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Dynamics of the Evolution of the Cotton System in Mali

A.C. Michel Fok

ABSTRACT

The cotton system is defined as consisting of all actors implicated, directly or indirectly, in the production or processing of cotton. It is suggested that the cotton system in Mali is the result of a succession of contradictory actions and decisions made by these actors. The succession is neither predetermined nor inevitable, as the actors are free to oppose prescribed solutions or to adhere to others that they find more acceptable. The suggested mechanism is self-generating, particularly as it is possible for those not recognized as actors to take advantage of opportune moments to demand that their interests be considered. Our hypothesis has been validated by reference to almost 100 years of cotton production and trade in Mali. We have demonstrated that there is an endogenous capacity for adaptation to change provided that collective learning is possible and the associated time constraint can be overcome. We conclude from our results that it is essential, prior to formulation of agricultural policies, to identify contradictions that may arise in the future.

KEY WORDS

Actor, adult literacy, agricultural policy, collective apprenticeship, cotton, dynamics, farmer organization, input-output price ratio, input subsidies, rural blacksmiths, soil mining, sustainability, youth.

INTRODUCTION AND OBJECTIVES

Examination of agricultural progress in southern Mali, where the *Compagnie Malienne pour le Développement des Textiles* (CMDT) [Malian Company for the Development of Textiles] has responsibility for extension, development, and marketing in the zone, is of value for many reasons beyond the simple growth of cotton production

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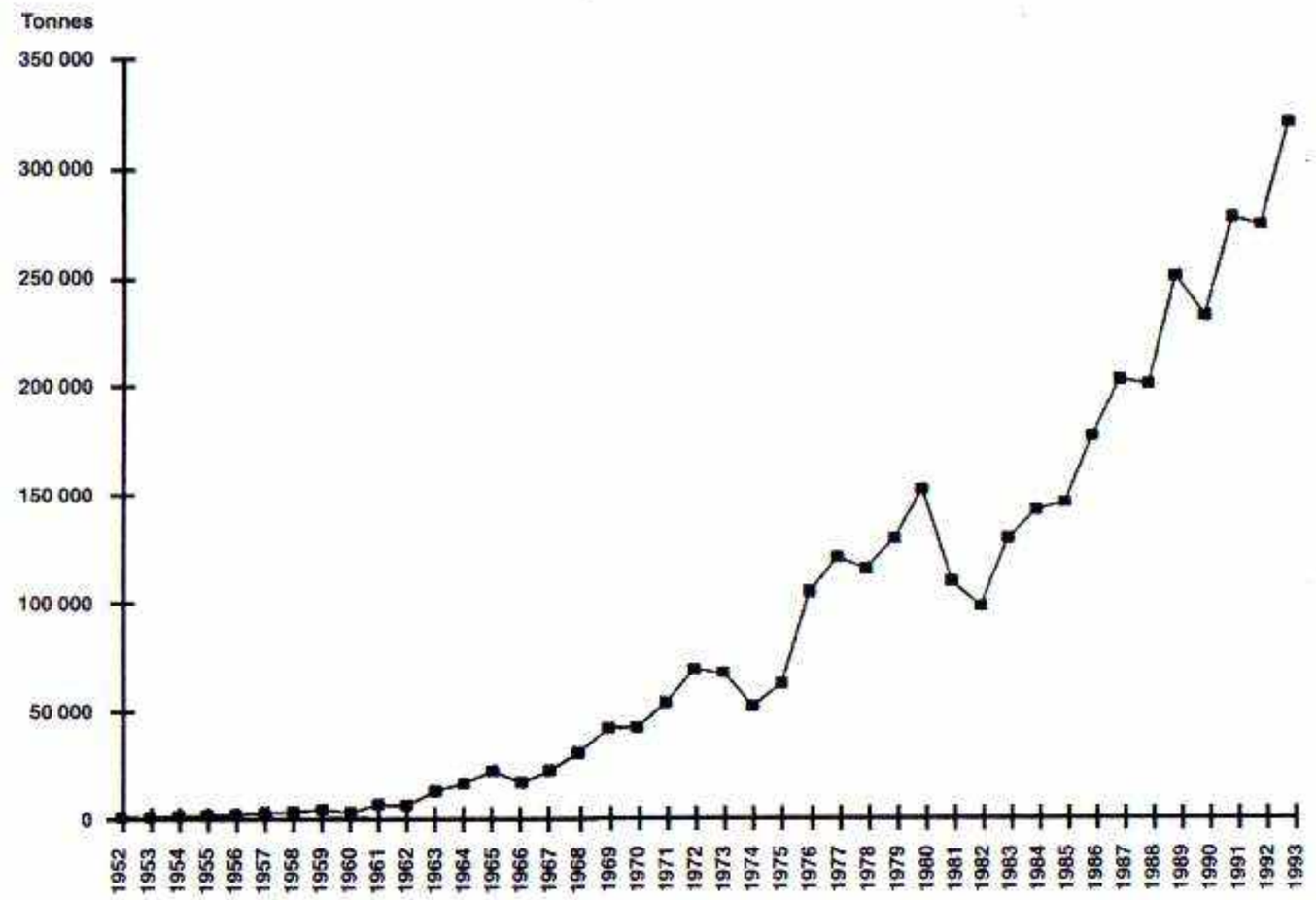
(Figure 1). Animal traction is practiced by more than 75% of farms, with the manufacture of equipment transferred to an association of rural blacksmiths. Village associations (VA) carry out the marketing of 80% of the zone's cotton production.

These achievements have been highly applauded by some (Braud, 1989; World Bank, 1988), while other authors discuss their limits (Freud, 1988; Kleene et al., 1989; Amselle and Benhamou, 1985; Le Roy et al., 1991) or denounce their negative effects (Sy, 1981; Van der Pol, 1990). The lack of a global understanding of the cotton system that would encompass both positive and negative aspects is evident. By "cotton system," we refer here to the set of actors involved in all activities linked to cotton production and its valorization, in both operational and institutional senses.

Our research seeks to provide a framework for this global understanding. We first propose a hypothesis to explain the evolution of the cotton system, and then test this hypothesis by examining the historical facts of evolution over nearly a century. Finally, we attempt to show the relevance of this framework to the domain of agricultural policy.

FIGURE 1
Evolution of cotton grain production in Mali (based on annual reports of the CFDT and the CMDT).



HYPOTHESIS: CONTRADICTIONS AND RESOLUTIONS AS THE DRIVING FORCE FOR THE EVOLUTION OF THE COTTON SYSTEM

The hypothesis that we propose is that the evolution of the cotton system is the result of the successive appearance of contradictions in the interests of the actors involved ("contradictions") and solutions that either emerge or do not, to solve those contradictions ("resolutions"). By "contradiction" we mean a failure to satisfy the interests or objectives of particular actors at a given time, in a given situation. In other words, the fact that A seeks to satisfy his or her own objective can prevent B from satisfying his or her objective, and vice versa. It follows from this that the existence of a contradiction implies the corresponding existence of an obstacle that prevents each actor from satisfying his or her desires. By "resolution" we mean the emergence of a new situation in which each actor can pursue his own objectives (Champagne, 1982).

However, not all contradictions are necessarily resolved. The dynamics of the system consist of advances and retreats, with a given advance not necessarily prevented by a prior retreat, nor a given retreat necesarily determining a hypothesis about the possibilities of the next advance. Furthermore, there is no single solution to a given contradiction, because any solution judged to be acceptable becomes a "resolution." Indeterminism is thus the first rule of a dynamic system. The solution chosen is acceptable but not optimal; it does not protect against the emergence of subsequent contradictions (Crozier and Friedberg, 1981). It is this fact which gives the dynamics their own momentum for subsequent evolution. This is especially true in situations where there are two sets of actors, one set which has not been perceived by the second set who were at the origin of a prior resolution, with first set not having been associated with the prior resolution. In these situations, the first set takes advantage of the new situation to make themselves become visible, by creating an obstacle sufficiently obvious that their interests must be taken into consideration by the second set.

Our approach does not involve the evaluation *per se* of agricultural policy. However, it takes into account the shocks that certain actors receive from the implementation of these policies, through the introduction of new production technologies, or the providing of new opportunities. These shocks cause the affected actors to attempt to have the value of their roles better recognized, and to demand compensation for their roles due in return. Agricultural policy thus is itself one of the causes of the dynamism of the cotton system.

Following our hypothesis, reality observed at any given time is the direct result of solutions that either appeared or did not, to prior contradictions. Reality contains the seeds of evolution in the form of latent contradictions. The identification of these

latent contradictions is thus an important element of the diagnostic phase prior to any policy formulation.

THE HISTORY OF RESOLUTIONS OF CONTRADICTIONS IN THE COTTON SYSTEM

The cotton system was in existence long before the arrival of the French in the country formed from the former French Soudan, now called Mali (Vuillet, 1925). However, it was only after colonization that the pre-colonial system would first experience exogenous shocks.

One half-century of disregard of farmers' interests

The inadequate supply of cotton on the international market following the American Civil war provided the first incentive to diversify sources of supply and to consider production in French colonies (Poulain, 1863), without government actually taking the initiative. But it was the spectacular development of the American textile industry in the second half of the 19th century, with as its immediate consequence the reduction of the exportable surplus of American cotton, which launched the cotton adventure for many European colonial powers.

In the former French Soudan, the governor-general of Trentinian in 1865 instructed his local administrative personnel to pay attention to local cotton production (Mademba, 1931). The policy of cotton development in Mali began from this date.

Starting in 1898, policy changed from the exploitation of local cotton to the stimulation of the production of cotton with specified characteristics, reflecting industrial requirements for a minimal fibre length. This change brought the local cotton system into contact with the promotors of African cotton, consisting of industrialists, investors, and officials of the colonial or metropolitan power.

The absence of a defined strategy and competition from the local market kept farmers from following the objective of production for export. Given the market prices administered by the colonial power, cotton production was considered to be forced labor in the eyes of the farmers (Henry, 1925).

Faced with this contradiction, the colonial government made cotton production obligatory in 1912 (Schreyger, 1984), but the amount exported continued to be low. The strengthening of coercion suggested by the industrialists involved (Freud, 1988) had no effect, demonstrating the ability of actors to resist, even when faced with governmental power.

This failure led the promoters of African cotton to become favorable to the alternative of irrigated production, lauded by Belime (1931), and led to the establishment of

the *Office du Niger* [Niger River Bureau]. This attempt at a different solution did not produced the desired results: production of irrigated cotton grain never exceeded 10,000 t and would disappear in 1968.

The failure to obtained expected results on the one hand, coupled with increased supply on the international market at the beginning of the 1940s on the other hand, due to technogical improvement, removed all interest on the part of French industrialists in the promotion of Soudanese (or Malian) cotton. Heightened competition in the textile market meant that the price of raw cotton became more important than its origin. That could have finished the development of cotton in Mali if its development had not been revealed to be the solution to a new contradiction.

A virtuous dynamic and its pitfalls

The percentage of France's trade deficit attributable to cotton (imported in costly dollars at that time) during and after the Second World War was about 20% of the total deficit. This convinced the administrative powers of the importance of production in the colonies. Moreover, the implementation of economic and social development plans in the colonies, for which recurring costs should have been borne by the colonies themselves, made necessary the development of taxable activities. In the former French Soudan, where agricultural activities predominated, only cotton seemed to have the potential, due to its high value per unit weight, for supporting its transport costs (Présidence du Conseil, 1954).

It was this observation which led to the creation of the *Institut de recherches sur le coton et les textiles exotiques* (IRCT) [Research Institute on Cotton and Exotic Textiles] in 1946. This was followed by the *Compagnie des textiles de l'Union francaise* [French Union Textile Company] in 1949, which was renamed a year later the *Compagnie française de développement des fibres textiles* (CFDT) [French Textile Fiber Development Company].

To the CFDT's credit, it learned its lessons from past failures and developed a strategy (Figure 2). By taking into account farmers' interests, this strategy built relationships based on trust, increased production and tax revenues, and facilitated the obtaining of financial support.

The implementation of this strategy did not, however, mean that no new contradictions would arise again. The modernized agriculture introduced by the CFDT began to pose management and maintenance problems starting in the middle of the 1960s. The reduction in the returns expected from investment in equipment, due to frequent breakdowns and delays in repair, did not encourage farmers to invest in capital. This is in spite of the fact that capital is supposed to be an important factor in increasing produc-

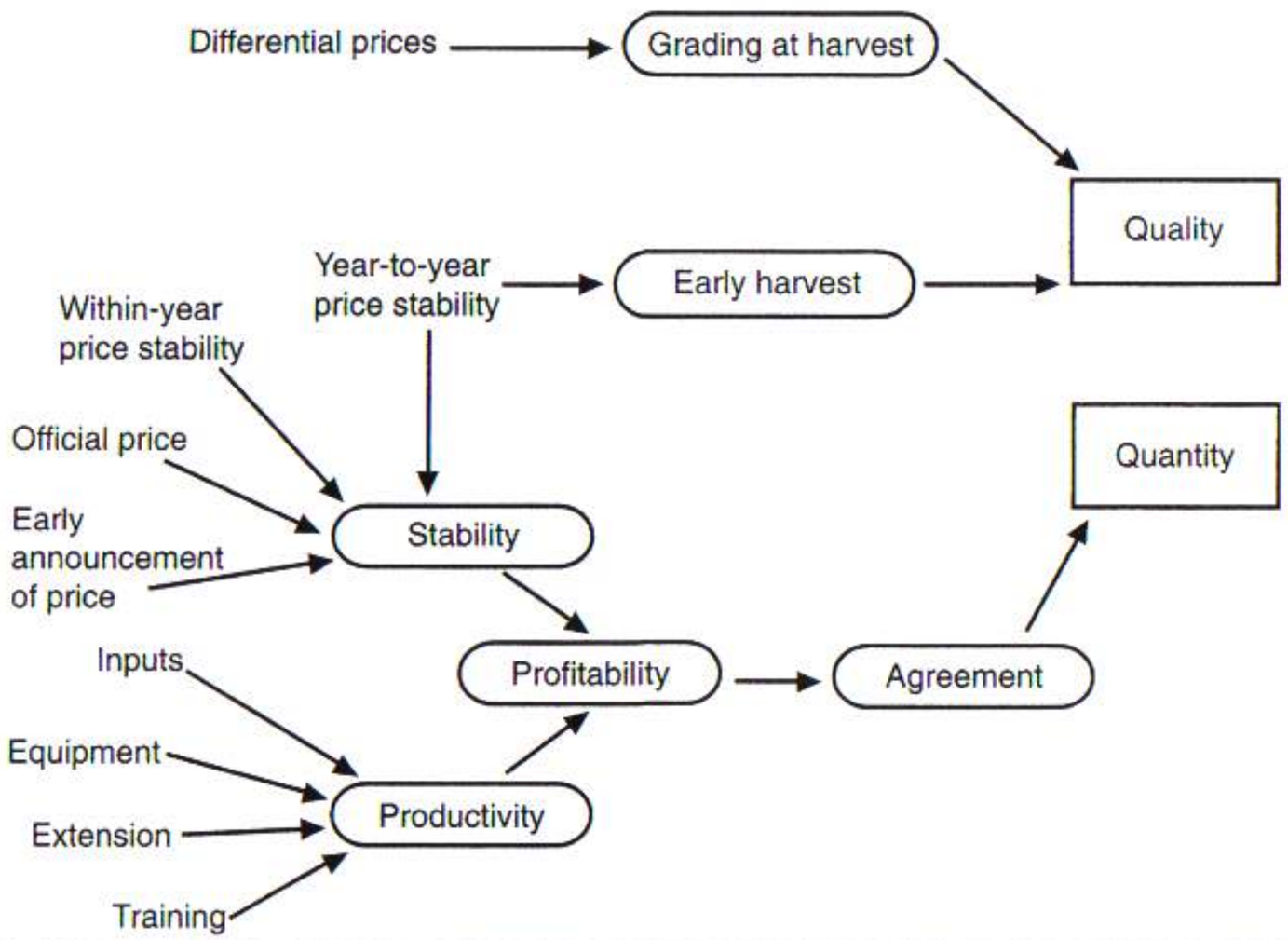
tivity, which allows for the stabilization and indeed strengthening of the farmer's commitment to cotton production.

The solution to this contradiction was not immediate. Establishing more local warehouses with complete sets of spare parts was still inadequate for reaching farmers. Having a small truck filled with necessary spare parts circulate on weekly market days did not meet farmers' needs between market days.

It was only after these two failed efforts that the idea surfaced to train village blacksmiths to make certain spare parts and manage local stocks of other parts. This was the beginning of what would become the professionalization of the rural world. This example provides evidence of the role of collective apprenticeship (with a trial-and-error period and adequate time) in the creation of an innovative, successful solution.

The implementation of the CFDT's strategy brought real results to farmers in terms of increased monetary revenues. This resulted in a kind of power reversal between farmers and extension agents.

FIGURE 2
The strategy implemented by the CFDT (CFDT, 1952).



However, new contradictions soon appeared. The retention of a "right to correctly produce cotton" in the distribution of inputs, management of agricultural credit provided to illiterate peasants, and the responsibility for the improvement of the quality of cotton (for which a price differential was applied) conferred considerable power on supervisors. Some of the supervisors abused this power by seeking personal gain at the expense of farmer producers' income. Such cases of embezzlement were denounced during the 1973-74 season and damaged the trust that had been painstakingly built between the farmers and officials.

Faced with this new contradiction, a local agent put forth the idea of transferring the management of credit and the marketing of grain-cotton to villagers who would be trained for this purpose. This idea became a reality with the creation of the first Village Association (VA) in 1974-75. This innovation captured the interest of farmers, conscious of the advantage of being independent of a third party in matters that directly affected their incomes. The VA was a dynamic innovation, but at the same time it was the fruit of a crisis. Its appearance could be explained as the result of the necessity for the CMDT (which took over from the CFDT in 1974-75) to regain the confidence of the farmers. The CMDT saw the VA as a way of regaining confidence and promoting cotton production through a village training program, and donors found that the approach embodied their principle of participatory development.

Outside observers called the VA a success, but it was no more than the externalization of a service through the voluntary acceptance by villagers of the costs of development. The appearance of the VA led to the formation of a new administrative structure called the *Zone d'animation et d'expansion rurale* (ZAER) [Rural Animation and Expansion Zone], regrouping many VAs with the objective of transferring even more responsibilities to farmers. The acceptance of this objective by donors enabled the CMDT to obtain the financial means to implement the second phase of the Southern Mali project.

Among the responsibilities transferred to villagers was the collection of production statistics. Data would first be collected at the individual farm level by a young farmer who had completed an adult literacy program in the local language. The data would then be assembled at the village level by village technical teams of each VA. The fact that not all farms had a young person who had been through the adult literacy program caused the responsibility for collecting the data to fall back on the technical teams who in turn complained, seeing their workload increase (CMDT, 1989); village leaders also noted this consequence for the technical teams.

The CMDT quickly reached an agreement with village leaders to increase the marketing bonus for cotton in VAs grouped into a ZAER to compensate for their extra work, but it did not get involved in how the bonuses would actually be redistributed

within the villages. This solution pleased the villagers who saw collective revenues increase rapidly. It had the effect of silencing the open dissent among the youth and the technical teams, a group of actors that had not been recognized by the CMDT, but it has not eliminated their passive protests. The ZAER approach seems to be marking time; the youth neither seem eager to go through the adult literacy program nor to be trained in the collection of statistics (CMDT, 1993). Dissatisfaction with the salary received and the refusal of the traditional leaders, the elders, to share the revenue with them (IMRAD, 1991), are at the roots of their dissatisfaction. There is a blockage caused by non-recognized actors demanding recognition.

Dissatisfaction with the lack of willingness of traditional villagers leaders to share the bonuses is by no means limited to the youth. The concentration of new forms of power resulting from the operation of the VAs is at the base of heated disagreements that ultimately have led, at increasing rates, to the breakup of one VA into smaller units.

FACTORS THAT WILL DETERMINE THE FUTURE EVOLUTION OF THE COTTON SYSTEM

In 1992 farmers attempted to boycott the marketing of cotton, and the formation of the *Syndicat des producteurs de coton et de vivriers* (SYCOV) [Cotton and Food Crop Producers Union] provided a strong voice for their demand. The same year, workers in the cotton ginning factories went on strike, protesting against the priority given to farmers within the CMDT. These events were certainly encouraged by the political context [of the democratic revolution of 1991, a popular uprising, supported in the end by young military officers, that overthrew the one-party dictatorship of 23 years — editor's note], but they also attested to the existence of major contradictions present in a latent state. These latent contradictions are factors that will determine the future of the cotton system.

It is clear that in the formulation of agricultural policy, one should aim for the most comprehensive identification possible of these factors, to obtain a more accurate picture of the reality at a given point in time. We present here some of these contradictions, which have been treated in a more complete manner elsewhere (Fok, 1993).

The contradiction between the objectives and economic signals of policy decision makers

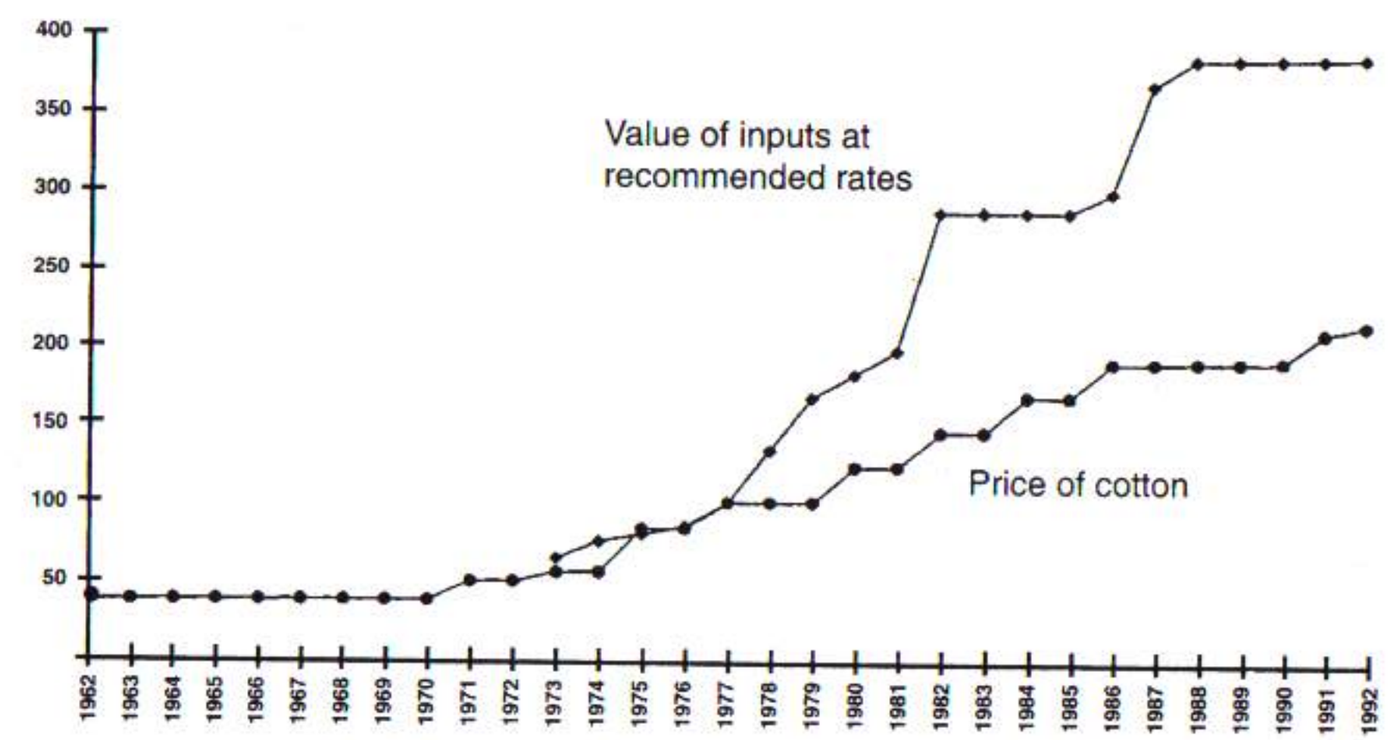
This contradiction is most evident in the proclivity of policy decision-makers towards crop intensification. This proclivity reflects their desire to increase land productivity to maximize returns to the crop as well as their desire to reduce soil mining.

However, this proclivity masks the ngeative effects of a declining ratio of cotton sale prices relative to production input prices (Figure 3).

If one accepts that the principal objective of farmers is to increase labor productivity (Campagne and Raymond, 1993), increased land productivity constitutes but one means to that objective, a means that can just as quickly be abandoned if it appears too costly. In this context, a reduction of input subsidies becomes an increase in the relative price of inputs to farmers. The farmer responses of increasing land area in cultivation, and/or extensification achieved through increasing the workload required of the family labor force (CDMT, 1991; Berkmoes et al., 1990; Fok, 1993), are therefore rational.

It is the decision makers who have established the principle of reducing input subsidies, and ultimately eliminating them. However, the farmers' adaptation to this leads to increased soil mining, a result contrary to the stated objectives of the same decision makers. A contradiction clearly exists between the proclaimed objectives of policy decision makers and the economic signals that they send, signals which do not take into account the economic rationality of farmer producers.

FIGURE 3
Evolution of indices of inputs and outputs in cotton production (1977=100).



Antagonism between short- and long-term objectives

This antagonism is manifested in the implementation of programs designed to preserve the sustainability of the farming systems of the region.

No effort is spared to assure sustainability. Four donors are independently financing programs which are very similar in their approaches and content (assessing the degree of degradation, increasing farmer awareness, providing technical assistance for farmers to carry out collective and individual activities). Yet, one sees both the demise of collective activities, due to delayed results, organizational difficulties (CDMT, 1988), and conflicts of interest (Leener *et al.*, 1992), at the same time as individual activities are also declining. All this indicates that there are few shared objectives among actors within the rural community, which makes the chances of success for collective activities questionable at best (Crozier and Friedberg, 1981). Funds invested in efforts which in essence simply attempt to increase awareness without providing any monetary incentive are wasted, because it is basically futile to attempt to modify the strategies of farmers faced with the problem of sustainability.

Survival in the short-term constitutes the best guarantee for long-term sustainability, as Ndione eloquently puts it (1992): *"In fact, life is like an immense pasture where one goes to collect all that allows itself be collected, that is, to search for all which can support life in the present or serve as a stock of forage for later."*

What therefore seems essential, is to find ways to make activities that support the sustainabilty of agriculture compatible with the need to survive in the present.

The types of activities currently being promoted are not truly congurent with such compatibility. To neglect work to make time available for collective actions that will have a delayed effect on income (such as certain anti-erosion techniques, for example) can be perceived as contrary to the improvement of income in the short term. The difficulty in protecting a "forage reserve" that is created to keep other actors from having access to its forage (as is the case in the forest part of village land) will not encourage the creation of other such reserves.

The provision of mechanisms that can make the objective of land management appear feasible in the eyes of the actors involved, is definitely one of the major challenges for collective innovation within the cotton system.

Passivity in the face of the restructuring of rural households

The disintegration of rural households is not really only a recent phenomenon, but recent studies suggest that it is becoming more pronounced.

The increased recourse to family labor, without payment considered equitable by its "active members" [*actifs*: a term widely used in Mali to refer to members of a household of working age — editor's note] creates in these members a feeling of being exploited, and encourages dissension within the production units [*unité de production*: a term used in Mali to refer to an extended family household, usually containing several subfamilies, including subfamilies formed by polygamous marriage, managing common agricultural land to produce a common supply of basic food staples — editor's note]. Table 1 shows the importance of household disintegration as a cause of the creation of new households in five regions of Southern Mali.

TABLE 1
Creation of new farms in the CMDT zone (source: CMDT, 1991).

Region	Number of New Farms		
	Total	By breakup	By migration
Fana	943	51	49
Bougouni	586	75	25
Sikasso	1,204	61	39
Koutiala	488	75	25
San	711	90	10
Total	**3,932**	**69**	**31**

Without making any normative judgment about this phenomenon that can also be seen in other types of farming systems besides the cotton-based system, the consequences for the efficiency of the entire cotton network are worth examining.

The breakup of a farm is most often accompanied by an unequal division of the factors of production between the parent household and its affiliate(s). The parent household most often finds itself lacking the labor needed to valorize all the equipment which it receives at the time of scission, while the affiliate household lacks the equipment to valorize the technical knowledge of recommended cotton production practices that it has acquired (CMDT, 1991). The increasingly unfavorable ratio of input and output prices retards the process of accumulation (Campagne and Raymond, 1993), so that the demand for equipment from the new households becomes more difficult to satisfy. The lack of awareness of this problem risks wasting human capital represented by the youth who have challenged their elders. This has a negative impact on productivity, and thus on the competitiveness of the entire network, yet it is precisely this competitiveness which must be increased if the system is to be able to respond to prices on the international market.

CONCLUSIONS

The framework that we have presented here for an analysis of the evolution of the cotton system is based on a systems approach centered on analysis of relationships between perceived actors. Examination of the historical record using this framework has shown that the cotton system has evolved through a succession of contradictions and their resolutions.

This succession is neither determined nor inevitable, but it is rather the result of the way that solutions are implemented. When the context was conducive to collective apprenticeship, the resolution of contradictions was achieved through solutions that resulted in the professionalization of the rural world and in new organization of the village. These solutions both represent real progress, and confirm that there is a strong internal capability for the creation of new responses to adapt to a changing environment.

The implementation of these solutions has caused the cotton system to continue to evolve, generating new contradictions that must be resolved. This thus brings us back to agricultural policy. Our hypothesis that the evolution of the cotton system is the result of contradictions and resolutions, indicates the importance of the identification of these contradictions for proposing solutions to real problems, and illustrates the relevance of the systems approach to policy formulation.

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Section II

Empirical assessments of micro-level policy impact

SECTION CONTENTS

INTRODUCTION

In this section, following the examination at the macro level of the effects of policy evolution, we examine three empirical studies of the micro-level effects of specific agricultural policy change, in Syria in West Asia, Burkina Faso in West Africa, and Cameroons in Central Africa. The authors present different concrete methods to examine the relationship between policy changes and productivity in the agricultural sector. This relationship can be characterized as one of a loop of mutual feedback: not only do changes in agricultural policy influence sector productivity (a given objective of policy), but also changes in sector productivity have implications for agricultural policy. The papers in this section document the forward side of this relationship through modelling, and then draw conclusions for the latter, less obvious half of this feedback loop.

In the first paper in this section, the authors simulate the effects of agricultural policy changes on the production of barley and the livestock population in northwestern Syria. A systems policy model is used to characterize the economy of barley and livestock production. The specific agricultural policy discussed is the government subsidy of fertilizer used on barley, and the progressive removal of this subsidy which has been implemented since the late 1980s. The model incorporates rainfall magnitude and variability simulated over 1,000 seasons, barley fertilizer response in grain and straw (the latter in turn an input into livestock production), livestock weight gain, and input

Cover Photos:
(Top to bottom, from left to right)

1. Cotton, a key cash crop in West Africa with policy implications for food crops and sustainability as well as rural income (Opération Haute Vallée du Niger [OHVN] Zone, Mali)
2. Women's groundnut / sorghum planted in association, important as a source of family food and an example of women's activities outside cash crop-based credit mechanisms that non-traditional mutual credit can support (OHVN Zone, Mali)
3. Crop-animal interactions with implications for sustainability: livestock feeding on crop residues (OHVN Zone, Mali)
4. Household gardens, a key element in village-based agriculture in West Africa (OHVN Zone, Mali)
5. Transplanting of rice, the basis of family food security and focus of labor sharing and village cooperation in Southeast and East Asia (Ilocos Norte, Philippines)
6. Cooperation, a basis for developing group-based approaches for increased farmer participation: land preparation by buffalo in Southeast Asia (Ilocos Norte, Philippines)
7. Cooperation in natural resource use: animal manure collected from livestock farms for upland crops (Tohoku, Japan)
8. Transition on vulnerable farms: vegetables on an uplands mixed crop-livestock farm (Virginia, United States)

(All photographs taken by the senior editor)

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