of secondary holdings and of the activities of household members, regardless of the type of farm in this group. Thus type A has more active members than the other farms. Their yam production was done in a system of pure yam cultivation with short-term fallow and whose farm managers mobilize the wage labor as a priority to support the FL and significant wage costs, both for the yam than for other crops. However, there were a mixture of several varieties of yam with an average of four (04) varieties; they correspond to the varieties sought on the markets by consumers, processors and also producers. About 60% mix several varieties of *D. rotundata* (*wassara*, *larbacoua*, *toula*), are found on very rich and loose soils and when they are associated with *D. alata* (*Folou* and *kaledjanin*), they are put on field borders for 30% of farms. Only 10% (1 producer) have more mixture of *D. alata* compared to *D. rotundata*. Although the results indicate that the share of yam income in total agricultural income is almost stable and low, due to the share allocated to redistributions of social prestige through various yam donations made by campaign; this share remains significant compared to the benefits reaped by the yam. The economic autonomy of household members is essential to the evolution of the yam system. The autonomy of both women and men is important.

Type B "Mutual Assistance" includes 50% (19) of farms that advocate unity and collective action in the management of EA. Three types of FF are encountered in Nadiou as in Taga. Type B1 corresponds to FFs whose strategic farm objective is to intensify yam cultivation for 17.65% in Taga and 9.52% in Nadiou. They contract agricultural loans from private financial institutions for other crops such as maize, which they invested in the cultivation of yams. They pay attention to the sensitivity of yam as the next crop in the choice of previous crops. They attend agricultural extension services to learn techniques/practices for good land fertility management.

Type B2 corresponds to FFs for which yam cultivation contributes significantly to the management of the distribution of risks between the different agricultural and non-agricultural activities of the holding, but also for those of the different members of the household. They are found for 17.65% in Taga against 28.57% in Nadiou. In type B2 FFs, the decision-making centers of the latter are rebuilt by giving more space to women (wives) and young sons, who became independent earlier. Indeed, the management of FFs was, in the recent past, close to that of the traditional yam production system in collective fields. Decisions on its conduct, harvest management and expenditure commitment, formerly centralized, become more or less mixed depending on the type of decision to be made. When it comes to the management of revenues from the sale of yams, then, we are witnessing the emergence of new participants in decision-making in yam cultivation. It should be noted that this reorganization around the cultivation of

yam allows the satisfaction of the investment needs of the men of the household and influences the methods of management of the other crops of the household according to their importance within the FF and the type of farm (collective or individual). Decision-making relating to the transfer of know-how in yam cultivation remains the prerogative of the household head and sometimes of the family head.

Finally, Type B3 presents the FFs that produce yams in competing orientation strategies while seizing the opportunities of agricultural market needs. This third type represents 11.76% of Taga's FF against 14.29% of Nadiou's. Operators primarily mobilize unpaid social labor and the FL. The management of the farm of the head of the household depends slightly on the activities of the farms of his dependents. These farms operate like a business. The head of the household decides by mutual agreement with his sons in the case of divided land assets (11 farmers) or with his brothers in the case of collective fields (08 farmers) of the crops to be produced and the objectives of their production. In the particular case of yam cultivation, the household project includes several sometimes conflicting objectives. They relate both to future agricultural investments to improve production, to investments to improve family comfort for each other, to socio-educational investments for school children, to investments to support extra-agricultural activities for certain young people or for their future installation. Each of the members is responsible for supervising certain tasks (maintenance of the fields, mobilization of the FL, management of the social work, management of the wage labor, management of storage, and marketing), and the production objectives are prioritized after a discussion between the men of the household and consultation of the women if necessary. A yam producer explains this state of affairs as follows:

*"The children said one night after dinner: dads you see that the world is changing, we need a motorbike, so as not to borrow elsewhere. What you can do, you must do it, you must not be criticized for it. We replied: it's true, you were right [...] we asked them to work together; so after the sale of the yams, the senior brother bought for him and the following year it was the turn of the junior brother"* (N08, 45 years).

As for the socio-educational needs of the youngest, they are satisfied according to the effort made by them during the agricultural campaign. A head of household tries to explain the situation through this interrogative sentence *"one day my son got up and came to tell me to buy him pants for his school, I answered him like this: you, you didn't a long job and you want long pants?"* (T14, 46 years).

The production of yam was done by crop rotation system of which 35% (07 FF out of 19) is rotated with cereals; 50% (09 FF out of 19) rotate cereals and legumes; 15% (03 FF out of 19) rotate legume were used to finance other factors



of agricultural production, especially (fertilizers, phytosanitary products, etc.).

Type C "Hope": Twelve (12) FFs make up this class; farms in this latter group are mostly without FLs. They are mostly under guardianship although they have their own farm. Producers in this class are unable to mobilize wage labor due to the unavailability of financial resources and the weakness of their social capital. The resources of these farms come from the multi-activity of the dependents of the household. They are forced to invest in paid social labor, which they often repay after the crops have been harvested. Yam production were irregular over time and were done primarily in combination with other tubers (sweet potato) and/or cereals such as maize and/or sorghum or with legumes such as cowpea. Producers in this group mainly raise goats, whose productivity were faster than that of cattle. The production of yam is mainly intended for sale after having ensured the supply of the wage labor in cash crops (especially cotton). Yam is sold even if the yields of other crops are deemed insufficient to ensure family food. They are operators who live almost on the margins of society. They are seasonal migrants and practice more gold panning with little gain. In short, yam cultivation was highly dependent on available resources and investments in their exploitation remain difficult, as this producer argues:

*"I'm old now I have up to five sons but they don't work in the field and at harvest it's them who sell without me realizing it, to pay for things. Yet when it comes to work they disappear. So I decided to divide the fields between us and everyone manages. I rely on the children of the brothers to cultivate for me because I no longer have the strength as before. Even in my mango plantation, they steal the fruit from me to sell it to friends or their friends' wives. This is why my yields are low, here everyone is busy, and who will leave their field for you?" (T17, 47 years).*

Type C contains FFs for which yam cultivation mainly follows two distinct objectives. The first objective can be described as a survival strategy. The FFs that engage in it seeks either to maintain or strengthen their social capital, or to develop it through the cultivation of yams. It was the C1 type with 5.88% of FF in Taga and 23.81% of EA in Nadion. The second objective is defined with the FFs which are moving more and more towards new cash crops (soya, sesame, mung bean (variety of cowpea)) promoted on the Burkinabe soil in order to allow the yam to benefit from the financial spin-offs and environmental and who hope to return to yam cultivation very soon. This type C2 has a representativeness of 19.05% of the FFs in Nadion and 11.76% of the FFs in Taga.

### **Evolution trajectory of FFs**

#### *The evolutionary trajectory of type A FFs*

Figure 1 summarizes the evolutionary trajectory of three FFs, two of which are type A2, residing in Nadion and Taga

and one type A1 in the village of Taga. These FFs through the production of yam are in search of both financial and social independence, including power and prestige. In order to achieve such agricultural objectives, they develop agricultural and non-agricultural activities mainly generating income. The propensity for these activities was made in the mid-1990s among these FFs (A1 and A2) having benefited or not from rural training promoted by the State through the "Training of Young Farmers" centers on the National territory. They have also been impacted by the emergence of the Muslim religion in the public sphere following structural adjustment policies

The producer, as soon as he is installed, implements a progressive strategy. They believe that their addiction was an obstacle to the realization of their life projects. It gradually calls into question the previous rules of management of the FF, hence a change in the meaning of the profession by a progressive practice of food polyculture with or without cash crops associated with livestock and arboriculture.

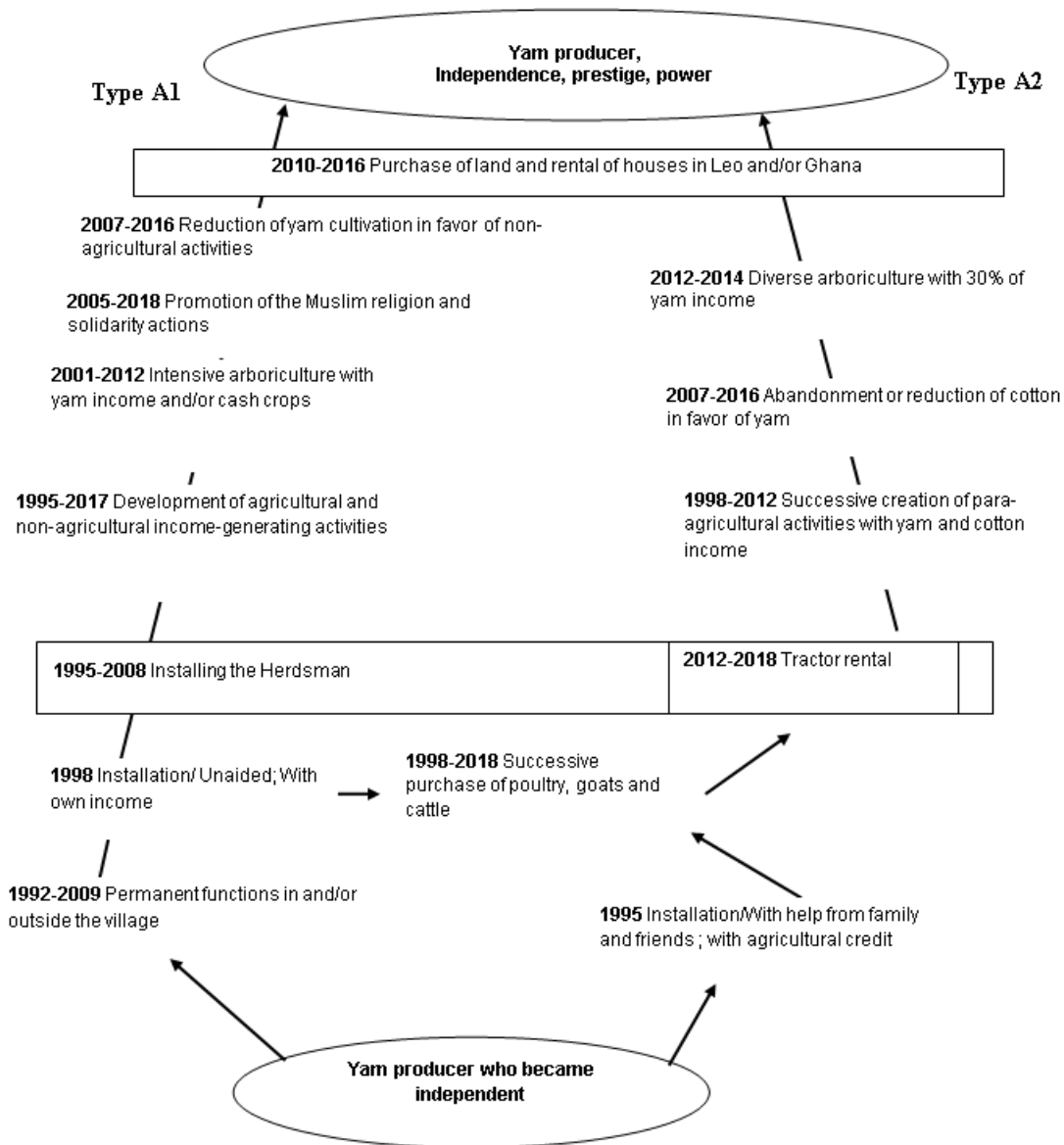
In type A1, land pressure seems to him to be more and more perceptible, inducing in him an awareness of the importance of the association of agriculture and livestock for land improvement from the middle of the year 1990s. It is expressed by strengthening cattle breeding and sustained interaction between the two activities for the production of organic manure. In addition, the multiactivity of the producer interacts with his social environment, as a result, the latter under the effect of collective consciousness, ends up deciding on his relations with the members of his community and giving meaning to his practices in the village. His practices result from the confrontation between his individual experiences and acquired forms of collective exchanges which are endowed with knowledge produced by a common environment. They continuously guide the behaviors and attitudes of the producer in space-time. The accessibility of religious media and new communication technologies have transformed traditional and vertical modes of authority and religious interpretation to the benefit of the Muslim religion. Thus, through the conceptualization of the "good Muslim", the young Arabist of Taga participates in the "remoralization" of the public sphere by highlighting their agency. They attach importance to social and humanitarian aid through the payment of tithes, and the granting of informal loans, the granting of space for worship. All this gives birth to a new generation of Muslims who pose as "religious entrepreneurs" in order to enhance their prestige and gain followers, hence the tacit establishment of Friday as a day of rest and prayer. Finally, the preponderance of non-agricultural activities leads in the long term to a reduction in the areas under yam cultivation.

The evolution of type A2 FFs is clearly polarized by the increase or stagnation of yam cultivation areas and the search for additional income. The financial gains from the cultivation of yams contribute to increasing the diversification of agricultural and para-agricultural activities. Complementary crops to yams improve accessibility to agricultural inputs and risk management, as one producer explains:

*"I chose to produce maize and cotton; because when you make cotton you can get the inputs there and produce maize without paying or taking credit with a bank. The corn yield is such that you can repay all your debts with SOFITEX and still have a little to*

*put aside (economy). Corn is like the profit of cotton."* (N01, 41 years).

In addition, in this type, it is the constraints linked to the cultivation of cotton that would revitalize that of yam over the period 2008-2010. This help to increase the symbolic capital of producers.



**Figure 1:** Evolution trajectory of type A1 and A2 farms: strategies and sources of determination  
**Source:** Realized life stories of successful farms

With help: FF benefits from agricultural training, financial and/or material support from a relative, knowledge of the village, support in formal agricultural advice.

*The evolutionary trajectory of B-types*

In the evolutionary trajectories of type B (figure 2), cattle contribute about 30% to their total income during "normal" years for farms that have a herdsman and where breeding remains a collective activity, even if the fields are individual. The herd were considered an asset that can be sold in times of hardship such as drought to meet the economic needs of

the household. Also the number of cattle were such that these FFs regularly renew the draft oxen like the A1 and A2 types, which increases agricultural income. They have a satisfactory level of economic autonomy. When crop yields are sufficient and profits acceptable, they contribute to meeting the needs of dependents in the household, which could be perceived as a form of remuneration for family labour.

B1 includes FFs whose main objective were to increase yam cultivation in the commune. They settled with the support of a precursor without decision-making power in the management of the FF they acquired after their marriage. They improved the initial state of their rainfed and food production system in particular to maximize their agricultural income. They sell more than they consume. They decided to improve their yam production in order to circumvent the difficulties of access to agricultural resources (credits, training, markets) intended for yam. As illustrated by the speech of a producer to the question of knowing on what basis he chooses his activities.

*"I look at my present needs and those of my children later, that's why I grow a lot of crops and especially yams I want people to continue to produce yams so that the end of each end of the campaign I reserve a share of yam that I give as seeds to those who come from Kwalaga, Woro, Onliassan (neighboring villages) to work in my field [...] I also give because there are producers who have a lot of willpower so I encourage them to stay in yam. There is also the fact that one day I may be in need; I know that if I go to them they will give me too. It may be my children who are in need tomorrow since seeds are very rare here. Because of my donations they will be able to easily have access to seeds of certain varieties; they will be rewarded because of my gesture today humanity and the yam wins" (T01, 48 years).*

For others, it is the financial benefits they derive from crops, mainly that of yams, that guide the definition of the production project. In other words, the investments that the sale of yams allows them to make are essential. They seek to specialize more in the cultivation of yams. They use improved techniques that are applied to speculations that they partially readapt to the cultivation of yams. When asked why you want to improve yam production, a producer replies:

*"The production is not sufficient but can be improved if there is support to show us how to produce better despite the fact that our soils are no longer very fertile as before. The size of the acreage may be small yet what you will gain from it is beyond*

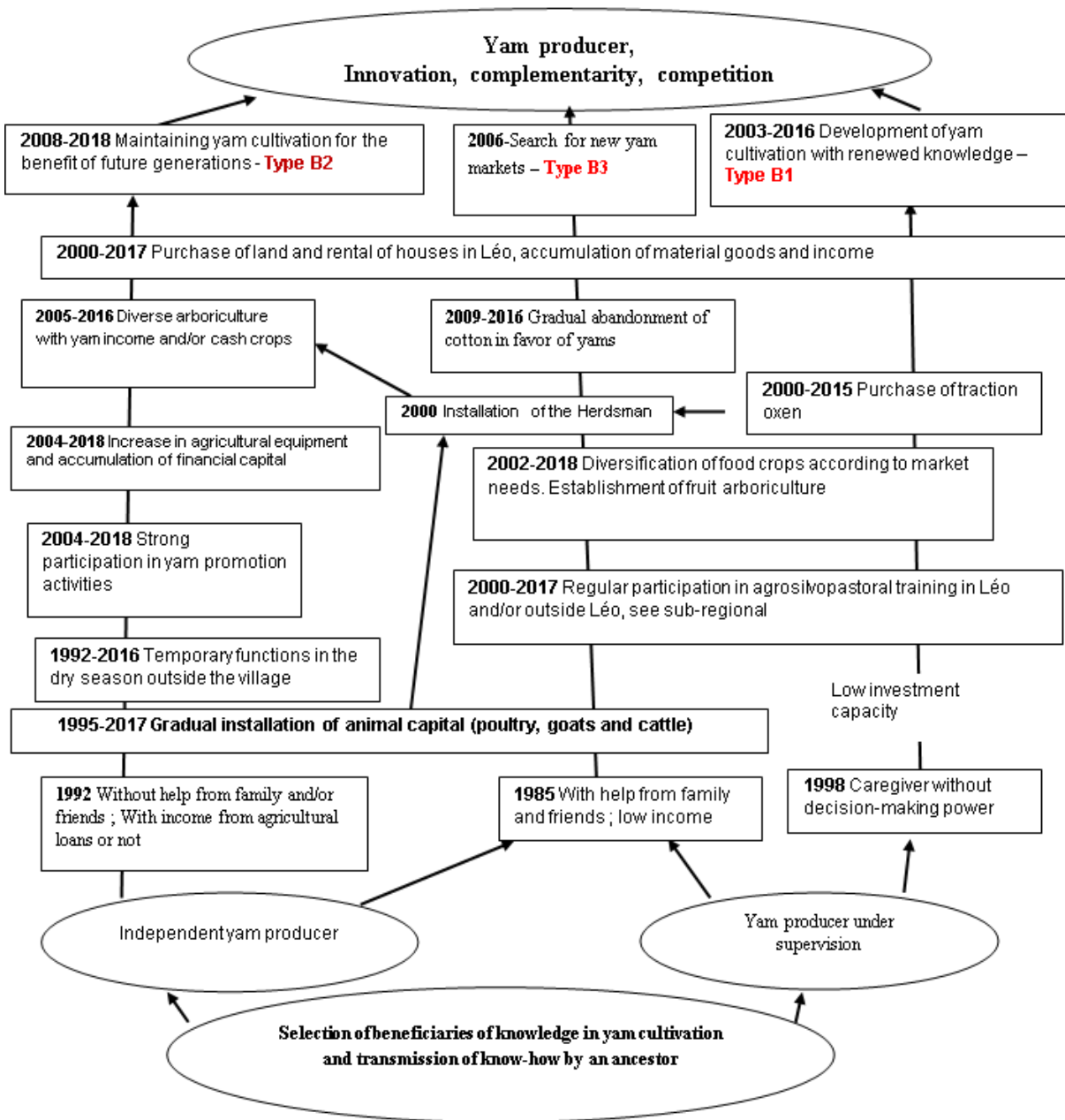
*someone who has a large acreage. We have been taught that extending our fields is not the solution in crop production but it is knowing how to manage quickly, on time and well the needs of each crop by following production advice. That's what I do, what I don't know I improve elsewhere and I come and do a little bit in my fields. The government also needs to look into the yam, it has built stores in Léo, but if production is not supervised, it won't even be of any use a few years later it will be other cultures that will be there" (N03, 32 years).*

In these remarks, it appears that these producers have become aware of the positive effects of the technical supervision of a third person and the interest in organizational decision-making, which allows them to improve their practice and the monitoring of the crops which is that of yam (Lamine et al., 2009). They manage to improve their living conditions by diversifying and increasing their sources of income. From the discourse, it appears that the external and internal contexts of the farm influence the decision-making process of producers. As reported in the work of Madelrieux, Dedieu, and Dobremez (2002), which illustrates that certain constraints relating to work among breeders of mountains induce the simultaneous implementation of certain activities outside and inside the farming system that affect equipment, the sizing of activities or the organization of the workforce.

The B2 results show that these producers have always sought additional income outside the farm in order to compensate for shortfalls and this practice has continued even after their installation. They become seasonal workers in industrial enterprises in the dry season, others are employed as community health workers, animal health workers, or municipal workers in the commune. They hold positions of responsibility in development projects for a fee. They work there on a temporary basis, one or two days a week. They continuously produce yam, and some of them regularly participate in yam promotion activities such as tuber promotion days, yam festival, and best yam producer competitions. These relationships influence their knowledge process and the questioning of the mimetic learning of their ancestors. Thus the choice to perpetuate the cultivation of yams is built according to interactions and negotiations with others. This is what a producer says in these terms:

*"I do a lot of activities in addition to cultivation and livestock such as food trade, I am currently the representative of the village producers, I really participated from 2004 to 2018 in the yam festival in Léo, which allowed me to know a lot of producers and to learn a lot of farming and farm management techniques. This knowledge and relationships have allowed me to*

improve my yam fields today and have good yields” (N11, 51 years).



**Figure 2:** Evolution trajectory of type B1 farm; B2; B3: strategies and sources of determination  
**Source:** Realized from life stories of farms

B3 FFs of this type aim to control agricultural markets, especially food crops, including yams. All types of land are represented in B3. In collective fields, the yam producer was producer under supervision whose decision-making power were limited. To do this, active participation in agrosilvopastoral training activities in the municipality or nationally allows them to renew their technical knowledge. They proceed by their application on a small scale on the FF for the production of various speculations. The yam benefits

above all from knowledge relating to the management of water and soil or the fertility of the land. Thus the areas allocated to yam cultivation were increased from the year 2014 to 2018 due to the conversion of a significant proportion of the land intended for cotton cultivation to yam cultivation on the one hand and/or following the recovery of degraded land considered unsuitable for plant production, especially in Taga on the other hand. They improved yam yields by including more maize and legumes in their

cropping system. They recently changed their yam sales strategy taking into account market needs. The types B1 and B2, in addition to pesticides and mineral fertilizers, they have been using organic manure in their plant production, including yam since 2013.

Types B3, B2 and B1 advocate the diversification of both agricultural and non-agricultural activities in order to support the evolution of their production system. They are trying to intensify their yam production in terms of physical, human and technical resources. All these contribute to strengthening their decision-making autonomy in the medium and long term and highlight increasingly proactive profiles that provide resilience to the cultivation of yams.

### *The evolutionary trajectory of C-types*

Type C (two C1 and one C2) correspond to the group of poor FFs facing major constraints such as integration into the community fabric, access to land and capital in general. Operators of type C1 at their installation after 1990 use the social capital of their previous one. These producers concede link their success to the resolution of the societal constraint. As illustrated in Figure 3, cultivating yams in this group is a strategy that the farmer develops to maintain his place in the social environment and not to be called a "woman" by his peers according to the words of this producer:

*"I have to produce yam every year and as my father gets along well with the other producers, he asks them to come and help me in my yam field, which he encourages me to always do. yam even when it's hard. [...] Here a real man is the one who makes the yam, in the family you will see that when there are certain meetings you are not invited to participate, they say you cannot eat from the dish of the initiates, one day a brother will tell you that you have rejected the culture of your ancestors"(T15, 29 years).*

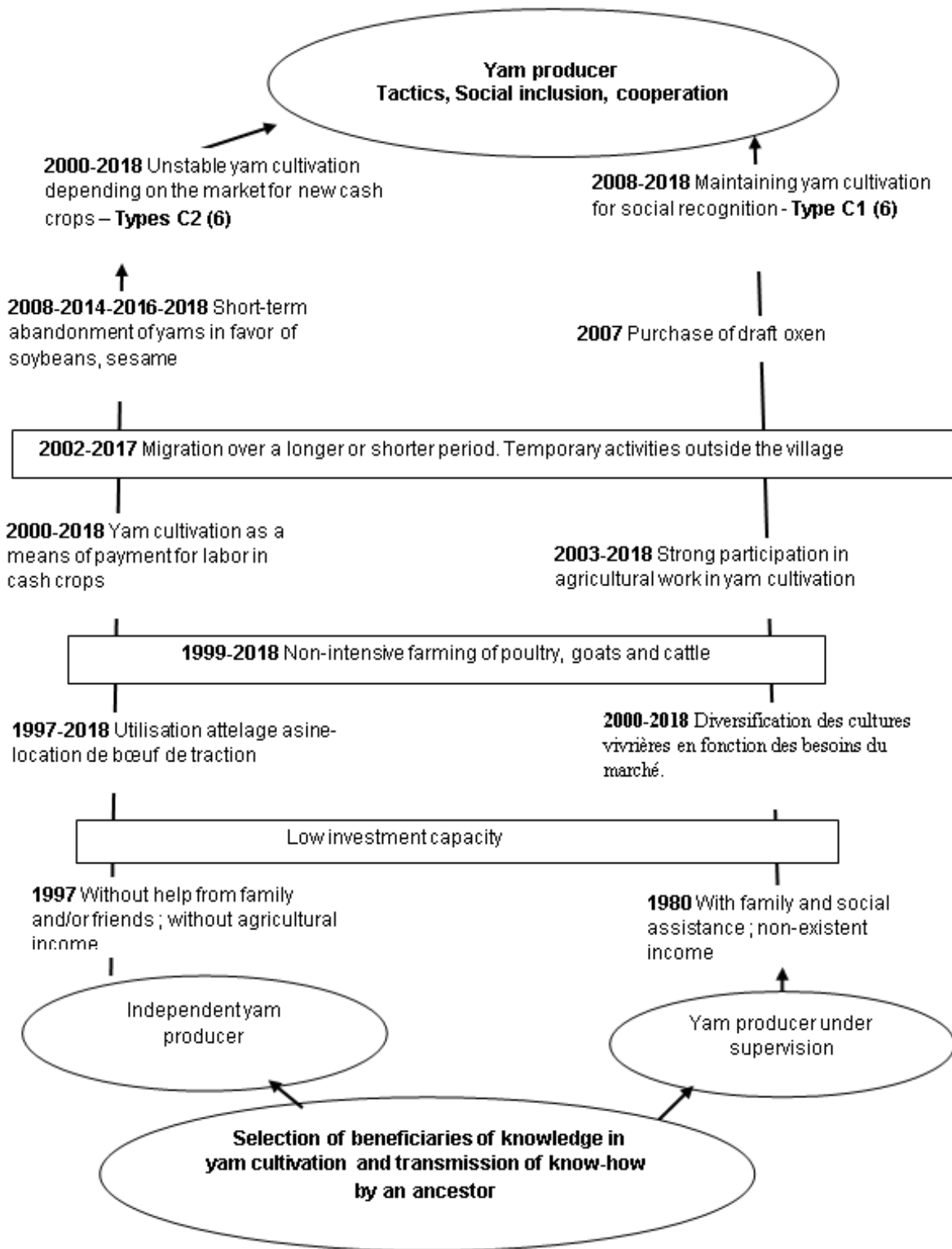
It emerges from this discourse that the FFs are working to implement strategies that enable the management of social capital and the respect of social standards in the short and medium term. This strategy underlies a certain form of "symbolic violence" imposed by the community on the individual to dissuade the latter from being a deviant in the community while avoiding humiliation. Moreover, as shown by Gafsi et al. (2007), in the strategies of decision-making and definition of objectives, there is the need to be in harmony with the dominant social norms. These FFs organize themselves to reduce their costs over time, especially in the cultivation of yams and other crops, by resorting to unpaid social labor as soon as possible. Indeed,

they actively participate in community activities requiring a strong involvement of social labor in order to benefit in return in the short term. This sharing of work, or agricultural mutual aid which requires working together while knowing that they all depend on the same resource of a more or less "finished" nature such as labor and/or land generates a feeling of belonging to the group since it makes it possible to recognize one's friend as another one (Sabourin, 2007).

For type C2 the FF develops income-seeking strategies in order to solve the difficulties present within them. However, these strategies cover a short period without a long-term vision. This behavior has increased since 2016 with the implementation of the national economic and social development program which promotes new crops with high economic potential (soya, sesame, cassava). At each opportunity on the agricultural markets, the production objective is redirected to seize these new feasibility spaces equipped with new economic incentives and respond to the climatic uncertainty impacting yam cultivation, as one producer explains with this statement:

*"Today we cultivate for the money, everyone runs after the money, it's not like our fathers who produced yams every time even when the conditions are difficult, I watch how the harvests of last year have been in the markets and also if the government is going to subsidize crops this year before choosing what crop i plant this year where i plant it and on what area the crop that will give me more money will be priority in any case even if I have to give up yam for the latter I won't hesitate and maybe I'll come back to it later (laughs) currently it's soybeans, sesame and even mung bean (variety of Niébé) from Larlé Naaba Tigré which give well and which require neither manure nor treatment" (N13, 42 years).*

Such assertions present the opportunistic nature in terms of reducing agricultural production input costs in relation to yields, and the problem of not planning for the long term in order to support yam cultivation. These behaviors describe the precarious situation of producers and the hedging strategy to protect themselves from fluctuations in agricultural prices while also maintaining a strategy of reaching out to the ministry in charge of agriculture. When asked how government support for yams is implemented, the farmer's testimony indicates that there is a need for institutional actors to fully understand the needs of yam producers before granting of technical and financial support while taking into account the specificity of speculation.



**Figure 3:** Evolution trajectory of type C1 and C2 farms: strategies and sources of determination  
**Source:** Realized life stories from poor farms

## Discussion

In Nuna society, mutual aid is an important parameter in the organization of rural society. It is erected by family lineage group and by age group around yam cultivation. Although it has diversified with the evolution of the socio-economic needs of households, the services emanating from mutual aid do indeed fall within the total social fact of M. Mauss (1927). Thus, the return of mutual aid is expected in terms of sociability and humanity, therefore mutual aid is not obligatory in contractual terms or in absolute terms. This is one of the differences between exchange and the principle of reciprocity (Sabourin, 2007).

In yam cultivation, self-help and work groups are structured by age groups - initiates - which helps to differentiate the status of producers. The yam is a centuries-old culture with myths, the fruit of collective production, which is collectively appropriated. Thus yam production tends to legitimize the established hierarchical order, tacit knowledge and the distinction from other producers. It is both an instrument of distinction and a "medium" of communication (it unites the FFs). For type A1, yam cultivation justifies the distinctions by constraining all producers cultivating other food crops exclusively to "sub-men" - women. Yam production takes place in a communication relationship that remains inseparable from the power relationships that transcend in their form and content, from the material or symbolic power that the farmer accumulates in this interactionist process like the potlatch, which can allow the accumulation of symbolic power. Beyond agricultural activities, types A1 and A2 practice non-agricultural income-generating activities. All of these activities make explicit that the various practices of FF highlight the knowledge and know-how that they have accumulated over time and through various spaces and have thus forged its social representation. Indeed, while paraphrasing Moscovici (1961), the elaboration of these various activities, are in fact social objects whose objective is to act by organizing one's conduct and actions and directing one's communication in a social group that will of his line in the village and outside the village. This communication makes it possible to understand and explain one's life trajectory in a group of belonging, one's family line. Type A FFs pursue an emergent progressive strategy (Gafsi, 2017) in their evolutionary trajectory. The progressive and emergent character is expressed by the recourse to the implementation of management practices for the survival of the yam in the environment through the development of a secondary source of income and a complementarity of activities, in order to carry out the project of their operation. The production system based on type A1 yam cultivation is rather sustainable in the short and medium term. It can be a channel for bringing about acceptable changes in the social norms that frame the cultivation of yams. As for the A2 types, they are in a sustainable yam production system since the technical and economic gains built are practically invested in the cultivation of the yam. They are underpinned by the quality and extent of the

individual's social capital. These gains consolidate their financial and technical autonomy in yam cultivation.

Type B FFs are diverse and creative. This state leads their manager to use various strategies of a deliberate and progressive nature, the temporality of which ensures the sustainability of the yam and of exploitation in general. Among B2 producers, each of the activities would constitute a form of safety net for each other and for the entire FF. The group of FFs included in this evolutionary trajectory can be qualified as farms specialized in agricultural production, and diversified in terms of the speculations produced. They regularly resize certain activities and redefine the combination of activities to be implemented in order to adjust their development process in time and space. In this process, non-agricultural and para-agricultural activities are presented by producers not as a problem-solving strategy to achieve their objectives but as an inevitable source of additional work (Madelrieux, Dedieu and Dobremez, 2002) to increase yam productivity. Type Bs are farmers who combine two strategies in their trajectory for decision-making and management of the farm: (i) a deliberate progressive strategy where the producer is in pursuit of additional income or the development of reorientation following technical or economic constraints; (ii) an emergent progressive strategy where the farmer seeks a development of the land in order to induce changes or a reorientation along the way in the yam cultivation system. In short, these are practices that contribute to strengthening the resilience of yam cultivation in the face of various constraints.

Type C2 FFs are "opportunistic" producers; they do not have a real yam cultivation strategy. They produce yams according to the variation in the price of rainfed and especially cash crops on the market. When their prices fall they produce yams. Mbétid-bessane, Havard and Djondang (2006) observe similar results with cotton producers in Central Africa. The latter abandon cotton cultivation in favor of new monetary activities as soon as the price of cotton falls. From their speeches, failures of the agricultural markets around the cultivation of yams are expressed in terms of agricultural insurance and credits. These results are in line with those of Sossou, Lebailly, and Hinnou (2013) who show that the inaccessibility of micro-finance institutions by poor farms is related to their low capacity to approach not only formal sources of financing but also to the weak capacity to establish social and/or professional relations with these institutions. This state is amplified when it comes to investing in the cultivation of yams, hence the incessant recourse to less restrictive speculations in agricultural charges to the detriment of yams. Types C1 capture the intrinsic values of social capital. This facilitates access to resources such as informal loans, and the improvement of trust between pairs, hence the sharing of tacit and explicit knowledge. There are also sources of various information such as the future intervention of a project in their production activity. Finally, there are sources of collective action such as the construction of mounds. Their low level of prosperity combined with their low capacity to mobilize the resources necessary for the cultivation of

yams justifies the first type of process. The temporality of their management strategies is short term. On the other hand, the medium-term vision of integration of the social fabric induces positive transformations for the yam. This operation, like the A1 type, contributes to the sustainability of yam cultivation and strengthens the resilience of the producer in the face of the lack of human, physical and financial resources. Producers of C types evolve through a process of deliberate or intentional strategy for C2 types and progressive emergent strategy for C1 types.

Producers continually interpret their environment through a mental process to construct their reality. The latter creates social representations of the world around them. The socio-economic environment in which the producer interacts affects his perceptions of yam sustainability (Baccar Ben Lamine, 2017). For some producers, the sustainability of yams is linked to an awareness of the management of natural resources, which manifests itself through the implementation of environmental preservation strategies, while for others, this sustainability is perceived through economic and/or social gains without real environmental management (Baccar Ben Lamine, 2017).

## Conclusion

The typologies carried out made it possible to distinguish seven action strategies resulting from three archetypes of agricultural exploitations based on yam cultivation: type A - Effort - includes rich farmers for them the sources of changes induced in their exploitation and theirs are internal; type B - Mutual Assistance - are moderately wealthy farmers, for them the sources of change are rather internal and external with a need to improve explicit knowledge in the cultivation of yams; finally type C - Hope - includes poor farmers. As for them, the sources of evolution are external to the farm. The operating logic of FFs shows that they are constantly adapting due to the complexity and permanent evolution of their context. Perceptions of the social, economic and ecological environment of the farm influence the adaptive strategic management process of farmers. Those limited, like the C2 type, by resource availability or being set up tend to have a deliberate strategy. However, the evolution of their exploitation could induce the decline of yam cultivation in their long-term production system. On the other hand, progressive strategies are observed in type A, B and C1 FFs since they are strongly linked to the operator's objectives and projects. The analysis of the evolution trajectory shows that the successive transformations of the FFs are consistent with their management strategies. In turn, the more the strategy defined and implemented is adaptive in a long-term vision of overall development of the farm, the more it tends during the course to induce extended sustainability in the cultivation of yams. The reduced availability of resources among farmers, combined with their low level of prosperity, leads to the emergence of a limited sustainability of yam cultivation. In addition, the high precariousness of operators makes it difficult to recover adequate feasibility spaces and a low capacity for

adaptability, hence low resilience. On the other hand, the biodiversity of the yam, although it is declining, the diversity of activities combined with the capacity of reorganization of the farmers contribute to making the management of the farm flexible and grant a resilience of the yam producers in the face of the lack of plant material, the low level of soil fertility and the weak involvement of institutions in its production. In perspective, FFs of types A2, B and C1 could be receptive to the process of "redesigning" of yam cultivation practices that take into account integrated management of soil fertility under yam cultivation in the municipality.

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