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Promoting sustainable intensification and productivity growth in Sahel agriculture after macroeconomic policy reform[1]

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Policy reforms and structural adjustment programs in Sahelian countries have eliminated many public agricultural support programs, creating a vacuum that has not yet been filled by the private sector. Sahelian farmers thus face more difficult access to inputs and higher input costs. Input use has stagnated or declined, yet higher population and less land for expansion of cultivation make it vital to increase the productivity of already cultivated land through adoption of intensive agricultural production techniques. While partial intensification is becoming common, too little investment is occurring in inputs and land improvements that maintain soil fertility, control erosion, and improve water availability. Partial intensification therefore risks being an unsustainable strategy. Higher and more sustainable productivity growth requires significantly increased use of chemical and organic fertilizer, improved seeds, bunds, and animal traction. The dilemma is how to ensure that such investments are financially and economically profitable and affordable in terms of government budgets. It is crucial to: (1) improve input access and reduce the unit cost of inputs to farmers through infrastructure investment; (2) increase the productivity of fertilizer and improved seed by encouraging complementary farm-level investments; (3) improve the coordination of input and output marketing systems, and improve incentives for private sector involvement; (4) improve farmers' ability to buy inputs using credit and non-

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farm income; (5) reduce the financial risks of purchased input use through integrated input/output markets and innovative credit schemes; and (6) evaluate the net economic benefits of selected agricultural support programs, including input subsidies. © 1997 Elsevier Science Ltd

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Growing land constraints, weak productivity growth: the intensification challenge

The Sahel[2] is passing from land abundance to land scarcity, owing to rapid growth of population (around 2–3% a year), slow growth of agricultural productivity (around 0.6% a year)[3] in the main food crops, millet and sorghum, and expansion of cotton production. Binswanger (1986) classified parts of the Sahel along with Bangladesh in the group of developing countries that are most densely populated in terms of persons per unit of "carrying capacity", a standardized unit of land. Even the Guinean savannah, a more favorable agroclimatic zone in the southern part of the Sahel, is undergoing rapid increases in population density, in part because of rapid migration in the 1980s and 1990s from the drier, northern zones (Savadogo *et al.*, 1994). Some areas along rivers were opened up to farming in the 1980s after eradication of onchocerciasis (river blindness).

As a result, Sahel farmers are increasingly unable to meet growing food and fiber demand by "extensifying" (cultivating new land). Instead, they must "intensify" by using more labor and non-labor inputs per hectare of land, seeking to increase yields. It is therefore important to understand not only what patterns of intensification are currently being followed by Sahel farmers, but also what pattern of intensification is desirable, i.e., sustainable agronomically, profitable financially and economically, and able to meet soaring food and fiber demand.

Sahel farmers' use of improved inputs and equipment (such as fertilizers, fungicides, improved seed, animal traction and organic matter) was lower than in most other developing areas in the 1970s. In most Sahel countries the use of these inputs stagnated or declined during the 1980s and 1990s, when macroeconomic policy reform and structural adjustment programs designed to eliminate fiscal deficits led to deep cuts in fertilizer, seed, equipment, and credit subsidies and public distribution programs. Those cuts raised input prices and led to reduction or stagnation in farmers' fertilizer use. FAO (1997) data for total fertilizer consumption (covering nitrogenous, phosphate, and potash fertilizers) for Burkina Faso, Mali, Niger, and Senegal during 1985–94 show strong inter-year variation, but growth rates over the period that are fairly flat or negative: − 6.8% per year for Burkina Faso, 0.6 for Mali, − 10.3 for Niger, and − 0.3 for Senegal.[4] 1994, the year of the devaluation of the CFA franc, brought a large drop in fertilizer imports in all countries. The annual growth rate using a regression on only 1985–93 gives more positive results for some countries: 5.5% for Burkina Faso, 2.7 for Mali,

[2]The "Sahel" here is considered as the West African political grouping of countries in the CILSS (Burkina Faso, Cape Verde, Chad, The Gambia, Guinea Bissau, Mali, Mauritania, Niger, and Senegal).

[3]We used FAO (Food and Agriculture Organization of the United Nations) data by crop to calculate growth rates in labor yields (national output per agricultural worker) and land yields (output per hectare cultivated) over 1961–91 for Burkina Faso and Senegal. We fit linear functions of yields to time trends. For Burkina Faso, annual rates of growth in land yields were 1.7% for maize, 0.7% for millet/sorghum, and 3.8% for cotton. For Senegal, the land yield growth rates were 1.6% for maize, 0.6% for millet/sorghum, and negligible for peanuts. In general, land yields grew more quickly than did labor yields.

[4]We used a regression of the form $F_t = (1 + g)^t F_0$, which gives $(F_t/F_0)^{(1/n)} = 1 + g$.

– 9.2 for Niger, and 2.2 for Senegal. There were some spectacular declines, such as in Niger, where fertilizer use declined by over 50% from 1985–90. Moreover, when one compares fertilizer use in the major consumer (Senegal) between 1975 and 1990, one finds a decline of 11.5%. Moreover, constraints to access to fertilizer have limited supply response after devaluation in various product subsectors in the Sahel (Le Vallée and Staatz, 1997).

The stagnant or declining trend in fertilizer use is emblematic of the situation for all improved inputs, and has troubling implications for long-term trends in soil fertility. For example, farmers have also experienced reduced access to organic matter, in particular manure, because of decreased pasture area in the Sahel and a decline in transhumance of cattle to the Sahel from the south.

It appears that private sector distribution of fertilizer has not yet filled the void left by government's withdrawal from the fertilizer market. Bezuneh *et al.* (1996), and Dembele and Savadogo (1996) found that fewer farmers are covered by private fertilizer markets than were covered by public programs before reduction or elimination of the latter. Dembele and Savadogo suggest that two key problems discourage the private sector from assuming a fertilizer distribution role in the short to medium run. First, compared to the government parastatal, the private sector at present is less able to reduce the risk associated with fertilizer transactions through geographic pooling or interlinking the input and output markets and providing credit. This limits farmers' access to inputs. Second, private merchants lack technical knowledge about fertilizer types; marketing of inappropriate formulas results in little effect on yield, leading in turn to farmers' loss of confidence in fertilizers and hence reduced use. Speirs and Olson (1992) note that private merchants found little commercial incentive for fertilizer distribution in less-accessible areas and outside of cash-crop zones. We also hypothesize that demand-side constraints due to low expected profitability at the farm level (discussed further below) also undermine the successful take-off of private fertilizer marketing.

In this article, we discuss recent field survey evidence concerning the nature of intensification in Sahel agriculture, pointing to both failures and successes. We then discuss the policy implications and conclude with a set of recommendations for action.[5]

Focusing on farm-level evidence: drawing lessons from failure and success in intensification of Sahel agriculture

Partial and unsustainable intensification strategies: illustrations from Senegal

Adoption of production techniques that "mine" soil fertility (a common strategy in Sahel agriculture, see Speirs and Olson, 1992) may be a rational short-term response to current prices and market conditions, but it is unlikely to provide significant productivity gains or be agronomically sustainable over time. Many field studies show that where improved inputs are not used, it is either because farmers lack access to them or because improved input use is not justified, in terms of profitability and risk, under current agronomic and economic conditions. With high implicit discount rates, farmers are choosing production techniques that have a

[5]The studies were collaborations involving Michigan State University; the Institut Sénégalais de Recherches Agricoles, Senegal; the Institut d'économie rurale, Mali; and the Université de Ouagadougou, Burkina Faso. The studies used primary data from surveys of rural households in the 1980s and 1990s. The empirical results and conclusions are discussed in more detail in Diagana *et al.* (1995, 1996); Gaye and Sène (1994); Dioné (1989); Kelly *et al.* (1996); Savadogo *et al.* (1994, 1995); and Reardon *et al.* (1994a, b); Reardon (1997).

short-run payoff, rather than investing in something (land improvement; phosphate fertilizer application) that gives returns further off in time.

The Peanut Basin of Senegal provides a telling illustration of farmers' soil mining as a response to two things: (1) decreases in expected profitability of improved input use due to changes in subsidy and credit policies in the 1980s; (2) a risky and deteriorating physical environment, the result of low and variable rainfall, as well as decades of continuous peanut/millet cultivation with limited use of fallow, organic matter, and chemical fertilizers.

Following the sharp drop in fertilizer consumption during the 1980s, farmers began increasing peanut seeding densities to improve yields and incomes, at least in the short run, and to compensate for the declining soil quality which they believed was slowing down the growth of peanut ground cover and therefore causing weed problems. The practice has become widespread; survey data show that many farmers are using more than twice the recommended quantity of seed per hectare.

Although raising peanut seed density appears to be a logical short-run solution (Kelly *et al.*, 1996), agronomic research suggests that it is not a sustainable practice (Gaye and Sène, 1994). Without supplementary fertilizer and organic matter, increased seeding densities will not only lead to further soil mining but also undermine seed quality over time—hence a vicious circle.

The 50% devaluation of the CFA franc in January 1994 did not break the vicious circle in the Peanut Basin, mainly because producer prices did not rise sufficiently to offset the increased costs of imported inputs. The government raised producer prices for peanuts twice—a combined increase of 71% over pre-devaluation levels, but less than the 100% increase in the CFA value of the world price. Passing on only a portion of the increase in the export price was a common strategy of Sahel governments after the devaluation for subsectors with strong government intervention (Le Vallée and Staatz, 1997); in general, the strategy is explained as a means to raise revenue to decrease deficits and finance public investments.

Despite the 71% farm-gate price increase, and smaller increases in the cost of peanut fertilizer (47% by May 1995), economic incentives to intensify peanut production with fertilizer remained inadequate in the Peanut Basin. Linear programming analysis (Diagana *et al.*, 1995) shows that the devaluation has not reversed the pre-devaluation problem of low fertilizer use and movement toward higher peanut seeding densities. The analysis shows that the "optimal" (net income maximizing) peanut production technology is to forego fertilizer and increase peanut seeding densities well beyond recommended levels. The lack of incentive for fertilizer use results from the worsening price ratio between peanut and fertilizer prices, and from insufficient liquidity at the farm level for purchase of fertilizer.[6] Diagana *et al.* (1996) note that constraints to access to peanut seed, fertilizer, equipment, and credit have limited the post-devaluation supply response in the peanut subsector in Senegal.

The devaluation also lowered incentives to produce irrigated rice and to use urea in the Senegalese River Basin. On the one hand, the government limited increases in rice prices to only 7% in the year after devaluation (1994–95) to protect real incomes of urban consumers.

[6]For Senegal, Gaye (1992) shows that farmers' demand for fertilizer is more sensitive to changes in output/input price ratios than to net returns. Sharp declines in the ratio in the mid-1980s led to drastic reductions in fertilizer consumed by farmers in the Peanut Basin despite economic analyses showing that fertilizer remained profitable in the southern Peanut Basin with average value/cost ratios greater than 5 (Kelly, 1988). Farmers' reliance on fertilizer output/input price ratios can be explained by the difficulty of estimating net returns for this input which exhibits highly variable inter-annual yield responses. Where farmers' reliance on input/output price ratios does not foster input use decisions that maximize net returns over time, policy interventions may be required to improve the farm-gate appeal.

On the other hand, unlike peanut fertilizer which is produced using large amounts of local phosphates and smaller amounts of imported nitrogen and potassium, urea is entirely imported, and import prices increased 90% due to the combination of the devaluation and changes in world market prices. The increase in urea costs, when combined with smaller but important increases in seed, pesticide, and irrigation costs (primarily imported fuel for pumps), caused net income per hectare of irrigated rice to fall from a pre-devaluation level of 139,000 FCFA to a post-devaluation level of 69,000 FCFA (BAME/ISRA, 1995).

Sustainable intensification strategies with increased productivity: illustrations from Mali and Burkina Faso

Success stories of agricultural intensification in the Sahel can be found where a capacity to invest existed and where macroeconomic policy reforms were supplemented by other government and producer strategies to create the conditions for higher profits and improved input use. First, where the CFA franc devaluation increased *net* returns, and there was an elastic market for the product, there were cases of intensification with increased use of improved inputs. For example, in Mali, there was a rise in the profitability of Malian irrigated rice, whose output price was allowed to rise faster than input costs. Net returns per hectare rose 10–35% according to the zone and level of intensity of input use (Mendez del Villar and Diakité, 1995; Coulibaly *et al.*, 1995). Rehabilitation of infrastructure would allow the system to function more efficiently and profitably. Expansion of this intensified system would require public investment in new infrastructure (e.g., irrigated perimeters).

In the cotton zone of Mali, the net real return to farm output (cotton, maize, sorghum) increased by 14% for the south Sudanian zone and 20% for the north Guinean zone in the first 2 years after devaluation (1994 and 1995). This resulted from higher maize prices, and from the government's decision to "pass through" to producers the higher cotton prices resulting from devaluation gains (unlike what we show above for Senegal's rice subsector) (Kébé *et al.*, 1996).

Second, the presence of cash cropping schemes stimulates farmer investment in improved input use. Farmers are attracted to participate in such schemes because they are profitable, and because the schemes are vertically coordinated, providing both access to inputs and credit as well as a stable market for the output.

Our Sahel case studies show that farmers usually apply the bulk of productivity-enhancing inputs and resource conservation investments to cash crops for these reasons. For example, Savadogo *et al.* (1994, 1995) found in Burkina Faso that the payoff (in terms of marginal value product) to use of animal traction, manure, and fertilizer was much higher (13 times higher in the Guinean zone) on cash crops (cotton and maize) than on semi-subsistence food grains (millet and sorghum). Farmers were much more likely to use capital and inputs on the cash crops, generally cotton and maize.[7]

In Senegal, a liberal credit program from 1960 through 1980 encouraged farmers in Senegal's Peanut Basin to invest in animal traction equipment. The equipment credit program was supplemented by other input policies (fertilizer and seed subsidies and input distribution programs) and output marketing programs (guaranteed prices and markets) that helped farmers earn the level of net returns necessary to reimburse the equipment credit. Adoption was very

[7]Bezuneh *et al.* (1996) also illustrate the case of cowpea produced as a cash crop by farmers in the Sudano-Sahelian zone of Burkina, under an agreement with the multinational Nestle. The assured market for the output was an incentive for farmers to invest in intensification inputs aimed at reducing unit costs through yield enhancement.

high during this period, so that virtually every farmer in the Peanut Basin now uses some form of animal traction. Nevertheless, since the mid-1980s the share of farmers in the Peanut Basin with no traction equipment has risen from 4 to 8% (Gaye, 1996).

Dioné (1989) found for Mali that cotton cropping increased the ability of farmers to buy inputs for maize cropping. Through the cotton scheme, farmers had access to credit to buy animal traction equipment, which increased the productivity of cotton *and* of maize production. The cash income generated from cotton farming also allowed for purchase of maize inputs.

Third, non-farm activities and livestock husbandry can generate income for investments in improved farm inputs, particularly where financial markets function poorly and thus alternative cash sources are needed. With the withdrawal of public credit institutions, the need for such non-cropping income sources has increased in the past decade.

For example, in the Guinean zone of southern Burkina Faso, where agroclimatic conditions are good, Savadogo *et al.* (1994, 1995) show that non-cropping earnings (mainly from local and migratory non-farm activities and from livestock sales) are reinvested in expensive animal traction packages. Non-cropping income (controlling for farm size) was an important determinant of animal traction adoption in this zone because credit was not generally available. Reardon and Kelly (1989) show that fertilizer use is positively related to non-cropping income in the Sudanian zone of Burkina Faso, but not in the Guinean zone where the presence of SOFITEX (the cotton parastatal) makes fertilizer available to farmers regardless of village location and household cash sources.

In Senegal, Kelly *et al.* (1996) show that non-cropping income is used to purchase tools and (in some areas) fertilizer, to repair animal traction equipment, and to obtain peanut seed. The source of non-cropping income appears to influence the method of peanut seed acquisition. Those with large shares of livestock income tend to use the income for down payments to obtain peanut seed credit. Credit permits these farmers to keep more of their wealth in livestock during the cropping season, rather than using it to buy seed. This spreads risk across different farm activities. Those with large shares of non-cropping income are more likely to purchase peanut seeds for cash, by-passing the deferred payment option associated with credit because the peak period for non-cropping liquidity is at the end of the dry season rather than at the end of the rainy season.

Implications for the policy and research agenda

An unfortunate consequence of macroeconomic policy reform and structural adjustment for farmers in the Sahel is reduced access to inputs and higher input costs. This has resulted in a stagnation or decline in improved input use, except in areas such as the cotton and rice zones of Mali where profitability and access to inputs have been assured. The trend toward declining input use comes at precisely the time when higher population and less land available for expansion of cultivated area in the Sahel create a need for intensification to increase the productivity of already cultivated land.

While partial intensification is already common, e.g., in the form of reduced fallowing and increased use of labor and seed per hectare, too little investment is occurring in inputs (fertilizer, manure) and land improvements (bunds, tied ridges)[8] that maintain soil fertility, control erosion, and improve water availability. Partial intensification therefore risks being an unsustainable strategy over the long run.

[8]See Sanders *et al.* (1996).

Higher and more sustainable productivity growth requires significantly increased use of chemical fertilizer and manure, improved seeds, animal traction, soil conservation and water retention methods (bunds, terraces, windbreaks, mulch). The nature of these investments will, of course, need to differ between the fragile zones of the northern Sahel, where little intensification can be supported, and the southern zones where soils are more fertile and the potential for intensification much greater (Matlon, 1990).

Macroeconomic policy reform was necessary but not sufficient to create the conditions for these investments. It will not be fiscally sustainable, however, to redress the constraints to access to inputs, and to raise expected profitability, by a return to expensive government support programs. Instead, we advocate a "middle path" between fiscally unsustainable government outlays and complete government withdrawal from support to agriculture. Nevertheless, this middle path requires substantial public and private investment in agricultural research, human capital, and production and market infrastructure. This will mean identifying cost-effective measures to increasing access to inputs, by improving the delivery of inputs and enabling farmers to acquire the means to pay for them. The benefits and costs of each measure will have to be examined within the particular country context. Although more analysis of this type needs to be done, as Donovan (1996) notes, we believe there are promising general lines of action to explore. The six actions discussed below are designed to increase farmers' access to improved inputs, to increase the profitability of improved input use, and to reduce the risk of using improved inputs.

Action 1: reduce input costs

It is necessary to reduce the unit cost of inputs to farmers through public and private (collective) investment in infrastructure. A key way to do this is to reduce transport costs and improve the quantity and quality of rural infrastructure. For example, a study of potential impacts of devaluation in Burkina Faso by the Prime Minister's Office (1993) shows that fertilizer costs can be greatly lowered through improving the transport system and infrastructure. Moreover, combining programs that meet immediate food security goals with construction of these complementary investments is key: a case in point are local *food-for-work* projects if the community lacks sufficient resources (von Braun *et al.*, 1992). Relief programs could be designed to provide farm inputs and complementary infrastructure rather than just food aid.

Impacts from prices of outputs and inputs must be considered in tandem. If more investment in sustainable intensification is the goal, policy makers must ensure that devaluation does not make "extensive" cultivation more profitable than intensive cultivation. There is a strong risk of this as "modern" inputs tend to be imported and prices will rise with devaluation.

In certain situations, where it is fiscally possible and justified by risk considerations and potential net benefits to farmers and to society, the reinstitution of selected subsidies for fertilizer use and soil conservation investments should be considered (Reardon *et al.*, 1995). Country-specific studies of selective fertilizer subsidies are needed (a taboo subject in the 1980s but a debate that needs to be revisited now). Agronomic research on fertilizer response (particularly the possibility of using locally produced phosphates) needs to be updated, especially as regards long-term effects on soil fertility. Cost/benefit analyses are needed of the subsidy levels that would be required to increase fertilizer use to more agronomically and economically appropriate levels. Both the agronomic and the economic analysis should take into account the risk associated with fertilizer use, to avoid underestimating the costs. Both private and social costs and benefits must be considered.

Action 2: increase input productivity

It is necessary to increase the productivity of fertilizer investments through complementary private investment in water management facilities (e.g., bunds, tied ridges). Complementary investments by villages, NGOs, national governments, and donors in physical infrastructure at the village or regional level can be crucial in facilitating profitable on-farm investments in watershed management. Critical infrastructure includes roads, culverts, and wells. Investment bottlenecks due to lack of such infrastructure need to be identified and addressed. Public interventions that demonstrate to farmers the practical payoff to conservation investments are critical to reducing the perception of riskiness.

Action 3: improve input/output market coordination

It is necessary to encourage the growth of better-coordinated input and output marketing systems, such as those provided historically in cash cropping schemes (Dioné, 1996). We found in our case studies that cash cropping is crucial to both the incentives and capacity for farmers to make productivity and conservation investments in both cash crop and food staple production. Moreover, credit programs organized by cash crop schemes, and cash income from cash cropping, allowed farmers to: (1) acquire fertilizer in Burkina Faso through cotton cropping; (2) acquire animal traction equipment in Mali through cotton cropping; and (3) acquire equipment in Senegal through peanut cropping.

There is a strong need to address fertilizer issues with national programs rather than many disparate programs sponsored by bilateral and multilateral donors. Study and promotion of the fertilizer/lime subsector are needed. The focus should be on constraints to private sector production and marketing of inputs. Government regulations and licensing requirements that inhibit fertilizer imports should be examined and, if need be, eased or eliminated.

Action 4: expand access to improved inputs

It is necessary to improve farmers' access to improved inputs through (1) and (3) above, but also by improving farmers' access to cash. Key ways to do this are promotion of non-farm activities and livestock husbandry. Promotion of small rural non-farm enterprises and employment, especially in the off-farm components of the food system (farm input manufacture and distribution, crop and livestock product processing and distribution, and food preparation and sale) is important for several reasons. Such enterprises can provide farm inputs as well as rural employment. Small-scale agro-industries (such as cereal and pulse processing) increase the demand for crops, and also provide employment for the poor. The income provided by non-cropping activities reduces pressure on the land by relieving households of the need to earn a livelihood entirely from farming. Non-cropping income can be an important source of cash for farm investments especially where financial markets are limited, as in the Sahel. In the West African Semi-Arid Tropics, non-farm income constitutes roughly one-half of rural incomes, and some two-thirds of cash income (Reardon *et al.*, 1994a, b).

Unfortunately, non-cropping income is poorly distributed and the poor need help to start off-farm businesses or find off-farm employment. Industrial location and small enterprise promotion policies should focus on providing greater non-cropping income-earning opportunities for the poor and in fragile zones experiencing severe land constraints and soil degradation. In agroclimatically more favorable zones where agriculture is more dynamic, such policies could promote non-farm enterprises linked to agriculture (Reardon *et al.*, 1994b).

For example, in Senegal, Kelly *et al.* (1996) recommended programs promoting animal traction equipment manufacture and repair, processing of peanuts and cotton, and livestock

feeding enterprises that sell manure and hides for local processing. There is a need to reassess the state of animal traction equipment and repair in areas that had successful equipment introduction programs in the 1970s; there is a need for new manufacture and repair capacity locally, which can be tied into small enterprise and rural employment programs. The current dilemma in Senegal is that the credit program was halted in the early 1980s and then replaced by a program which made access to credit much more difficult. At the same time, there has been substantial inflation in the cost of factory-made equipment; producers now tend to find this equipment too expensive. This has fostered the production of traction equipment by local blacksmiths who sell their products at a fraction of the price demanded for industrial-quality equipment. The extent to which artisanal production of traction equipment can provide a sustainable solution in the long run needs to be examined quickly, as the current stock of factory made equipment is, on average, more than 20 years old—well beyond the 10–15 year lifetime used in most calculations of depreciation. To spur such activity and an increase in access to animal traction equipment, the government of Senegal has removed the tax on agricultural equipment for the 1997 season.

Action 5: reduce the risks of improved input use

It is necessary to reduce the financial risks of fertilizer use through actions (1) and (2), but also through innovative credit schemes that help share the risk of crop failure. To take advantage of farm/non-farm linkages in areas where non-farm income is reinvested in the farm, credit could be provided for non-farm activities. This is especially attractive given the difficulties of designing economically viable financial institutions that directly fund agricultural projects; the covariate risk problem is at the heart of this difficulty. Note, however, that whether a credit program for a specific crop can be successful depends on the returns, risk, and sustainability of the market for that crop. Successful credit programs are typically associated with high-value crops that have specialized processing and marketing requirements (e.g., cotton, horticulture).

Credit programs that help cushion farmers from risk (e.g., by allowing variable interest rates or rescheduling after bad harvests), should also be investigated. An innovative approach would be to link input use and natural resource management programs, perhaps with the help of extension services. For example, one could tie fertilizer credit to evidence of improved natural resource management practices, such as composting.

The government of Senegal has recently taken innovative measures in the credit domain. It has opened the sharing of the public equity of the National Council of Agricultural Credit (CNCA) to the federation of farmers' organizations (CNCR, or Comité National de Concertation de Ruraux). It is hoped that participation of the CNCR in the credit institution will increase farmers' access to credit.

Action 6: encourage institutional innovations

It is necessary to pursue institutional changes in formulation and implementation of agricultural policies and input/output distribution systems, and to reduce the problem of externalities undermining private incentives to investment. A promising path is the encouragement of producer organizations, such as those for cotton producers and livestock merchants in Mali (Bingen *et al.*, 1995). This approach is spreading in Sahel countries as pressures from farmer organizations to increase access to inputs and credit force a partnership between the state and the farmer organizations. We noted the example of the partnership between the CNCA and CNCR in Senegal. A more general illustration is that in March 1997, the government of Senegal announced the creation of ANCAR (l'Agence Nationale du Conseil Agricole et Rurale, or the

National Agency of the Agricultural and Rural Counsel/Information), an incorporated entity with public equity open to government agencies, farmers' organizations, extension agents, and so on. The goal of the Agency is to provide agricultural advice and information adapted to the needs of farmers.

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