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Policy Options

The effects of policies on farming households' decisions: economic evidence and environmental implications in northern Nigeria*

H. ADE FREEMAN
International Crop Research Institute for the Semi-Arid Tropics, P.O. Box 39063, Nairobi, Kenya

TERRY L. ROE
Department of Applied Economics, University of Minnesota, St Paul, MN 55108, USA

JOYOTEE SMITH
Center for International Forestry Research, P.O. Box 6596, JKPWB Jakarta 10065, Indonesia

ABSTRACT. There is increasing concern that the intensification of cereal production in northern Nigeria is threatening the sustainability of the agricultural environment. This article describes the effects of trade restrictions on grain imports and of fertilizer subsidy on households' decisions, and draws implications for degradation of the agricultural environment. It develops social accounting matrices (SAMs) for two household types as the basis for capturing the structure of resource allocation, cropping choices, and input use, and then uses the SAM to simulate household responses to changes in relative grain prices and fertilizer prices. Both simulations, but particularly the fertilizer price change, favour the shift from cereals to legumes. A third simulation reflecting technical change in legumes results in the largest shifts from cereals to legumes. It is concluded that appropriate policy reforms complemented by technical change will increase diversification of the cropping system and reduce inefficient fertilizer use. The cumulative effects of these changes will improve soil nitrogen and organic matter and help break the pest and disease complex, thereby improving the agricultural environment.

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1. Introduction

Degradation of the resource base is the major environmental problem in most developing countries (Reardon and Vosti, 1992). In the Northern Guinea Savanna of Nigeria, increasing population densities, improved market access, and technological change are driving agricultural intensification in a predominantly cereal-based cropping system (Smith and Weber, 1994). Scientists are, however, concerned that the intensification of cereal production on fragile sandy soils is threatening the sustainability of the agricultural environment.

Intensive farm monitoring of production constraints in this area has linked the intensification of cereal-production to the elimination of fallow periods, decline in soil organic matter, increased frequency of micronutrient deficiencies, intense weed pressure, particularly from the parasitic weed *Striga*, and accumulation of cereal-specific soil-borne problems (IITA, 1992; Smith *et al*., 1997). Fallowing, which was the traditional means of maintaining soil fertility, has been replaced by continuous cultivation of cereals (Spencer and Polson, 1991). Data from this area suggests that organic carbon declines with the history of intensive cereal-cropping. For example, in Katsina state, with a longer history of continuous maize, organic carbon is 0.47% while in Bauchi state, where continuous maize is less important and short fallows exist, organic carbon is 0.83% (Smith *et al*., 1997). Negative nutrient balances for potassium and micronutrients have also been reported in this area (Smith *et al*., 1997). The severity of cereal-parasitic nematodes, particularly *Aphelenchoides* and *Pratelenchus*, was also associated with increased intensity of maize-cropping (Chindo and Weber, 1992). Average yield losses due to *Striga* on maize and sorghum were reported to have increased by about 50% over a five-year period (IAR/IITA, 1991). While these constraints do not pose an immediate threat to crop production, their cumulative effects can very quickly become major production constraints, with important implications for long-term soil productivity, food security, and human welfare.

Technological options for improving the sustainability of this cereal-dominated production system include diversification of the cropping system to provide a greater role for legumes (COMBS, 1992). In addition to providing grain and fodder, legumes contribute nitrogen and organic matter to soils and help to break the pest and disease cycle in cereal-based cropping systems. However, over the last two decades there has been a historical decline in the relative importance of traditional legumes such as cowpea and groundnut in northern Nigeria, because farmers are reallocating resources to other, more profitable activities (Smith and Weber, 1994). For example, in the mid-1960s legumes occupied 22% of the cultivated area, while cereals occupied about 50%. By 1991 the share of legumes in total cultivated area had declined to 11%, while the share of cereals increased to 77% (Smith *et al*., 1997).

The evolution of a cereal-dominated cropping system in northern Nigeria is due, in part, to policy interventions implemented in the country since the early 1980s. Trade restrictions on grain imports which pushed domestic cereal prices above world market prices provided an implicit subsidy for cereal production (Freeman, 1993). These policies increased domestic prices of cereals compared to those of non-tradable crops such as legumes. A fertilizer subsidy of around 85% substantially reduced farm-level cost of production for maize (Smith *et al*., 1994). The reduced cost of production and the availability of fertilizer-responsive high-yielding maize varieties further improved the competitive position of maize relative to other crops in the system. The rising demand for fertilizer, encouraged by the subsidy, also reduced the role of legumes as regenerating crops for maintaining soil fertility. These policies resulted in changes in the structure of incentives facing households, which caused farmers to commit far too many resources to the production of cereals and away from legumes. Attempts to diversify the cereal-dominated system must, therefore, incorporate appropriate policy reforms designed to reduce the distortions which have favoured cereal production.

The overall objective of this article is to examine the effects of quantitative trade restrictions and the fertilizer subsidy on environmental degradation via their effects on household economic behaviour. In particular, the short-term effects of trade and fertilizer policies on household cropping choices and input use are assessed; linkages are established between these decisions and environmental degradation; and the potential effects of policy and technological change on household decisions are explored.

The few studies that have examined the impact of policies on environmental degradation focused on trends in land use and their relationships to important macroeconomic indicators (Binswanger, 1989; Mahar, 1989). These studies, however, did not establish causal relationships among key variables based on rigorous analyses of household decision-making processes. This article extends previous research on linkages between policies and the environment by using a microeconomic model of household decision-making to understand household patterns of resource use and their relationship to environmental degradation.

In order to analyse the impact of policies on the environment, a static model that focuses on household production, marketing, and consumption decisions is developed. A two-step approach is used to assess linkages between policies and the environment. In the first step the effects of existing policies and technological change on farmers' crop choices, input use, and marketing decisions are determined given their technological, economic, and resource constraints. In the second step, information on the technical relationship between specific crops and resource use is used to link household economic behaviour to the environment. For example, information on the genetic characteristics of crops indicates that legumes are more efficient than cereals in fixing nitrogen in soils. Also, agronomic practices such as the level of fertilizer applications with the introduction of new crops or crop varieties have implications for the long-term productivity of the resource base.

The article is organized into five sections. The static household model is specified in the next section. This is followed by a presentation of the empirical results in section 3. The results from the simulation experiments are discussed in section 4. The article concludes with a discussion of implications for policy and technology interventions designed to prevent or reverse degradation of the resource base.

2. Model specification

The static model, constructed for two sets of households in northern Nigeria, integrates household production, marketing, and consumption behaviour. Households are assumed to maximize a utility function defined on agricultural and manufactured commodities as well as leisure subject to a full income constraint (Singh *et al.*, 1986). The basic agricultural household model is extended to include the marketing of household-produced agricultural commodities (Freeman, 1993). Labour and other inputs are allocated to farm production and other off-farm activities. Output and input prices are assumed to be exogenous, and the household is a price-taker in product and factor markets.

The study examines the effects of specific policies and technological change on household cropping choices and input use, and draws implications for the environment from these decisions for two household sizes, one relatively small and another large, in the same villages. Stratification of households was based on differences in land holdings and other physical assets.[1] Household social accounting matrices (SAMs), shown in the Appendix, were constructed for the two household types. These household SAMs provide the analytical framework for the empirical estimation of the household model in much the same manner as village-level SAMs (Adelman *et al.*, 1988; Subramanian and Sadoulet, 1990; Parikh and Thorbecke, 1996).[2] The SAM describes the structure of the household economy, its production activities, the sources and distribution of factor incomes, and transactions between the household and other agents in the economy. Because the SAMs capture the structure of household resource allocation, cropping choices, and input use for both household types it provides an adequate framework for analysing household production responses to policy and technological changes.

The data required to construct the household SAM were from a cross-section survey of fifty households in five villages, and village group interviews collected by the International Institute of Tropical Agriculture (IITA), in an area of high intensity of land use and intensive cereal-cropping in Kaduna and Katsina states of Nigeria (Smith *et al.*, 1994). The IITA survey collected data on household socio-economic variables, resource endowments, crop production, input use, and marketing behaviour. Consumption parameters were obtained from a combination of data from a market survey conducted by the authors and previous consumption studies in the area (Simmons, 1976; Hazell and Roell, 1983; Freeman, 1993). Technical relationships between specific crops and the environment were obtained from biological scientists at IITA and data from an on-farm monitoring of maize production constraints in the survey villages.

Five different cropping activities are specified in the household production account in the SAM. These production activities result in payments to the household's factors of production. The factor account comprises labour, capital, and land. Value added from production is distributed

[1] The procedures for stratifying households are described in IITA Northern Guinea Savanna survey manual.

[2] See Freeman (1993) for detailed discussion of the household SAM.

across the inputs used in production. Household income comprising receipts from crop sales, wage income, and off-farm income is allocated to expenditure on agricultural and non-agricultural consumption commodities, and purchased inputs. The household capital account captures household investment which, for the most part, reflects the value of grain inventory and livestock.

The production technology in the *i*th cropping sector is described by a Cobb–Douglas production function,

$$Q_i = A_i \Pi Z_{ij}\alpha_{ij},$$

where Q_i denotes output of the *i*th crop, Z_{ij} denotes the *i*th crop's demand for input *j*, α_{ij} is crop *I*'s production elasticity of input *j*, and A_i is a shift parameter. *Z* includes variable inputs such as family and hired labour, fertilizer, seeds, and fixed inputs such as land.

The demand for primary inputs is based on profit-maximizing behaviour. In the case of labour, first-order conditions for profit maximization imply that

$$\alpha_{ij}P_iQ_i/L_i = w_i$$

where L_i is labour input for the *i*th crop and w_i is the wage rate. Rearranging terms yields the share parameter for labour,

$$\alpha_{ij} = w_iL_i/P_iQ_i.$$

The values of output and variable input used for each crop are obtained from the SAM. Given output and input prices and a Cobb–Douglas production function exhibiting constant returns to scale, the share parameter is estimated for each variable input from the SAM.

Household income is given by

$$\Sigma_i V_{ij} + N + E$$

where V_{ij} is the value added in production of the *i*th crop by the *j*th input, *N* is wage income, and *E* is exogenous off-farm income.

Households are assumed to hold grain inventories proportional to the total output of each crop,

$$I_i = kQ_i,$$

where *I* is the level of inventory of the *i*th crop and *k* is a fixed crop inventory coefficient.

Household consumption decisions are modelled as an LES function without subsistence requirements,

$$P_mC_m = \Theta Y,$$

where P_m is the price of the *m* consumption good, C_m is the consumption level, *Y* is household full income and Θ is the average consumption share of commodity *m* in full income. Average consumption shares are estimated from the SAM by dividing expenditure on the *m* commodity by total household expenditure.

The household model was solved using GAMS algorithm. The model was calibrated to a base year solution to produce an exact replication of the

Table 1. *Base year results*

	Unit	*Small household*	*Large household*
Consumption			
Food crop	naira	1661	3871
Purchased items	naira	1566	9843
Leisure	naira	4155	14451
Production			
Maize	naira	2126	12546
Sorghum	naira	2049	4316
Legumes	naira	884	3689
Cotton	naira	548	5728
Other	naira	1953	4091
Input use			
Labour	naira	5622	26343
Fertilizer	naira	584	2153
Fertilizer use (N per ha)			
Maize	kg	158	143
Sorghum	kg	103	86
Legumes	kg	64	20
Cotton	kg	282	56
Other	kg	55	67
Marketed surplus			
Maize	naira	1587	5454
Sorghum	naira	1597	90
Legumes	naira	604	2797
Cotton	naira	521	5315
Other	naira	607	3476
Crop inventory	naira	768	8839
Farm profit (loss)	naira	2077	6920

Source: Survey data.

household SAM (Table 1). Supply and demand elasticities were derived from the US Department of Agriculture database for Nigeria (Sullivan *et al.*, 1989), while production shares and average budget shares were estimated from the SAM (Freeman, 1993). The base year solution, an exact replication of the household SAM, therefore reflected current household production, marketing, consumption, and investment decisions. The calibrated model was used to conduct policy simulations by comparing observed responses to existing policies in the base solution to counterfactual responses arising from policy or technological interventions. The output of the policy experiments was reported as percentage differences between the base solution and counterfactual results from the simulation experiments. Interpretation of the simulation results emphasized the likely direction, rather than the magnitude, of changes in the structure of the household economy under different policy and technology regimes.

3. Empirical results

The base year results provided useful insights into households' cropping choices and input use given existing policies and technologies.

Households cultivated maize, sorghum, legumes, cotton, and other crops such as rice and vegetables. No land was allocated to fallowing. The results showed the dominant position of cereals in household cropping choices. Cereals accounted for about 55% of the total value of agricultural output, while legumes accounted for about 12% among both small and large households. Maize was the most important cereal in household cropping choices, accounting for 51% of the value of cereal production in the small households and 74% in large households. Cereals were also important cash crops, accounting for between 33% and 65% of the value of marketed output among large and small households respectively. Household cropping choices exhibited a predominance of cereals, which make a high demand on nitrogen, over legumes, which contribute nitrogen and organic matter to soils.

The base year result indicated high levels of fertilizer use compared to the recommended levels. For example, farmers' application rates of 143–158 kg of nitrogen per hectare on the maize crop are higher than the recommended rate of 80–100 kg of nitrogen per hectare for the soil type found in the area (IAR/IITA, 1991; Freeman, 1993). Inefficient fertilizer use was also observed in on-farm monitoring of maize production constraints in the study villages (IAR/IITA, 1991).

While under the existing policy environment the dominance of cereals in household cropping choices and relatively high levels of fertilizer use may make good economic sense from the households' perspective, these decisions are raising concerns about the sustainability of the system. Considering the importance of nitrogen in crop production and the fact that soils in the Northern Guinea Savanna of Nigeria are highly deficient in nitrogen, existing household cropping choices have important implications for the long-term productivity of the resource base. Data from intensive farm monitoring of production constraints in the survey area linked the dominance of cereals in household cropping choices to a decline in soil organic matter, negative nutrient balances for potassium and micronutrients, and soil mining (IAR/IITA, 1991; IITA, 1992; Smith *et al.*, 1997). The dominance of cereals in cropping decisions was also found to be associated with rapid accumulation of cereal-specific pests and diseases, particularly parasitic nematodes, fusarium, and stem borers (IAR/IITA, 1991; Weber *et al.*, 1995). High levels of fertilizer use, particularly ammonium sulphate, increased the susceptibility of the production system to soil acidification and micronutrient deficiencies (Smith *et al.*, 1997). Continuous cereal cultivation and high levels of fertilizer use were also linked to the elimination of fallow periods, high levels of biomass export, and reduced interest in legumes (Smith *et al.*, 1997). The elimination of fallow periods and resulting lack of vegetative cover in land-use patterns was also associated with rapid declines in soil organic matter, intensive pressure from weeds, and soil erosion (Spencer and Polson, 1991; IITA, 1992).

Household cropping choices and input use decisions reflected in the model results resulted, in part, from trade policies which changed domestic relative prices of cereals versus legumes, a fertilizer subsidy which increased relative profitability of maize production, and technological change which increased the competitive position of maize. These policies, individually or in combination, shifted the structure of incentives facing households in favour of cereal production. Policy reforms and technological interventions should therefore be key components of efforts to reverse the threat various biotic and abiotic constraints pose to the sustainability of the production system. In the following section, simulation experiments are used to explore the possibility of improving the sustainability of the agricultural environment through the development of a more diversified cropping system which provides a greater role for legumes.

4. Simulation experiments

The simulation experiments examined the impact of policy reforms and technological intervention on household decisions and, therefore, on the potential to increase the role of legumes in the cropping system. Three simulation experiments were conducted. First, the price of legumes relative to maize was increased by 10%. This change in relative price represented a hypothetical reduction in the implicit subsidy on cereal production induced by trade policies. Second, the fertilizer subsidy was eliminated. Third, a 10% increase in legume yields resulting from technological change was introduced.[3]

The results of the simulation experiments are shown in Table 2. A 10% increase in the relative price of legumes induced an increase in legume production ranging from 0.6% in large households to 0.8% in small households. Production of legumes in response to an increase in legume price was positive but small. Households reduced the production of other crops, with the largest reductions in sorghum and maize production. The results indicated that changes in the relative price of legumes caused households to shift resources out of cereal production into legumes. The weak own price and cross-price effect, however, implied that relative price changes would not generate strong substitution effect between cereals and legumes. This suggested that changes in relative prices alone were not sufficient to induce households to reallocate substantial resources out of cereal production into legumes. The basic problem is that, with existing farmers' technologies, legume yields are extremely low compared to maize yields. Legumes are also susceptible to a higher incidence of pests and disease problems. Thus, given the substantial differences in productivity of these crops, a 10% increase in relative price does not provide sufficient incentives for farmers to shift resources from maize into legume production.

Elimination of the fertilizer subsidy resulted in a reduction in the production of all crops, with the largest declines in maize and sorghum production. Combined cereal production declined by as much as 59% when the fertilizer subsidy was eliminated. In comparison, the largest reduction in legume production was 24%. The sharp decline in cereal production following the elimination of the fertilizer subsidy was due to the high intensity of fertilizer use on these crops. Marketed surplus of all crops declined, and household income declined by 11–17%. The decline in

[3] The 10% increase in legume yields simulated in this experiment is realistic in view of the fact that freely nodulating soybean varieties developed at IITA record yields that triple traditional varieties on farmers' fields.

Table 2. *Simulation results*
a. Small household

	% change from base		
	1	*2*	*3*
Consumption			
Food crop	1.23	−13.30	1.19
Purchased items	1.17	−13.36	1.15
Leisure	1.26	−13.28	1.23
Production			
Maize	−0.28	−33.01	−0.02
Sorghum	−0.39	−9.84	0.29
Legumes	0.8	−23.71	32.89
Cotton	−0.1	−20.77	0.07
Other	−0.31	−7.73	0.02
Input use			
Labour	2.4	−40.82	2.29
Fertilizer	1.4	−21.01	6.69
Marketed surplus			
Maize	−0.32	−20.29	
Sorghum	−0.38	−77.74	
Legumes	0.83	−16.39	18.87
Cotton	−0.1	−16.89	
Other	−0.33	−22.25	
Crop inventory	−0.13	−10.01	2.99
Full income	1.26	−17.07	1.22

b. Large household

	% change from base		
	1	*2*	*3*
Consumption			
Food crop	1.55	−15.12	1.49
Purchased items	1.42	−10.83	1.36
Leisure	−0.58	−12.59	−0.65
Production			
Maize	−0.30	−21.27	
Sorghum	−0.38	−37.96	
Legumes	0.63	−11.28	31.60
Cotton	−0.07	−10.24	
Other	−0.28	−9.65	
Input use			
Labour	2.69	−22.25	2.56
Fertilizer	0.62	−13.90	0.57
Marketed surplus			
Maize	−0.29	−23.38	0.02
Sorghum	−0.40	−100.00	28.89
Legumes	0.61	−7.15	15.48
Cotton	−0.09	−5.40	−0.02
Other	−0.30	−5.61	
Crop inventory	−0.30	−13.72	0.40
Full income	1.37	−10.87	1.30

Source: Survey data.
1. 10% increase in relative price of legumes.
2. Complete elimination of fertilizer subsidy.
3. Neutral technical change resulting in 10% increase in shift parameter for legumes.

household income leads to further reductions in expenditure on food and manufactures, as well as leisure.

Technological change in legumes was simulated by increasing the shift parameter in the legume production function by 11%. It resulted in an increase by as much as 33% in the production of legumes. Household supply response to technological change was stronger than in the price experiment. This suggested that efforts to diversify the cropping system in the Nigerian Northern Guinea Savanna must incorporate technological change which increases legume yields. There were also small increases in the production of all the other crops except maize, which actually declined in the small household. This suggested that households reallocated resources from legumes, which experienced technological change, to other crops, thereby increasing their production.

5. Conclusions and implications

This article used a SAM-based household model to determine the effects of trade and fertilizer subsidy policies on decisions of agricultural households and, therefore, on the degradation of the environment in northern Nigeria. These policies influenced the structure of incentives facing households which, in turn, influenced household cropping choices and levels of input use. The linkages between policies and environmental degradation were drawn from decisions households made because different crops, crop combinations, and agronomic practices make different demands on soil nutrients, physical soil properties, and the pest and disease complex.

The base year result showed the dominant role of cereals relative to legumes in household cropping choices. Households did not allocate any land to fallows, suggesting that land is a scare resource in this area. The base results also indicated relatively high levels of fertilizer use, particularly on the more fertilizer-responsive maize crop. The dominance of cereals over legumes in households' cropping choices and the high levels of fertilizer use are, however, raising concerns about the sustainability of the system.

The cropping system in northern Nigeria needs to be diversified in order to be sustainable. Three simulation experiments were conducted to test the impact of policy reforms and technological change on the potential to diversify household cropping choices to provide a greater role for legumes. The experiments included a change in relative price of legumes, eliminating the fertilizer subsidy, and technological change in legumes. Technological change in legumes had a greater potential for increasing the role of legumes in household cropping choices compared to changes in relative prices. This finding suggests that, where large productivity differences exist among competing crops, technological change might be the critical factor in increasing the competitive position of crops with relatively low productivity. Elimination of the fertilizer subsidy resulted in a decline in production of all crops. However, cereals experienced the largest decline in production, because these crops used fertilizer more intensively. The results suggest that fertilizer policy reforms will ameliorate the degradation of the resource base through the differential effects on input use, input use intensities, and changes in the cropping pattern. While the resulting changes in cropping choices and input use will improve the agricultural environment, the reductions in household income and expenditures on food and manufactures, particularly in the less endowed households, might have undesirable welfare and distributional implications. Nevertheless, as many studies in other countries suggest, these distortions, even if sustainable, tend to lower the overall efficiency and welfare of the economy.[4]

The simulation experiments involving technical change in this study were restricted to legumes. This is because technologies for maize exist and vast areas of northern Nigeria are cultivated with improved composite maize varieties which offer higher yields and are less susceptible to major pests and diseases. The rate of diffusion of improved hybrid maize varieties is much slower in these systems, but this could well increase in Nigeria if the subsidy on fertilizer is eliminated as farmers look for ways to maintain maize yields at lower intensities of fertilizer use. At the same time, the prospects for solving the pest and disease problems with traditional legumes are not very promising. Besides the freely nodulating improved soybean varieties which are diffusing rapidly on farmers' fields, many improved high-yielding cowpea varieties that are available require relatively high levels of input use and managements that are not economically viable under smallholder farmers' circumstances.

Research and development efforts also need to address some practical questions relating to legume technologies which are relevant for household decision-making. To start off with, there are different types of legume technologies with varying potential to sustain the resource base. These include grain legumes, intercropping and rotation strategies involving legumes, green manures, and agroforestry. Each of these technologies involves important trade-offs between short-term food or income benefits and long-term soil fertility benefits, and they make different demands on farmers' scarce resources. The challenge for research is to judge correctly the threshold levels at which trade-offs can be made, as well as determining realistic levels of initial investment requirements given farmers' circumstances. In the Northern Guinea Savanna of Nigeria, where farmers are already familiar with fertilizer technology, there is a further challenge to determine the best combinations of legume technology to complement inorganic fertilizer use. Particular attention needs to be given to the interaction of soil fertility technology with other farmer inputs and management practices. The complexity of these decisions mean that these strategies can only be readily adoptable when farmers are given practicable advice which guides them through the many choices they have to make.

Appropriate policy reforms would encourage farmers to diversify away from cereals, particularly the highly fertilizer-responsive maize crop, into legumes. Technical change is equally important, as is shown by the tremendous response of households to an increase in legume yields. This implies that creating a conducive policy environment is necessary but not sufficient

[4] Several of the papers in Vosti *et al.* (1991) review the complex linkages between economic policies and the environment.

for sustained growth in productivity. Increased research which results in the development of improved technologies for sustainable production systems complements good policies. The complementarity of policies and technologies needs to be recognized in the setting of technological priorities. This should be done within the context of household decision-making and a holistic vision of the production system which recognizes the heterogeneity of systems, the understanding of system dynamics, and the interaction of these dynamics with the evolution of constraints.

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APPENDIX

Table A1. *Household SAM*

a. Small household (naira)

	Maize	*Sorghum*	*Legumes*	*Cotton*	*Other*	*Livestock*	*Labour*	*Capital*	*Land*	*Household*	*Capital a/c*	*Row*	*Total*
Production													
Maize	29									356	140	1601	2126
Sorghum		29								290	126	1604	2049
Legumes			98							86	98	602	884
Cotton				26								522	548
Other					44					928	385	596	1953
Livestock													
Factors													
Labour	1717	1658	577	289	1820							218	6279
Capital													
Land	94	122	94	36	43								389
Household							4627		389			599	5615
Capital a/c										2392		−1643	749
Row	286	240	115	197	46		1652			1563			4099
Total	2126	2049	884	548	1953		6279		389	5615	749	4099	

	b. Large household (naira)												
	Maize	*Sorghum*	*Legumes*	*Cotton*	*Other*	*Livestock*	*Labour*	*Capital*	*Land*	*Household*	*Capital a/c*	*Row*	*Total*
Production													
Maize	41									1296	5780	5428	12545
Sorghum		55								1785	2388	88	4316
Legumes			247							234	415	2793	3689
Cotton				114							275	5339	5728
Other					43					556		3492	4091
Livestock	550	550											1100
Factors													
Labour	10709	2463	2994	5237	3837							438	25678
Capital													
Land	338	429	320	198	91								1376
Household							17590	1100	1376			6302	26368
Capital a/c										12654		−3796	8858
Row	907	819	128	179	120		8088			9843			20084
Total	12545	4316	3689	5728	4091	0	25678	1100	1376	26368	8858	20084	