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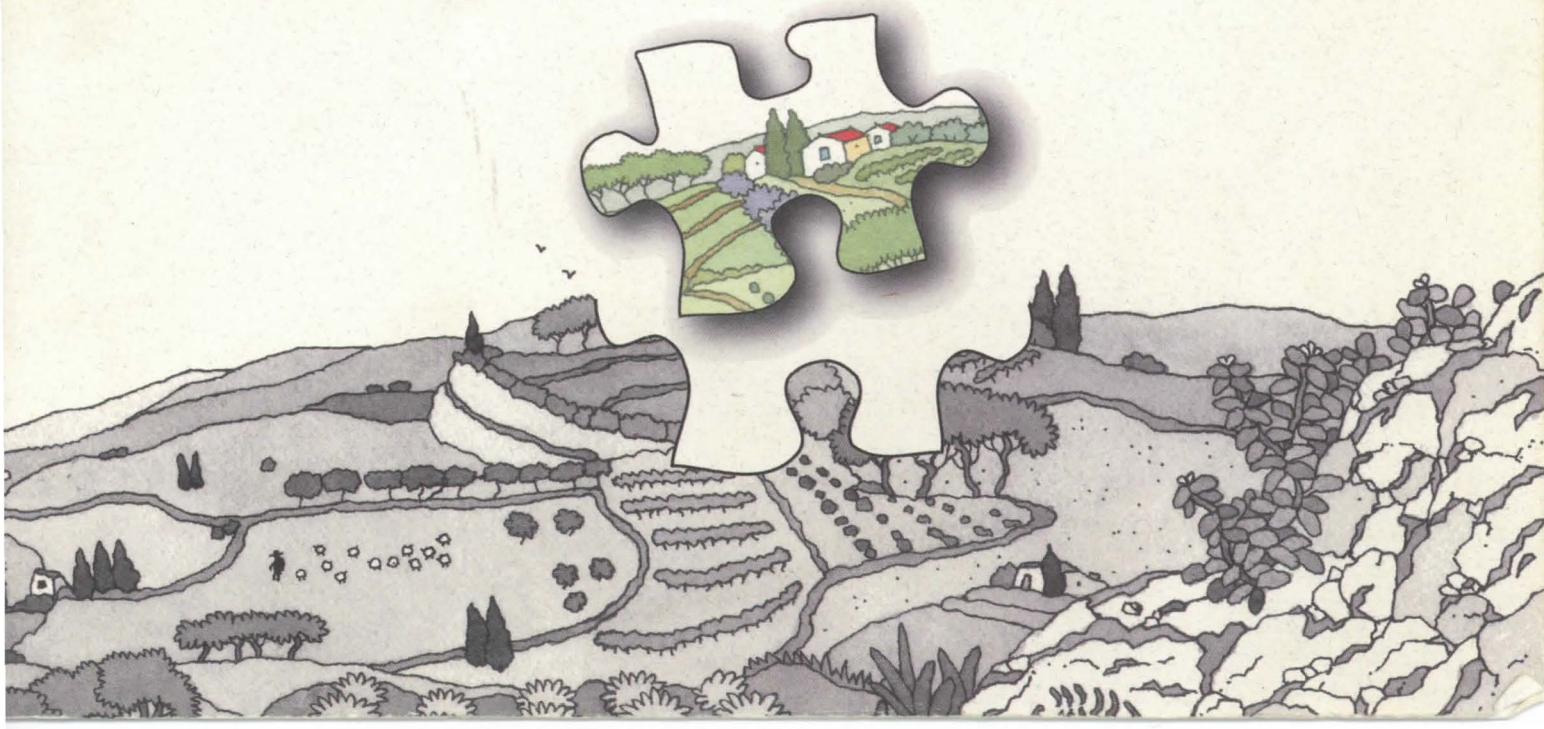

Agricultural Price Policy and Export and Food Production in Cameroon

A Farming Systems Analysis of Pricing Policies

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Abstract

This paper presents a farming system based policy analysis of the impact of price policy changes on food and export crop production in Cameroon. It is founded on a survey of farm households in Cameroon's four main export crop regions: the north, the southwest, the west, and the littoral, with cotton, cocoa, arabica coffee, and robusta coffee, respectively, as the base export crop in the farming system. Farm models have been formulated to show the direction of changes in production, income, regional and gender-specific income distribution, and labor markets that declining export prices are causing at macro level, and the impact of policy changes at farm household level. The paper concludes that price policy has a significant impact on production of export and food crops. It emphasizes the importance of productivity-increasing innovations in food production, and of institutional improvements in agricultural finance, agricultural input supply, and services for women. The models also allow an evaluation of the farm level impact of devaluation of the CFAfr, although the analysis was not carried out, as data collection in the field was completed prior to the devaluation of January 1994.

Key words

Price policies, policy analysis, farming systems, farm household models, export crops, food crops, linear programming (LP) models, Cameroon.

Résumé

Politique des prix agricoles, exportation et production agricole au Cameroun. Une analyse de la politique des prix selon une approche systémique

Ce document présente une analyse systémique de l'impact des politiques des prix sur la production et l'exportation de produits agricoles au Cameroun. L'analyse se base sur une enquête réalisée dans les exploitations agricoles des quatre principales zones exportatrices de produits agricoles du Cameroun : le nord pour le coton, le sud-ouest pour le cacao, l'ouest pour le café arabica et le littoral pour le café robusta. Des exemples d'exploitations sont présentés pour montrer les changements survenus au niveau du marché du travail, de la production, des revenus et de la répartition des revenus en fonction du sexe et de la région, à l'échelle nationale à cause de la chute des prix à l'exportation, ainsi qu'à l'échelle de la famille agricole à cause de la politique des prix. La conclusion du document est que la politique des prix a un impact réel sur la production et l'exportation des produits. Il souligne l'importance des innovations visant à augmenter la productivité agricole et à abattre les obstacles institutionnels au financement de l'agriculture, à la fourniture d'intrants et à la prestation de services aux femmes. Les exemples permettent aussi d'estimer l'impact de la dévaluation du Franc CFA sur l'agriculture, bien qu'aucune analyse n'ait été faite puisque la collecte des données à été terminée avant la dévaluation de janvier 1994.

Introduction

Since the late 1980s, Cameroon has initiated fundamental changes in agricultural pricing policy. In addition, the January 1994 devaluation of the CFAfr has had significant impact on agricultural prices. The general objective of this paper is to analyze the impact of agricultural price policy on the production of traditional export and food crops at the micro level in the main farming systems (FS) of Cameroon. It develops a methodological approach for analyzing exogenous price changes, such as those caused by world market developments or a devaluation. The paper first describes the modelling of FS for policy analysis and then identifies the conditions under which agricultural price policy is likely to encourage farmers in the long run to increase traditional export crop production without reducing the supply of food crops. Cotton-based FS in the far-northern and northern provinces, coffee-based FS in the western, northwestern, littoral, and eastern provinces, and

cocoa-based FS in the southwestern, central and southern provinces (Figure 1) were analyzed.

Characterization of the Production Systems

In Cameroon, ecoclimatical zones range from tropical rain forests in the south to semi-arid, Sahelian areas in the north. Accordingly, FS offer a wide diversity; however, in each system, the export crop is the main source of farm income and the importance of off-farm income is relatively low (Table 1). The land-to-man ratio is relatively small in the cotton and arabica coffee systems (ie, areas with high population density); it is relatively large in the cocoa and robusta coffee area, mostly less densely populated areas of tropical rain forest. The productivity of farm resources is higher in southern Cameroon because of its higher agriculture potential.

Methodology

The FS concept emphasizes the importance of understanding the entire farm household system, its constraints and potentials, and connects it with other systems and with

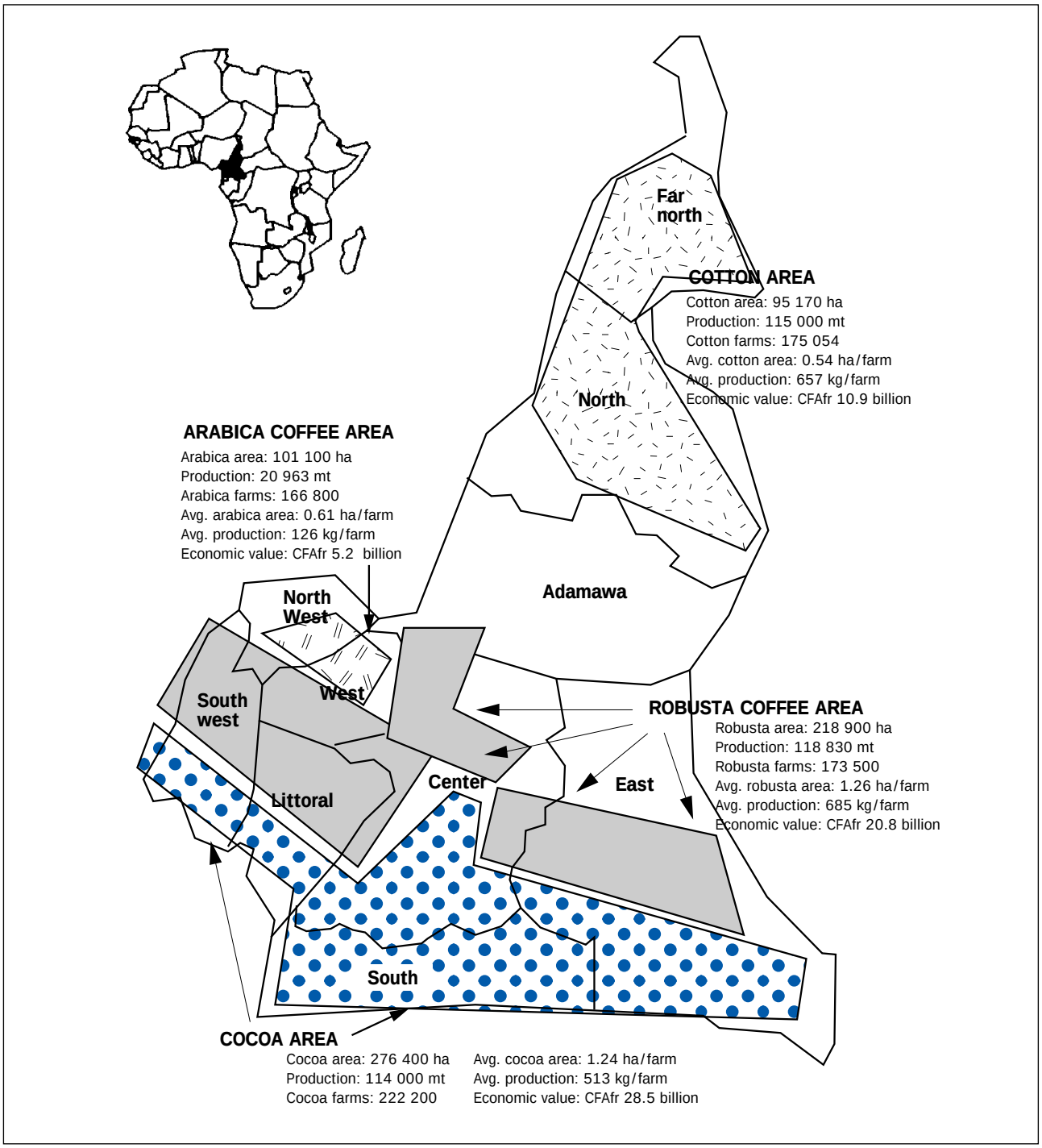

Figure 1. *Traditional agricultural export crop areas in Cameroon. (*Source: *Ministry of Agriculture 1987; 1992)*

Table 1. Comparison between different export crop based farming systems, Cameroon.

	Cotton	Coffee		Cocoa
		Arabica	Robusta	
Province	Far north	West	Littoral	Southwest
Avg. cultivated farm size (ha)	3.9	2	3.3	5.4
Land-to-man ratio (ha/man-equivalent)	0.59	0.44	1.20	1.08
Cash farm income provided by export crop production (%)	53.0	65.3	80.1	83.1
Share of subsistence food crop production in gross farm revenue (%)	68.2	66.9	41.3	25.0
Net farm income (CFAfr)[a]	102 211	271 010	241 500	415 443
Estimated share of off-farm revenues in household income (%)	23.0	25.5	<10.0	0
Productivity of farm resources:				
labor (CFAfr/man-day)	378	871	600	818
cultivated land (CFAfr/ha)	26 343	136 186	75 000	76 934
working capital (CFAfr/var. capital)	1.95	4.77	5.0	5.07
Observed diversification process[b]	+	+	-	-

Source: Heidhues et al 1993; Madi 1994; Fadani 1994; Temple 1993.

a. For comparison, the annual minimum income of a public-sector employee would amount to 224 000 CFAfr (Statistisches Bundesamt 1993). US$1 (1991/1992) is equivalent to CFAfr275.

b. Diversification is classified as high (+) and low (-); high diversification is the introduction of new farm activities, such as vegetable growing and intensive livestock production, or off-farm activities; low diversification indicates that no new farm/household activities were observed.

the institutional and policy environments. The FS approach recognizes that the system and the environment in which the small farmer operates is not only complex, but is also influenced by many factors, both internal and external. Realistic and comprehensive improvements can only be identified by close examination of the farm households' overall situation including the interrelationships between resources, ecological, and socioeconomic constraints.

Farm Surveys

As no adequate secondary data sources were available to analyze agricultural production systems, farm level surveys were carried out to provide a sufficient data base. The surveys were conducted in two steps: (a) a one-time structural survey, and (b) a continuous survey with a fortnightly recall period over 1 year. The samples were chosen from areas where the share of the export crop production of the total was greater than 10%. The structural survey was carried out to establish farm typologies; it was based on a sample of 150 to 450 individual farm units per farming system (in total, 1127 farms). It included a one-time collection of structural data such as household composition and activities, type of land use, size and number of fields, number of plants, crops and trees, total export crop production, estimation of total food crop production, and principal characteristics of the use of inputs, husbandry activities, major family labor activities, and hired labor use, commercialization of food crops, and farmers' opinions on institutional issues. In the second phase, about 90 randomly selected farms for each of the three main systems, totalling 279 farm households in all regions, were continuously surveyed during 1 year. In interviews every 2 to 3 weeks, production related data—such as family and hired labor use, input use, harvested production, crops sold and their prices, and household-related expenditures and revenues—were collected. Additional information was collected on farmers' opinions about product and input markets, their strategy concept for cropping patterns, mixed cropping, etc. Both genders were interviewed individually, as women often represent an independent decision unit. Farm plots were measured to assess land productivity. Furthermore, prices on local markets in the selected survey areas were collected monthly. The surveys were carried out between February 1991 and September 1992.

Table 2. Sample size and distribution used in the agricultural price policy analysis, Cameroon.

Farming system	Province	Survey sample	
		Structural	Continuous
Cotton based	Far north	250	96
	North	200	
Coffee based	West/northwest	269	60
	Littoral	126	33
	East	60	
Cocoa based	Southwest	132	90
	Central south	90	
Total		1 127	279

Data Preparation and Analysis

Within each of the surveyed farming systems, the analysis of the collected farm data started with a formulation and characterization of farm types. Farm types were formed on the basis of different criteria in the three FS. Types of farm based on cotton were differentiated according to the use of animal traction, farms based on cocoa and robusta coffee, by farm size and labor organization, and farms based on arabica coffee, by diversification of farm activities. The aim of categorizing farms was to form homogeneous groups of farms that show similar reactions to changes in prices, technical parameters, and the socioeconomic environment (Boussard 1987). For each farming system, the gross margins for individual cropping and livestock activities, whether for subsistence or sale, were calculated. On this basis, farm activities within a farm and between different

farms were compared. Farm and household income including off-farm income was calculated and grouped by source into income from export and food crops, livestock, and off-farm activities. On this basis, the productivity of farm resources was established (net farm income per hectare, per man-equivalent, per man-day, and per unit of working capital).

Farm Modelling

Analysis of the farm survey data provides the information for modelling typical export crop based FS that are used to derive the effects of price policy measures on production and income at the farm level and, especially, to study the interdependencies between traditional export and food crops. The modelling of each farming system is based on the linear programming approach (LP). The objective of the model is to maximize farm income under the constraints of farm resources and the provision of minimum requirements of adequate food for household subsistence. As the survey was conducted over 1 year and time series data were lacking, risk factors other than the minimum requirements for the household food consumption were not considered. Off-farm activities were not integrated in the farm household models, but economic profitability was compared with the shadow price of labor resulting from the model. Figure 2 illustrates the design of the concept of farm modelling for policy analysis. The main data source is the structural and continuous survey with secondary data completing the data sets. Data analysis mainly focused on identification of typical farms and farm enterprises, calculation of technical and economic coefficients, factor endowment, identification of technical improvements and innovations, product and input prices, and socioeconomic constraints within the respective farming system. Mainly static comparative analysis with parametric variation—the systematic stepwise change of the model's coefficients to obtain a sequence of optimal solutions—was used to reveal the impact of export crop, food, and input price changes on farm organization, labor economy, production, and income. To test the impact of changes in the traditional gender-specific division of labor, different labor allocations were analyzed with the model. Also policy changes under the Cameroonian structural adjustment program, such as reduced fertilizer and other input subsidies, devaluation, and privatization measures were analyzed in different policy scenarios.

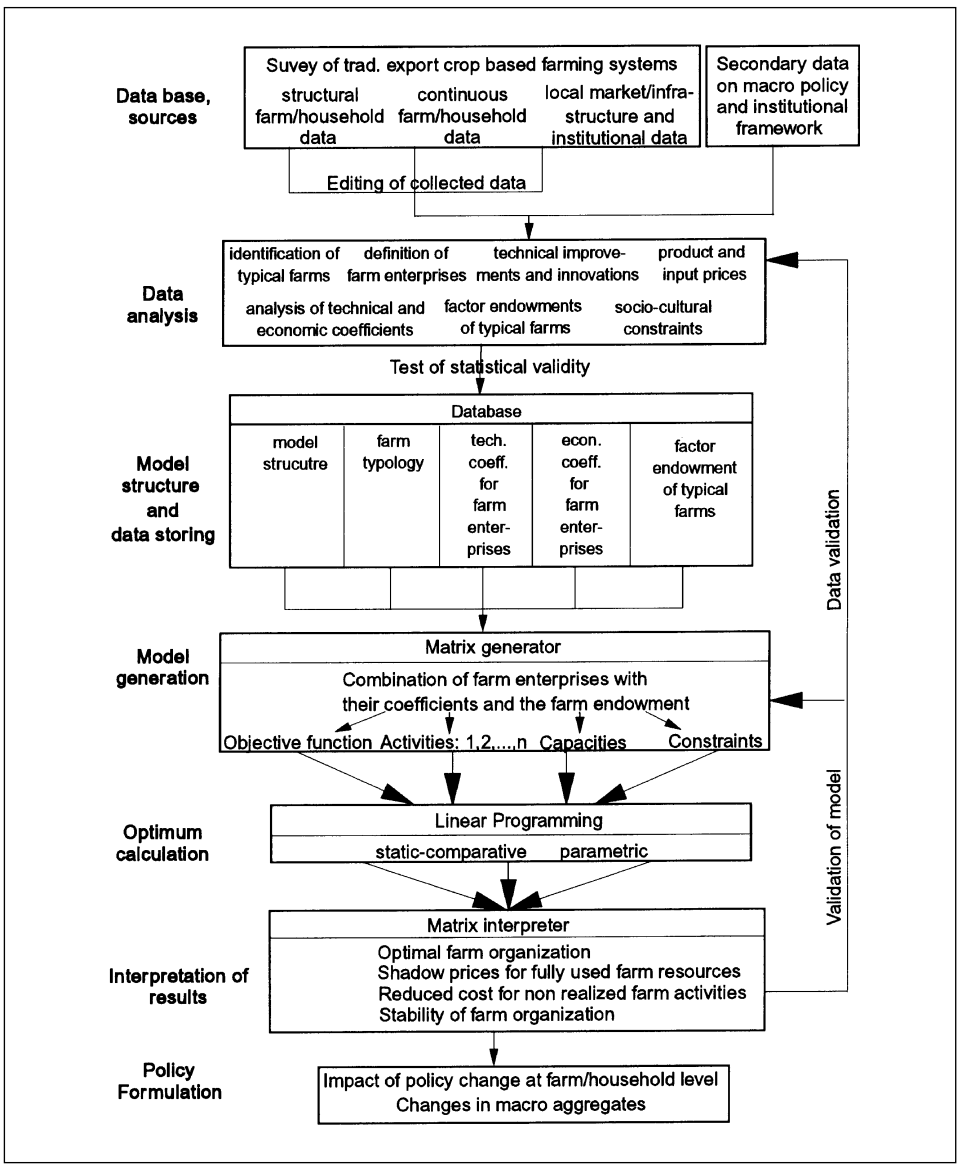

Figure 2. *Design of the structure of farm modelling for policy analysis.*

It should be emphasized that the micro based policy analysis approach has to face the problem of aggregation, which is discussed extensively in Day (1963), Weinschenck (1967), and Hazell and Norton (1986). It implies that it is difficult to formulate policy conclusions on the basis of micro policy analysis. Generalization at the macro level requires certain severe homogeneity conditions, endogenizing prices and resource and environmental constraints. In reality, these conditions are difficult to fulfill. Therefore, the results derived from FS based analysis cannot be used to derive quantitative assessments of impacts on macro aggregates such as income, production, employment or exports. Nevertheless, the micro based approach is useful for indicating directions of change at the macro level and for

analyzing the impact of policy changes at farm/household level.

Policy Analysis Results

Until the mid 1980s the main feature of agricultural price policy in Cameroon was the heavy taxation of the main export crops coffee, cocoa, and cotton. With the world market decline of coffee, cocoa, and cotton prices towards the end of the 1980s, the 1989 producer price was reduced by 30–60%. Meanwhile, subsidies were progressively reduced for some agricultural inputs and were entirely abolished for key inputs. The economic impact of this policy follows partly expected lines, ie, a significantly lower export crop production and reduced use of modern inputs (Table 3). Lower farm production of export crops reduced the cash income that had been the main source of revenue for the majority of export crop based farms in all three cropping systems. The decline in cash income resulted in difficulties in financing essential household expenditures, for example, on school fees, the health service, and food.

Table 3. Observed impact of export price cuts on agricultural production in coffee-, cocoa-, and cotton-based systems, Cameroon (1991/1992).

	Coffee	Cocoa	Cotton
Change in export production[a] (%)	-45% Arabica -38% Robusta	Reduction	-50%
Change in food crop production	Insignificant	Increased plantain, cocoyam	Increased maize, cowpea
Change in modern input use:			
Fertilizer (%)	–30	–	–50
Pesticides (%)	–50	Reduction	0
Change in hired labor (%)	–20	Reduction	–
Other reactions	Increased off-farm activities by household members	–	Increased livestock rearing and off-farm activities

a. Comparison of the 1990–1992 situation with that in 1987–1989.

Whether food crop production increased as a reaction to the export price decline is difficult to say as contradictory trends become apparent. Declining coffee prices had no effect on food production whereas lower cocoa and cotton prices led to a shifting of resources into food crops and, thus, an increase in food production. In the coffee-based FS, the division of labor between men and women is maintained, limiting a reallocation of resources as a result of relative price changes. In the southwestern cocoa area, where the same division of labor between men and women prevails, but where land is still plentiful, men have put additional land over to the production of food crops. In the cotton area, allocation decisions are made by men only for both cotton and food crops. Here, men have shifted resources into food crop production to make up for the lost income from export crops.

Other effects of price changes are relevant for policy formulation. These occurred at micro level during the cut of export prices in 1989. (a) Income distribution between farms was becoming more uneven. Large farms were faring relatively better than small farms. Their larger resource availability allowed them to draw on reserves and provided more flexibility in reallocating resources. (b) Income distribution between men and women was becoming more even in the cocoa and coffee areas. Although the average income of women before export price reductions amounted to 50% of men's income, they had become almost identical by 1989/90. As women are mainly responsible for providing food for the family, individual food security has probably been less affected. On the other hand, the relative improvement of women's income has also led to a shift in responsibility, ie, women are increasingly taking over the financing of schooling and clothing. (c) Household income activities have become more diversified. The export crop price reductions are an encouragement, particularly for men, to seek off-farm employment.

The above observations were confirmed by the model results. Model calculations show that prices have a significant, but different, impact on the production of export and food crops in all three study areas. Rising export crop prices lead to rising export crop output and vice versa. There is, however, a difference in the source of production increase—that may be the result of higher input and labor use or area expansion (Table 4). The reaction of food crop production on relative price changes is determined by the division of labor between men and women. Model results

Table 4. Model results for the impact of agricultural price policy on agricultural production in coffee-, cocoa-, and cotton-based systems, Cameroon.

	Coffee	Cocoa	Cotton
On raising the export price, the production reacts: Cause of the export production	Positively For arabica: input use; for robusta: input and labor use, and plantation expansion	Positively Input use and plantation use	Positively Increase in cultivated area
Impact of export price increase (10%) on export production	Arabica, 2%; robusta, 4%	Southwest, 8%; Central south, 2%	2%
Reaction of food crop price changes on production	Insignificant	Positive	Positive
Relation between export and food crops	Competitive	Complementary	Competitive
Major constraints emerging from the model analysis	Innovations in food crop production; farm labor availability	As for coffee	Labor and credit availability

show that rising food crop prices lead to a food production increase that is soon constrained by availability of seeds, fertilizer, labor, and credit. In the cocoa area in the southwest increasing relative food prices lead to a complementary, not a competitive, relation between export and food crops. The explanation is that with rising food prices more fertilizer and pesticides are being applied to food crops, thus their production and productivity increases. Furthermore, the farm models show that farm labor availability, particularly of women, in cocoa- and coffee-based farms is a dominant constraint.

Model simulations of a devaluation of the CFAfr show positive effects on export crops. As the relative prices of export crops compared with food crops improve, the production of export crops increases. In the longer term, export price increases can only be successful in encouraging export production if additional land and labor or productivity increasing innovations become available. The more that land and labor become limiting constraints, the more important are productivity increasing innovations—both in export and food crop production—to a successful export price policy. This points to the overriding importance of agricultural research in producing technological progress and agricultural-support systems such as extension, credit, marketing and input supply, and in providing the necessary back-up for the introduction of innovations (Weinschenck, Jung 1987; Heidhues, Weinschenck 1989; Zeller et al 1993).

Policy Conclusions

(a) Prices do have the expected effect on production, but the reactions are relatively modest because of institutional constraints, particularly for food crops where women carry the main responsibility. (b) Productivity increasing innovations, particularly in food crops, are high priority areas for supporting a production increase. This points to the importance of food crop research. (c) Institutional and marketing constraints are important in limiting additional crop production, particularly weakness in input supply, infrastructure, marketing, rural finance, and extension. Institutions and markets need also to be oriented specifically to those producing food, ie, to women. (d) On-farm labor availability, particularly of women, is a dominant constraint. How the labor constraint can be mitigated is an important research question. (e) In the cotton areas, there is a high preference for investing additional income in animals. This may cause environmental problems and calls for research into environment protection, alternative innovative investment, and opportunities for saving.

The capacity to generate productivity increasing innovations in food crops will therefore be a key factor in the success of relative price increases for export crops. Consequently, a key conclusion is that high importance must be given to research into food crop improvement, improvement in extension, input supply, rural finance, and marketing for food crop production.

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