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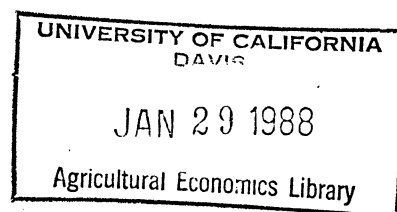
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AGRICULTURAL POLICY REFORM IN BURKINA FASO

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ABSTRACT

TITLE: Agricultural Policy Reform in Burkina Faso

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An agricultural sector model emphasizing interactions between official and private markets is used to evaluate policy reforms in Burkina Faso. Fertilizer subsidies, food aid and commodity price policies are examined. Reforms improve agricultural performance, but rely on cotton exports for foreign exchange to cover fertilizer imports --- contrary to government self-sufficiency objectives.

AGRICULTURAL POLICY REFORM IN BURKINA FASO

Introduction

Agricultural productivity in Sub-Saharan Africa has declined for over two decades (USDA, 1981). Chronic food production problems and rising food imports have become widespread due to high population growth and stagnant agricultural output (The World Bank, 1981a). Throughout the decade of the 1970s, cereals imports rose at an average annual rate of 9.5 percent despite slumping economic growth of many countries in the region. Problems of scarce foreign exchange, fiscal crises, and growing dependence on the rest of the world for food aid assistance have become commonplace in the economies of Sub-Saharan Africa.

Studies by the Club du Sahel (1982), FAO (1977), USDA/ERS (1981), DAI (1982) and the World Bank (1981a and 1981b) have comprehensively explored the complex factors contributing to the continent's agrarian crisis.

Historically, Africa's agriculture has relied on traditional farming practices. Area expansion has accounted for most of the growth in production. However, rapid population growth and tightened constraints on the supply of arable land have led to the decline of traditional land conservation practices and thus to land degradation in many areas. Environmental and climatic factors, including drought, pest infestation and crop disease, have severely constrained yields.

Commercial inputs that might maintain or improve yields receive limited application. Poor economic incentives to producers, constraints on the supply and distribution of inputs, weak extension services, and poor communications and transportation infrastructure are factors commonly cited for low modern

input use. Agricultural research and extension systems are generally not well developed and tend to be geared toward production of export crops rather than food crops (Acharya, 1981; Tosh, 1980; USDA/ERS, 1981).

There is growing awareness that agricultural policies of African countries are partially to blame for this crisis. Government intervention in African agriculture is pervasive. Throughout the 1970s, exports were heavily taxed and food prices were consistently held below world market levels (World Bank, 1981a; Acharya, 1981). Marketing boards or parastatal agencies were (and continue to be) used by governments to regulate prices and carry out marketing functions in official markets. Governments face pressures from urban constituencies to maintain cheap food prices. The necessity for parastatals to maintain profitable operating margins forces low prices for producers. Input subsidies are often offered to producers as compensation, but since quantities are rationed and modern input use is low, subsidies usually benefit only a narrow segment of the farm population (USDA/ERS, 1981; World Bank, 1981a). Input supply by parastatals is constrained by capacity limitations, government budgetary problems and scarce foreign exchange. New technological packages have been slow to be adopted because of low price incentives and restricted input supply. Food aid has become a common means for countries to supplement domestic procurements by parastatals.

Burkina Faso

Burkina Faso is a West African country beset with many of the problems facing the African continent. Agricultural productivity is stagnant. Production of millet and sorghum, the staple food crops, grew at an average annual rate of 1.1 percent from 1962 to 1981 (Roth and Abbott, 1983). Population is expanding rapidly, at over 2.5 percent per year. Food imports, representing about 8 percent of total cereals supply (in 1979-81), are

required to meet food deficits. Even though food self-sufficiency is the country's top priority, there is growing dependence on international donors for food aid assistance. Food aid represents 35 to 50 percent of food imports in normal years, but is as high as 80 percent following drought years. Export growth has lagged imports, creating balance of payments and foreign exchange problems.

The State intervenes extensively in Burkina agriculture. Government programs regulate public investment in irrigation schemes and land reclamation. Parastatals conduct marketing activities for important agricultural commodities. Cotton marketing and exports are controlled by SOFITEX. Export monopolies also exist for groundnuts, sesame and sheanuts. Modern inputs, including agricultural chemicals, are distributed by SOFITEX and government extension offices, and until recently have been subsidized by as much as 50 percent.

OFNACER, the government's cereals marketing board, buys grain from producers at official 'producer' prices that are fixed uniformly nationwide. Low 'producer' prices, physical restrictions on OFNACER's marketing capacity and budgetary constraints severely impede domestic procurements, however. Domestic procurements plus food aid imports are sold by OFNACER to consumers, mainly in cities and extreme food deficit areas, at official 'consumer' prices. Input subsidies create income transfers to producers; low 'consumer' prices provide income transfers to consumers. Costs are borne by the government, supported in large part by foreign assistance and export taxes.

Parallel or private markets operate alongside official markets to balance regional supply and demand. Whereas prices are fixed and quantities are rationed in official markets, private markets are relatively competitive. Prices are generally higher than official prices, and private market shares

can be large. Private grain traders handle about 80 to 85 percent of cereals trade, with the remainder marketed by OFNACER in the official market. Government parastatals hold virtual monopolies in the marketing of export crops and modern inputs.

Growing budget deficits and balance of payments problems in the 1970s prompted intervention by the IMF and the World Bank to correct the structural imbalance in Burkina agriculture. Three related policies were proposed: (1) raise producer prices of sorghum and cotton; (2) remove fertilizer subsidies; and (3) eliminate food aid imports that depress prices. These policy reforms emphasized a free market approach towards commodity and input pricing. This study evaluates the economic consequences of each of these reforms.

Methodology

A spatial and recursive model of Burkina Faso's agricultural sector was constructed for use in policy evaluation. Spatial dimensions of this model are represented by the determination of quantities and prices in private regional markets, connected by inter-regional trade. Operation of private markets is constrained by interactions with official markets. Supply, demand and trade (inter-regional and international) components are solved recursively in arriving at a market solution.

The model contains 9 commodities, 5 supply regions, 7 demand regions, 3 border points for international trade, and 2 types of markets. Supply is estimated via Linear Programming (LP) based on profit maximizing behavior of producers. Demand is estimated via a Linear Expenditure System (LES), in which parameters are derived from limited data using the Frisch (1959) procedure. Regional production and consumption are linked with foreign markets through trade, both official and private. Foreign trade is allowed with Abidjan, a major international coastal market, and with interior

countries Mali and Niger, which are smaller, regional trading partners. The sector model links LP models of supply, LES models of demand and foreign import-export equations, and solves for a competitive market equilibrium in prices and quantities. The model represents behavior of producers and consumers in private markets, where prices are set by competitive forces, and in official government controlled markets.

In the official market, parastatal agencies have monopoly control over input supply and distribution. Inputs are sold at fixed, government regulated prices. Commodities are bought from producers at fixed 'producer' prices, through OFNACER's marketing operations. Input distribution and commodity procurements are restricted to reflect capacity, institutional and budgetary constraints faced by parastatals. Grain procurements and food aid imports are sold to consumers at fixed 'consumer' prices, but in rationed quantities because supplies are limited. The official market equilibrium determines commodity procurements from producers, and market rations to consumers.

The private market equilibrium determines prices, production, consumption, resource utilization, and trade in the private sector of the economy. In the regional LPs, producers make their planting decisions based on their expectations of future private market prices, and administered commodity and input prices in the official market. Input purchases are partially linked to official market sales, effectively lowering real producer prices and affecting allocations between official and private channels. Consumers allocate income between goods on the private and official market. Profit from agricultural operations is an endogenous component of income in the LES, thereby influencing rural consumption. The complete model is solved sequentially:

1. Crop production is estimated via LP models based on producers' expectations of prices in the private market and government administered prices in the official market.
2. Commodity procurements by the government, generated in the LPs, plus food aid imports are used to set rations for consumers in the official market, based on fixed allocation weights calculated from past government sales.
3. Regional LES systems, foreign trade equations and price linkage equations are written as a Linear Complementarity Problem (LCP) and solved for quantities demanded, prices and trade in the private market. Official consumer rations, agricultural production net of official sales, and marketing margins are constants for the LCP. Agricultural production less official market sales, less quantities demanded equals private market sales by producers.
4. Producers' price expectations can be revised with updated prices from the LCP. Then steps (1) to (3) can be repeated for 'n' iterations (years) to project long term impacts.

The model is an extension of the type of agricultural sector models reviewed in McCarl and Spreen (1980) and in Egbert (1978). Those models represent a competitive spatial equilibrium for several commodities.

This methodology makes several unique contributions to this literature. The sector model explicitly incorporates official markets for input supply and commodity marketing into the analysis. LPs estimating supply are linked with an LCP for estimating the private market equilibrium. Supply models, estimated with producers' price expectations rather than market prices, more accurately reflect producer decision making. The LES, used to model demand, satisfies the general restrictions of demand theory.

The supply models have detailed specifications, enabling evaluation of a wide mix of technological options. Data were taken from experiment station and Farming Systems Research (FSR), exploiting areas where information is relatively abundant. Thus, the model links FSR research with policy making at the national planning level. All data for the analysis comes from secondary sources in an environment where data is considered to be severely limited.

Policy Simulations

The annual agricultural sector model, i.e. steps (1) to (3), proved to be a robust policy analysis tool suitable for evaluating a broad range of policy issues. It provided useful economic information on production and consumption response, trade between domestic and foreign markets, income distributional impacts, balance of payments, government costs, resource utilization and shadow prices of scarce factors in the economy. The multi-annual model, i.e. steps (1) to (4), also produced useful insights into the long term implications of policy reform. But the combination of low cross-price elasticities implicit in LES systems and high cross-price elasticities in the LPs cause high year to year variation in prices and quantities. In view of space requirements, only results for the annual model are summarized in Table 1.

Fertilizer Policy

Two aspects of fertilizer policy are evaluated: (1) the effect of removing fertilizer price subsidies (28 to 40 percent for Urea and 53 to 56 percent for mixed fertilizer depending on the region); and (2) the effect of relaxing fertilizer rations (constraints on fertilizer supply) in the official market. With existing fertilizer rations, model results suggest that removing input subsidies would have minimal effect on commodity prices, output, consumption or trade. The quantity demanded of fertilizer shows no perceptible decline, since rents to fertilizer rations exceed fertilizer price increases.

Maintaining subsidies, but removing restrictions on fertilizer availability, increases national fertilizer utilization to 214.0 thousand tons (17.2 times existing usage). Fertilizer use shows the greatest gain in the arid north and central regions. Although yield response there is low, the

high concentration of farms plus high commodity prices create a strong latent demand for fertilizer. Total production of cereals increases 15.2 percent nationwide. Cotton production more than doubles. Producers benefit from fertilizer subsidies while consumers benefit from lower commodity prices. The cost of fertilizer subsidies increases from 0.7 to 11.1 billion FCFA, substantially increasing government outlays for the subsidy program. Fertilizer imports exceed higher cotton export earnings, causing the balance of payments to decline by 7.2 billion FCFA.

Model results suggest that constraints on the government's ability to supply fertilizer, not prices, impose the most serious impediment to fertilizer utilization. Model forecasts also lend credence to worries of international authorities concerning the government's ability to meet subsidy payments with existing subsidy levels in place. Since subsidy payments rise with expanded modern input use, the government's goal of technologically transforming agriculture will meet with growing budget restrictions.

When both fertilizer subsidies and restrictions on the supply of fertilizer in the official market are removed, fertilizer utilization equals 129.7 thousand tons, showing a strong fertilizer price response. Even with higher fertilizer prices, fertilizer utilization is 10.5 times 'base' period levels, indicating there is considerable scope for expanding the government's fertilizer marketing activities. Cereals production is 17.2 percent above 'base' period levels. Even though fertilizer prices increase, cereals production rises due to the substitution of grains for cotton.

Post-harvest cereals prices fall due to greater supply. The national price of white sorghum, which shows the greatest production response to fertilizer, falls from 68 to 27 FCFA/kg. in the capital city of Ouagadougou. This urban center dictates national price patterns, as most marketing channels

flow through this point. Prices of maize and groundnuts increase; their supply falls due to expansion of white sorghum area.

Fertilizer imports increase from 0.9 billion FCFA (base case) to 9.6 billion FCFA. Imports of maize also increase in response to higher domestic prices. Cotton exports rise from 23.6 to 29.8 thousand tons (6.5 to 8.2 billion FCFA). Since cotton is exported only through official market channels at low 'producer' prices, higher expected private market prices for grains, make cereals appear to be more profitable. (The annual model does not allow for producers' price expectations in the private market to fall due to lower post-harvest cereals prices. The multi-annual model, i.e. step (4), is required for this recursive effect to take place) While cereal production increases, high transport costs to the international market at Abidjan inhibit cereals exports at current exchange rates. Exports to neighboring countries increase, but the effect is small due to the inelastic nature of regional import demand. The trade balance worsens by 7.2 billion FCFA.

Results suggest that the proposed fertilizer policy reform will lead to higher output, lower food prices and the elimination of government outlays for input subsidies. But, the import bill will exceed export earnings, creating problems maintaining fertilizer imports over the long run.

Food Aid

Eliminating food aid imports, amounting to 15.4 thousand tons of white sorghum (3.0 percent of white sorghum supply), 16.4 thousand tons of maize (14.5 percent of supply), 3.5 thousand tons of wheat (18.9 percent of supply), and 5.5 thousand tons of rice (11.2 percent of supply) has three main economic effects. First, commodity prices increase in the private market. Prices in Ouagadougou increase 5 percent for white sorghum, 18 percent for maize, 2 percent for wheat, and 6 percent for rice, thereby improving producer

incentives for domestically produced cereals. If food aid were to be increased, on the other hand, price disincentives would be created because of high transportation costs inhibiting cereals exports to the rest-of-the-world.

Second, the elimination of food aid increases imports on the private market. Wheat imports through Abidjan increase from 16.3 to 18.3 thousand tons. Rice imports increase from 15.7 to 19.7 thousand tons. The country becomes an importer of sorghum and maize through Abidjan. Sorghum imports increase from 0 to 1.2 thousand tons while maize imports increase from 0 to 5.0 thousand tons. Imports increase due to higher domestic prices and a relatively elastic import supply schedule. Including trade with Mali and Niger, total imports of sorghum, millet and maize increase from 8.7 to 15.6 thousand tons. Overall, the balance of payments deteriorates by 1.02 billion FCFA.

Third, consumer subsidies drop nationwide from 0.7 to 0.2 billion FCFA. The decline is especially sharp in the north and in Ouagadougou, which receive the highest rations of food aid. Since food aid is the largest component of official market rations, its elimination has major implications for government strategies intended to transfer income to consumer groups.

Higher Commodity Prices

Two aspects of the government's commodity price policy are evaluated: (1) increasing commodity prices and relaxing constraints on procurement of cereals in the official market; and (2) removing subsidies, eliminating food aid imports and raising official 'producer' prices -- corresponding to the complete World Bank policy. Official 'producer' prices for cereals and cotton are increased 20 percent to bring them in line with international prices. 'Consumer' prices are also raised to maintain fixed margins in the official market. 'Base' period procurement constraints are partially relaxed; a

ceiling on grain procurements of 50,000 tons is retained, reflecting OFNACER's national storage capacity.

Raising commodity prices in the official market increases cotton production from 63.8 to 194.9 thousand tons. Production of sorghum falls from 561.1 to 454.5 thousand tons, due to area displacement by cotton. Even though the government increases official 'producer' prices of cereals, the constraint on storage capacity limits the quantity of cereals the government can procure from producers at those prices. Higher cotton prices and unconstrained cotton marketing activities stimulate the production response for cotton. Cotton exports rise from 23.6 to 72.1 thousand tons. Since fertilizer imports are constrained at 'base' period levels, the trade balance improves by 12.7 billion FCFA. Consumption of cereals falls from 173 to 156 kg./capita, however, exacerbating the country's food problem.

Raising commodity prices, removing input subsidies, relaxing fertilizer rations and eliminating food aid resembles a free market scenario. Fertilizer utilization in the model solution is 151.9 thousand tons, an increase of 22.1 thousand tons over the price policy scenario alone. Sorghum production increases from 561.1 to 670.1 thousand tons, due mainly to fertilizer policy. Cotton production increases from 63.8 to 245.5 thousand tons, largely in response to higher prices. Post-harvest white sorghum prices in the Ouagadougou market fall from 68.0 to 43.9 FCFA/kg. Maize prices increase from 66.5 to 101.6 FCFA/kg., due to substitution of white sorghum for maize in the southwest. Maize imports through Abidjan increase, from 0 to 25.4 thousand tons, due to the sharply higher domestic prices. Wheat imports increase from 16.3 to 18.6 thousand tons and rice imports increase from 15.7 to 19.5 thousand tons due to the elimination of food aid. Fertilizer import costs rise from 0.9 to 11.2 billion FCFA. However, cotton export revenues increase

from 6.5 to 25.0 billion FCFA, more than compensating for the higher import bill. Overall, the trade balance improves by 6.3 billion FCFA.

Implications

Fertilizer policy alone is shown to increase agricultural output, lower prices for consumers and reduce costs of government input and commodity subsidy programs. However, higher fertilizer imports are not accompanied by growth in exports, creating balance of payments problems. Without capital inflows from abroad, the country would be unable to achieve its objectives of expanding use of modern technology and transforming agriculture over the long run. With fertilizer and price policy combined, cereal production and consumption increase. Improved profitability of new agricultural technologies leads to expanded use of modern inputs. Moreover, the policy has a favorable effect on the external trade balance. Thus, the World Bank policy appears to accomplish its intended objectives.

The policy, however, places heavy emphasis on cotton exports, creating a dilemma for policymakers. Higher cotton production generates foreign exchange needed for purchase of intermediate inputs. However, it creates dependence on cotton cultivation, which is incompatible with national objectives of food self-sufficiency. The viability of the policy also depends on the production response of cotton. Solution results are sensitive to changes in relative prices, and may overstate the capacity of the economy to shift from cereals to cotton production.

The government will have to considerably expand its input distribution and marketing network if it is to meet the potential input demand that exists in agriculture. This will require either a substantial investment in government marketing infrastructure or greater participation of private

entrepreneurs in input markets. Commodity marketing faces the same problem. The policy of higher prices, which is often proposed for Africa, was shown to be ineffective due to market constraints which impede cereals procurements, storage and handling. If government input and commodity programs are to be effective, greater investment in marketing infrastructure and improved marketing strategies will be required.

Table 1. Summary Statistics Comparing Alternative Policy Scenarios, Burkina Faso

	Base Case	No Fertilizer Subsidy	No Quantity Restrictions	Fertilizer Policy	Eliminate Food Aid	Higher Output Prices	Fertilizer and Price Policy
Fertilizer usage (metric tons)							
Cotton fertilizer	12,410	12,410	213,950	129,720	12,410	12,410	151,869
Urea	361	361	1,134	1,060	361	361	1,377
Govt. subsidies (mil. FCFA)	650	-	11,075	-	650	650	-
Production (thousand metric tons)							
Cereals	1,174.8	1,174.8	1,353.7	1,376.3	1,174.6	1,020.3	1,213.9
Groundnuts	79.1	79.1	77.5	74.6	80.9	113.4	123.3
Cotton	63.8	63.8	150.8	80.6	61.5	194.9	245.5
Prices, Ouagadougou (FCFA/kg.)							
White sorghum	68.0	67.7	27.0	27.0	71.7	83.2	43.9
Millet	69.9	69.7	65.2	66.7	69.1	74.6	70.1
Maize	66.5	66.2	92.9	92.9	78.6	72.1	101.6
Rice	141.2	141.1	141.6	141.2	149.2	140.4	148.7
Groundnuts	130.8	130.5	87.2	158.6	129.8	47.1	34.5
Wheat	133.0	133.0	133.4	133.2	135.3	132.9	135.6
Other	54.2	54.2	55.8	55.2	53.4	54.1	55.0
Consumption [excl. official purchases] (kg./person)							
Sorghum, millet and maize	165	165	188	186	161	145	169
Wheat and rice	8	8	11	11	11	11	11
Groundnuts	8	8	9	7	8	10	10
International trade [excl. food aid imports] (metric tons)							
Sorghum, millet and maize	8,690	8,650	23,193	23,186	15,620	22,821	33,037
Wheat	16,259	16,252	16,663	16,464	18,347	16,203	18,575
Rice	15,739	15,721	15,966	15,569	19,728	15,368	19,452
Cotton	-23,602	-23,602	-55,805	-29,821	-23,601	-72,105	-90,818
Groundnuts	-	-	-	-	-	-	-
Other	-58,866	-59,097	-51,055	-55,210	-59,436	-60,101	-55,636
Current account adjustment (mil. FCFA)							
	7,950	7,968	737	752	6,933	20,646	14,251

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