

*Bjørn K. Wold (ed.)*

**Supply Response in a Gender-  
Perspective**

The Case of Structural Adjustment  
in Zambia

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# Abstract

*Bjørn K. Wold (ed.)*

## **Supply Response in a Gender-Perspective**

The Case of Structural Adjustment in Zambia

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Persistent poverty, low economic growth, deteriorating public service, prolonged public budget deficits, and large foreign debt have forced the majority of Sub-Sahara African countries including Zambia to implement structural adjustment type of economic reforms. By getting prices right and reducing market imperfections reforms are designed to ensure that higher prices on agricultural crops will serve as an incentive for women and men small, medium and large scale farmers alike to increase production and hence economic and social welfare.

This study addresses the empirical impact of such a reform program in Zambia step by step, as follows:

- by assessing how economic reforms affect price and market conditions at community level;
- by assessing how price, market and other local conditions at community level affect the supply-response and welfare of women and men small and medium scale farmers; and finally
- by determining whether these conditions are causing a gender-biased supply-response and welfare impacts.

The study starts off by testing central assumption in gender economics literature with a focus on legal gender constraints, gender obligations and preferences, gender based division of labor and bargaining power within households. Crop prices and prices for a simplified consumer price index are collected at community level, aggregated and presented as deflated prices at district and centrality level. National price time series are presented for a range of crops. Farmers response to changing prices are presented both over time and by a cross sectional regression analysis. Data sources for regression analysis are two linked households surveys, one social and one agricultural survey. Cross sectional supply response is analyzed according to three household models; the uniform household, female- versus male-headed households and finally by bargaining power within households. The welfare impact of a certain crop production is analyzed by a reduced form regression analysis for the same three household models; the uniform household, gender of the household head and the bargaining within households. Finally, based upon conclusions from the empirical analysis, three main recommendations for improved economic reforms are presented.

**Keywords:** Bargaining power, Crop production, Economic reforms, Gender, Households, Sub-Sahara Africa, Supply-response, Welfare analysis, Women farmers, Zambia.

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# Contents

<b>Preface</b> .....	<b>7</b>
<b>1. Introduction</b> .....	<b>9</b>
<b>2. Methodology</b> .....	<b>11</b>
<b>3. Structural adjustment in Zambia: The agriculture sector</b> .....	<b>12</b>
<b>4. The bearing of gender</b> .....	<b>16</b>
4.1. The literature on gender and structural adjustment.....	16
4.2. Gender and agricultural production.....	18
<b>5. Supply response</b> .....	<b>24</b>
5.1. Supply response over time: 1980-1991 .....	24
5.2. Structural factors affecting price .....	26
5.3. Cross-sectional statistical analysis of supply response: 1993.....	29
5.4. Participatory rural appraisal: Findings in 1995.....	34
<b>6. Welfare effects of agriculture sector structural adjustment</b> .....	<b>37</b>
6.1. Poverty.....	37
6.2. Nutrition .....	37
6.3. Statistical findings on welfare effects at micro-level.....	38
<b>7. Conclusions and recommendations</b> .....	<b>43</b>
7.1. Conclusions.....	43
7.2. Recommendations .....	46
<b>References</b> .....	<b>48</b>
<b>Appendices</b>	
A: Poverty.....	51
B: Nutritional status and malnutrition .....	56
C: Gender disaggregated data .....	60
D: Marketed agricultural production data .....	63
E: Prices.....	64
F: Regression specification and sample regression outputs.....	68
G: Recommended studies.....	75
<b>Recent publications in the series Reports</b> .....	<b>77</b>



# Preface

This study has been undertaken by a team comprising Bjørn K Wold, editor and teamleader, Statistics Norway, Oslo; Tom Langer Andersen, Statistics Norway, Oslo; Efrida Chulu, Central Statistical Office, Lusaka; Regis Gwaba, Farming Systems Association of Zambia, Chilanga; Ruth Haug, Noragric, Ås; John Kabongo, Farming Systems Association of Zambia, Chilanga; Joyce Kanyangwa-Luma, Central Statistical Office, Lusaka; Angela Keller-Herzog, Ottawa; Mwila Lwaile, Farming Systems Association of Zambia, Chilanga; Astrid Mathiassen, Statistics Norway, Oslo; Nancy Mukumbuta, Farming Systems Association of Zambia, Chilanga; Monica Munachonga, Farming Systems Association of Zambia, Chilanga; Julius Shawa, Central Statistical Office, Lusaka; Patrick Sikana, Farming Systems Association of Zambia, Chilanga; Espen Sørensen, Statistics Norway, Oslo; Johnny S Y Valen, Noragric, Ås.

Wold prepared the overall report which was then reviewed and edited by Keller-Herzog. The overall report was based upon a series of inputs. Wold drafted the first four chapters. Chapter three was partly based upon a document on agricultural production and policy drafted by Shawa and Wold. The four sections of chapter five were drafted by Wold; Andersen; Valen and Mathiassen; and Keller-Herzog. Section one and section two were based upon «Appendix 1: Prices and marketing» by Andersen and Sørensen with contributions from Chulu. Section three was based upon «Appendix 2: Regression analysis, methodology and results» by Mathiassen, Valen and Wold and a theoretical outline for the regression analysis by Wold. Section four was based upon «Appendix 3: Participatory rural appraisal» by Sikana, Gwaba, Haug, Kabongo, Lwaile, Munachonga, and Mukumbuta. The first section of chapter six was drafted by Keller-Herzog based upon the enclosed appendix «Poverty» drafted by Chulu; the second section was drafted by Keller-Herzog based upon the enclosed appendix «Nutritional status and malnutrition» drafted by Kanyangwa-Luma; and the third section was drafted by Mathiassen, Valen and Wold based upon the above mentioned two papers: Appendix 2 and the related theoretical outline. Chapter seven was drafted by Wold. All work benefited from team peer reviews.

The three appendices mentioned above are published in a separate document: Bjørn K Wold (ed.) (1997): «Supply Response in a Gender-Perspective, The Case of Structural Adjustment in Zambia, Technical Appendices: Prices and marketing; Regression analysis, methodology and results; and Participatory rural appraisal», Document 97/forthcoming, Oslo: Statistics Norway.

Gunvor Iversen and Jan Lyngstad assisted in planning the study and writing terms of reference. The latter and Ib Thomsen reviewed a draft document and provided valuable comments on the structure, content and presentation. Liv Daasvatn, Frank Kakungu, Kristian Lønø and Nelson Nkoma prepared clean analysis files and Kakungu and Nkoma assisted in the data analysis. John Dagsvik and Marie Arneberg assisted in planning, conducting and reporting from the meso-micro analysis. Iulie Aslaksen reviewed the document from a gender economic perspective and provided valuable ideas and inputs. However, none of these are responsible for any shortcomings of the study, which remains the sole responsibility of the study team.



# 1. Introduction

Persistent poverty, low economic growth, deteriorating public service, large public budget deficits, and a hugely burgeoning foreign debt left no doubt that economic reforms were a necessity in the majority of Sub-Sahara African countries including Zambia. The issue was not whether or not to reform but how. Structural adjustment type of economic reforms were designed to reduce and eradicate economic distortions, and hence create incentives for economic activities which were previously constrained by indirect taxation, structural market distortions and inefficient resource allocation mechanisms. For agricultural production, it was assumed that an economic reform program would produce the necessary incentives (prices, marketing opportunities, available transport services, etc.) to ensure that farmers would share in the expected economic growth and that increased agricultural production would lead to increased economic and social welfare.

In many sub-Saharan African countries, including Zambia so far, structural adjustment and economic reforms have failed to elicit this intended producer “supply-response” and poverty has increased under structural adjustment. In Zambia the agricultural sector employs roughly 60 per cent of the labor force (CSO, 1994) and over half of the labor time allocated to agricultural crop production is provided by women (Kumar, 1994). Hence, the issue is how economic reforms affect production incentives and agricultural output response; how reforms affect the economic and social welfare of small-scale, medium-scale and commercial farmers<sup>1</sup>, and, in particular, how reforms are affecting women farmers versus men farmers.

The specific research questions addressed by the study are the following,

- to assess how the economic reforms affect price and market conditions at community level;
- to assess how price, market and other local conditions at community level affect the supply-response and welfare of the small scale farmers; and,
- to determine whether these conditions are causing a gender-biased supply-response and welfare impacts.

The overall objectives of this study follow from the challenges outlined above. It is to contribute to an understanding of how and why economic reforms have affected small and medium-scale women farmers versus men farmers, and how reforms should be designed in order to allow women farmers to share in the benefits of economic reform, increase production for sale and own-consumption, and improve their social and economic welfare. The new genderized economic policy literature has begun to significantly bridge the gap between structural adjustment policy literature and gender literature. It is therefore due time for empirical studies in different countries and contexts to underpin this effort. This study makes such a contribution.

The study is organized as follows. *Section 2* provides an overview of the methodologies employed. *Section 3* provides background information on the changing policy context in the Zambian agriculture sector, followed by background information which contextualizes the study for readers less familiar with small and medium-scale agricultural production in Zambia.

*Section 4* begins with a selective overview of the literature bridging gender and structural adjustment issues with particular reference to the sub-Saharan situation. A combination of primary and secondary sources is then used to present information relevant to an understanding of the constraints facing female small and medium-scale producers in Zambia. A particular focus is the identification of the theoretical and empirical gender biases in opportunities and constraints that promote or tamper the agricultural supply response of female farmers. This understanding of why women farmers may respond differently from men farmers

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<sup>1</sup> In Zambia, farmers are usually classified into three categories; small-scale farmers which number around 600,000 households; emerging farmers, also called medium-scale farmers which number around 100,000 households; and commercial farmers, of which there are approximately 2000 households and/or companies. Our study focuses on small-scale and emerging farmers.

then serves to support the inferences drawn in subsequent parts of the study.

*Section 5* addresses the observed agricultural supply response, beginning with an examination of longitudinal price and production trends over the pre-adjustment period. Given that price is a key signal to producers, but is not the only determinant of supply response, structural factors and structural factors affecting price in the Zambian context of agricultural sector reform are then examined. Only thereafter in section 5.3 is the statistical analysis of supply response presented, based on a large sample of cross-sectional household data from the 1992/93 growing season. The methodology for the statistical analysis includes use of an intra-household bargaining power model as well as the separate analysis of female and male-headed producer households. Section 5 on Supply Response concludes by presenting findings coming out of the PRA conducted in 1995, giving additional qualitative depth to observations and further information on women and men farmer responses to SAP-induced changes in the small-scale agricultural producer environment.

*Section 6* then turns to the welfare effects of structural adjustment. The section begins with an overview of poverty and nutritional trends in Zambia. Cross-sectional household data is then analyzed using regression techniques in order to find out key determinants of male and female farmers economic and social welfare in the 1992/93 adjustment context.

*Section 7* completes the study by presenting conclusions and recommendations.

*Appendices* provide additional information and data on poverty, nutritional and gender-disaggregated indicators, as well as more technical information on the price analysis, methodological notes and sample regression outputs.

A separate unpublished document, Technical Appendices<sup>2</sup>, presents three technical documents: Prices and marketing, Regression analysis, methodology and results, and Participatory rural appraisal.

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<sup>2</sup> Available from the main author.

## 2. Methodology

The study follows effects of macro-economic and sector reforms down to the community, household and individual levels thus combining macro, meso and micro-level analysis. Research methods employed were the following. (i) Policy analysis, literature review and reanalysis of existing aggregated data provided a base of information on agricultural crop production, gender, poverty and nutritional status. (ii) A price-level analysis based on community level prices from the Community Survey (CS) data set was used to generate a household data set with real prices in a spatial sense. (iii) Time series on prices, aggregated nation-wide data and provincial data were reviewed as to supply-response patterns in response to price changes. (iv) Cross sectional supply-response and welfare regressions were run on the basis of a simplified correlation model using multi-level data collected at community, household and individual levels. The analysis was conducted for alternative theoretical models of household behavior: the uniform household model and the intra-household bargaining effects model. For the former, separate analysis of female versus male-headed households in the sample was undertaken; for the latter the sample of male-headed households was used. The basic theoretical assumption underlying the household analysis is the new family economics model augmented with specific gender-related variables identified. The econometric method used was tobit<sup>3</sup> analysis for the supply response to correct for the non-producing farms for the various crops. The welfare analysis was done using ordinary least squares (OLS) estimation<sup>4</sup> since all observations in the sample were used. Methodological limitations are duly noted alongside findings presented. And (v) the final research method employed was a series of village-level PRA exercises conducted by field teams, focusing on prices, supply-response and welfare. The PRA was carried out by the Farming Systems Association of Zambia (FASAZ) to complement the secondary and statistical analyses with a qualitative approach in six selected villages. The PRA study complements the quantitative methods by an approach rich in details, up-to-date and providing disaggregated

information for each gender, socioeconomic group, and geographical area.

The case study was able to utilize data from the following primary sources:

- (i) *Community Survey* (prices and community context data from 1993, sample: 381 communities);
- (ii) *Priority Survey II* (multisectoral household and individual level data from 1993, sample: 10 151 households);
- (iii) *Crop Forecast Survey* (agricultural information from 1993, sample: 3 000 households, overlapping sample 1 664 households); and,
- (iv) *Participatory Rural Appraisal* findings (6 villages, 3 provinces conducted in 1995).

The aggregated Zambian national and provincial-level time series data was used for policy analysis. Community, household and individual-level 92/93 data was used for the empirical analysis and it was possible to construct a matching data set including information on prices and marketing channels utilized by local producers. The survey data were then also complemented by Participatory Rural Appraisal (PRA) findings which served to supplement the research team's understanding of processes and which provided information on supplier responses to reforms two years after the cross-sectional data were collected. In addition, literature relating to structural adjustment and gender was reviewed, see references.

<sup>3</sup> Tobin (1958), Maddala (1983)

<sup>4</sup> Judge et al. (1988).

### 3. Structural adjustment in Zambia: The agriculture sector

At independence, Zambia inherited a characteristic dual economy with a large urban economy and an impoverished rural population (Dumont and Moltin 1983). Since independence, the agricultural sector has accounted for a roughly constant share of GDP – between 13 and 18 per cent – but employs about 60 per cent of the labor force. From the time of the 1968 economic reforms up to 1991, the agricultural sector, as with the rest of the economy, operated under a controlled policy environment.

Maize has since colonial times been the dominant crop and was estimated to account for roughly 70 per cent of the land under cultivation and 70 per cent of the fertilizer use in the early 1990s. Maize is grown as a staple as well as cash crop. Marketed maize usually employs hybrid varieties which are high-yielding, but also demand more fertilizer inputs and are less drought resistant than so-called 'local' varieties. Other important food crops in Zambia include groundnuts, beans, millet and sorghum. Groundnuts and beans are particularly interesting in a gender perspective as they are often grown by women and marketed for sale by women. Maize is grown by both genders (i.e. labor inputs from both), but mainly marketed by men, particularly the hybrid varieties.

Post-independence rapid expansion in the urban population was not accompanied by significant increases in the volume of production of the main urban staple maize meal, and food imports doubled between 1964 and 1974 alone (Robert 1976). As a result, the government of Zambia has been under heavy pressure to increase domestic agricultural production since about the mid-1970s. Furthermore, small and medium-scale farmer involvement in hybrid maize production was seen by the politicians as the only vehicle through which national wealth could be redistributed from the center to the impoverished rural areas (Sano 1988).

The set of policies developed to address these policy objectives was a comprehensive system of maize

promotion, maize marketing and structural support to maize growers. Agricultural policy strongly supported the promotion of hybrid maize over other crops. This was achieved through orienting state-controlled agricultural support institutions mainly towards the production of maize. For example, credit for agricultural inputs was made available to farmers at concessionary rates that enabled male and (to a lesser degree) female farmers to take up hybrid maize production (Mwansa et al. 1994). Similarly, other services such as input supply, research and extension were invariably biased towards hybrid maize production (hence biased towards male farmers). There was a real effort to promote high-input high-output varieties (mostly hybrid, but at the end of the 1980s even improved local varieties based upon varieties from Tanzania and Zimbabwe). As a result, Zambia was able to capture some of the "green revolution" benefits – though accompanied also by the short comings, including drainage of soil nutrients due to low fertility soils unsuited to intensive cultivation and increasingly acidified soils due to fertilizer over-use in large parts of especially Northern Zambia.

Prices of crops and agricultural inputs were fixed by the government. Hybrid maize production was subsidized/cross-subsidized through the provision of inputs at pan-Zambian uniform prices, and through the purchase of maize crops again at uniform pan-Zambia prices – irrespective of distances between producers and final consumers of mealie-meal. Maize was traded exclusively through government agents, with sales other than to government illegal. Floor prices were announced for crops other than maize.

The center-piece of the effort to increase domestic maize production was the system of government run door-to-door maize purchasing and maize collection, which enabled farmers in the most remote corners of the country to market maize, with all transactions costs born by the state. This system of public marketing of crops was established in the later 1970s and eventually covered the whole country including remote areas. It

was operational in the line-of-rail provinces<sup>5</sup> from the mid-70s to 1992. In the off line-of-rail provinces it was formally in place in the later half of the 1970s, but an effective system providing extension, credit, hybrid-seeds, fertilizer and picking up the bags after harvest at depots close to villagers (the ‘one stop system’) was only established during the early 1980s.

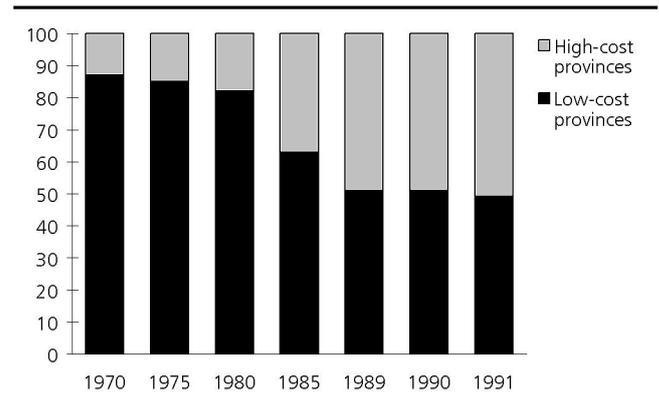
Through extension programs and various political campaigns at the community level, the official public policy emphasized and fostered the notion of development in terms of the transformation of traditional farming systems (subsistence) to marketed agriculture (centered around hybrid maize production) (Gatter 1993). The overall effort of the government campaign to promote hybrid maize production did achieve the greater integration of traditional farming systems with urban markets in most parts of the country. Hybrid maize became the dominant crop even in provinces such as Northern, Western and Luapula Provinces, which were designated as unsuitable for hybrid maize production during the colonial period. According to Bolt and Holdsworth (1987), between 1976 and 1985, marketed maize production increased by 50 per cent at the national level and by as much as 500 per cent in Northern Province. The implications of changes of this scale at the household level in terms of labor allocation, income levels, consumption patterns and dietary preferences, etc. should not be underestimated.

In general the public marketing and agricultural support system functioned best during the first half of the 1980s. The system had reached all areas and delays and shortages were still minor. All the factors were there: hybrid variety seeds, basal and topping fertilizer, extension service (which, although it did not reach the remotest villages and in general did not significantly reach women, did provide substantial service), credit (which reached further than extension but again few women), a predictable marketing system with uniform and farm-income stabilizing pan-Zambian prices (high prices when production was low and vice versa).

Despite, or due to, these comprehensive government-driven efforts, the contribution of the agricultural sector to the national economy, remained far below its potential. Of the total arable land of nine million hectares, only 20 per cent is utilized for agricultural production. The government increasingly came under macroeconomic and balance of payments pressures

<sup>5</sup> The line-of-rail is the old Cape railway which intersects Zambia from Livingstone in the south to Copperbelt in the north. The existence of this transport corridor has led this area to be the focus of most of the economic activities in Zambia. Cities and towns like Lusaka, Ndola, Kitwe, Kabwe, Kafue, and Livingstone are located along this railway connecting Zambia to Zimbabwe and South Africa in the South. The Tazara railway connecting Kapiri Mposhi north of Lusaka with the Tanzanian port of Dar es Salaam was constructed in recent years and is not considered as a line-of-rail leading to the development of centers of economic activities.

Figure 3.1. Sources of official maize purchases, per cent



(originating mainly from the copper production sector which dominates Zambia’s foreign trade). The contribution of the agricultural sector to foreign exchange earnings has for a long time been low, measuring at below 5 per cent. The growth of the sector from 1965 to 1991 was only 2.2 per cent, hiding a decrease from 1965 to 1983 and an increase of 7 per cent from 1983 to 1990. On an annual basis this growth is less than one per cent, far below population growth<sup>6</sup>.

These aggregated figures of relatively stagnant national output growth, hide the drastic change in spatial reallocation that the public maize management system’s set of incentives effected. Figure 3.1 shows that during the low growth period from 1970 to 1982, maize production remained largely concentrated in the line-of-rail or low-cost provinces<sup>7</sup>. However, during the high-growth period from 1983 to 1991, maize production moved out from the low-cost line-of-rail provinces to the high-cost off-the-rail provinces. The share of production in remote provinces increased from less than 15 per cent in 1970, to 20 per cent in 1980 and up to 50 per cent around 1990. When the adjustment process started in the early 1990s, production per farmer household was not very different in central versus remote provinces. Increasing production in high-cost provinces also had resulted in increasing transport subsidies, which contributed to an increasingly unmanageable public sector deficit.

To provide context for the study of the effects of liberalization and structural adjustment, it is important to also have a sense of the socio-economic impact on poverty of the pre-adjustment regime. Reanalysis of existing information on crop production, poverty and nutritional status shows important redistribution of

<sup>6</sup> This last observation of declining per capita production is significant also from a productivity perspective. Labour is a primary input factor for small and medium-scale agricultural production; hence, with greater labour input one would have expected rising total output *ceteris paribus*.

<sup>7</sup> In this section, we have followed the definition used by the CEM (World Bank 1992 and 1993b) including only Southern, Central and Lusaka provinces among the low cost provinces. Usually Copperbelt is included as well.

**Table 3.1. Income 1975 to 1991 in rural and urban Zambia.**  
Monthly income per household

Measurement/Year	1975, incl. consumption of own produce	1975, excl. consumption of own produce	1991, excl. consumption of own produce
Rural nominal income	K 29.20	K 15.32	K 3 634
Urban nominal income	K 107.34	K 106.60	K 10 378
CPI, 1985 base	18.18	18.18	3 225
Rural real income <sup>1</sup>	K 5 180	K 2 718	K 3 634
Urban real income <sup>1</sup>	K 19 041	K 18 910	K 10 378
Rural change			+34%
Urban change			-45%

<sup>1</sup> 1993 prices.

Sources: CSO 1980 and CSO 1993.

both production and economic welfare (as measured by income) from central to remote provinces and from urban to rural areas.<sup>8</sup>

Examining Zambian aggregate rural and urban income data, two clear trends are evident over the period 1975 to 1991 (see table 3.1). Mean income in rural areas increased 34 per cent in the period 1975 to 1991, coinciding with the steady increases in marketed agricultural output in the off-the-line-of-rail provinces (see figure 3.1). Income remained constant in the line-of-rail provinces. This appears to indicate that, on average, increased production led to increased incomes. However, the lack of data on own-produced consumption requires some caution. As the table shows, the value of own-produce constituted almost half the income in rural areas. Hence, if the farmers became more integrated in the market economy during this period only by selling a larger share of a constant volume of produce, there might have been no real increase in economic welfare. This is likely to have happened to a certain degree, but we would still expect *a certain rural welfare increase to have taken place in rural Zambia during these pre-adjustment years, and certainly in the off-line-of-rail provinces.*

Real incomes in urban areas on the other hand *decreased* by almost half during these years; a change larger than the rural increase in incomes. However, 1975 urban income was approximately four times rural income; even if one was able to include the value of production for own consumption in the 1991 rural

<sup>8</sup> Interestingly, decreased production in more central provinces did not lead to a similar decrease in income in line-of-rail areas. Our hypothesis is that other opportunities were available in those areas. Crop producers could switch to other crops and other economic activities. They were not pushed out of maize production but pulled into other crops and other economic activities. If this was the case, the public marketing system succeeded not only in raising production, but increased economic opportunities in remote provinces without destroying opportunities in central areas thus creating more equal opportunities across the country. Unfortunately the aggregated data does not allow us to test this push or pull hypothesis nor to test the potential gender biases of the public system.

figures, average urban income would probably still have been considerably higher than the 1991 average rural income. By the early 1990s, the inefficiencies in the public marketing system and the increasing budgetary drain it represented when combined with heavy-mealie meal subsidies were apparent. To cope with the on-going fiscal crisis, the previous Government had initiated some economic reforms before losing the 1991 election. When voted into power at end of 1991, the new Movement for Multi-Party Democracy (MMD) government embarked on an ambitious program of reforms. In line with the requirements of the structural adjustment program advocated by the IMF and the World Bank, agricultural policy reforms were instituted with the aim of providing an environment in which the private sector would play a leading role in crop marketing, distribution, transport, credit and input supply.

Input subsidies and mealie-meal subsidies were progressively withdrawn. For the 1991/92 growing season the government stopped announcing crop prices except a floor price for maize. While the drought in 1991/92 delayed the further implementation of the new policies, by the 92/93 season, public marketing of crops other than maize was abolished, private traders could trade in maize, and only a floor price for maize was retained. In 93/94 the floor price for maize was then also abolished and buying was left entirely to private agents. Overall, liberalization of the agricultural sector has meant that the public sector has withdrawn from input supply delivery, crop marketing, agricultural pricing, and subsidization at all points of the production cycle from fertilizer to mealie meal. Agricultural credit institutions servicing small-scale farmers and marketing parastatals (also for other crops) have been eliminated or privatized. The government did however retain a system of providing credit for large and medium scale private traders.

After a couple of years the government has realized that private marketing has its limitations and has caused food security problems in remote areas. Hence a limited scheme for provision of fertilizer was reintroduced during the 1995/96 and 1996/97 seasons. It is however a part of the story that due to late payment by the government to the South African providers the delivery in the last season was too late and had a low coverage. Zambian farmers seem to face the pitfalls of both marketing systems.

The assumptions and driving rationales behind the structural adjustment program are relatively simple. Advocates of liberalization argued that government subsidy in agriculture distorted the true market value of agricultural crops and that the public price-and-marketing-control policy regime imposed high levels of

direct and indirect taxation<sup>9</sup>. The system was seen as constraining farmers (especially, but not only, large scale farmers in central areas) from achieving higher prices through private marketing and exporting. It was further argued that government subsidies principally benefited urban consumers, who were able to purchase mealie-meal at a depressed price.

A key World Bank study (Jones and Kiguel 1994), covering the period 1981/83 to 1989/91, ranked 28 sub-Saharan African countries and found Zambia's adjustment performance at the macro level to be "very poor", in fact, the worst of the 28 countries studied<sup>10</sup>. The study found that, over the period, Zambia was one of just a few countries where the direct and indirect taxation of farmers increased. By their estimation such taxation had risen by 75 per cent over the period<sup>11</sup> – far more than in any other country. This led their study to conclude that the potential for economic reforms was large in Zambia.

A main rationale for economic reforms is to get the prices right. Free-market-generated producer prices are understood as 'signals' for a more efficient allocation of resources (as against publicly controlled price regimes which are seen as 'distorted signals' resulting in misallocation and inefficient use of resources). This also explains the importance and attention given in the literature to the question of *supply responses to price signals*. In short, market liberalization of the agricultural sector in Zambia was expected to correct distorted prices and lead to higher prices for farm produce, particularly for crops which usually were priced below world market prices. It was expected that farmers would respond positively to these price incentives by producing and marketing more. Higher production was then expected to result in increased economic and social welfare for both women and men

farmers<sup>12</sup>. The aim of this study is not only to analyze whether or not these expected outcomes are materializing, but also how and why or how and why not.

<sup>9</sup> Farmers were obliged to sell maize to a parastatal marketing agency to lower than world market prices and hence taxed indirectly.

<sup>10</sup> Prior to the concerted adjustment effort undertaken by MMD beginning in 1992, Zambia had been characterized by a "stop-go" pattern of adjustment with successive rounds of SA lending.

<sup>11</sup> Calculation of taxation in Jones and Kiguel (and elsewhere) is based upon comparison with world market prices. Explicit or direct taxation is due to mandatory sale to the marketing board, which bought to a certain price (often using vouchers payable some time in the future) and exported at a higher price. Indirect or implicit taxation is created by the artificial exchange rate. These 'taxes' would be paid by farmers in central areas and close to borders. Without any public marketing, these farmers could have sold straight to urban markets or exported to higher prices. It should be added that the vocal farmer lobby in Zambia was comprised mainly of large scale commercial farmers who were quite obviously taxed by the system before the reforms.

<sup>12</sup> The Government of Zambia and the World Bank have outlined a poverty-reduction strategy based upon three elements (World Bank, 1993b). First, employment is assumed to grow in the informal sector. Second, rural poverty is assumed to «be reduced sharply with increases in agricultural output». Third, «dramatic increases» are assumed to «be possible in the delivery of vital social services [such] as health, education, water and sanitation».

## 4. The bearing of gender

### 4.1. The literature on gender and structural adjustment

The major working hypothesis advanced in the literature on gender is that each gender has different work obligations and different preferences for the overall resource allocation in the household<sup>13</sup>. In sub-Saharan Africa the gender pattern found is one where women tend to give preference to consumption and domestic needs, and men to cash income, luxury items and investments. In the agriculture sector, this is reflected in the split between crops grown by women and crops grown by men. Women tend to grow crops which are mainly used for household own-consumption, while men tend to grow crops for sale.

Mainstream literature on economic reforms in sub-Saharan Africa, such as Jones and Kiguel (1994), states that structural adjustment type of reforms set the necessary conditions to improve resource allocation and create increased incentives for agricultural production, but might still not be sufficient to yield a positive aggregated supply response in all sub-Saharan African countries. Given the important role and contribution of women in agriculture, a key question for empirical research is therefore whether gender-related factors are significant in explaining why the agricultural supply response to structural adjustment reforms has been lower than expected in sub-Saharan African countries, including Zambia.

According to the relevant gender literature<sup>14</sup> one would expect to find a gender bias in Zambia that systemati-

cally affects the opportunities and constraints facing women farmers versus men farmers. Responses to incentives, such as for example increasing production or changing crop patterns in response to higher crop prices or different market-institutional arrangements, would therefore also be systematically gender differentiated. Policies which are designed and implemented based on a gender neutral (or gender blind) understanding of the policy context would then be sub-optimal in achieving desired outcomes.

In this context, Bakker (1994:1-29) documents the gender-bias of structural adjustment policies (SAPs). She develops three levels of arguments. Firstly, she points out that at the level of conceptualization of markets in standard economics, structural power relations and asymmetrical gender dimensions are missing. This is in turn reflected in standard modeling approaches. Secondly, at the macroeconomic level, the unpaid labor of women in caring and reproductive tasks is ignored. Thirdly, at the level of structural adjustment policy, she provides a number of examples of how SAPs might effectively be gender-biased in impact and outcomes. For instance, to reduce chronic public sector deficits, cutbacks in public expenditure, such as provision of food at hospitals, will shift this responsibility onto women, requiring them to make up the shortfall.

Elson (1994a) provides a more detailed presentation of gender and economic analysis in the context of structural adjustment. She discusses macro, meso and micro levels, and identifies the mechanisms creating the gender-bias of an economy. At the meso-level, this includes for example mechanisms leading to the explicit exclusion of women from access to resources, such as access to credit and access to family assets as

<sup>13</sup> "Gender" is used sometimes indiscriminately to describe different things at different times. Sometimes it means "women", sometimes "sex" and sometimes more precisely "gender". Gender refers not to men and women, but to the relationship between them and to the ways in which the roles of women and men, girls and boys are socially constructed.

<sup>14</sup> Even the well informed reader might still have the impression that while economists and gender specialists both address structural adjustment reforms, they hardly address the same reality. This might be the general picture, but hardly the complete one. The Oxfam study 'Women and Economic Policy' (Evers 1993), the Zed Books publications 'Mortgaging Women's Lives' (Sparr 1994), 'The Strategic Silence' (Bakker 1994) and 'Structural adjustment, the

rural-urban interface and gender relations in Zambia' (Geisler and Hansen 1994) all address welfare and living conditions for various groups of women within the framework of economic reforms. Hence it is well justified to state that the genderized economic policy literature is finally bridging the gap from structural adjustment policy literature to gender literature. The theoretical framework underlying this study is based on this 'gendered' structural adjustment literature.

collateral; and the micro level, for example the assumption of the household as a harmonic unit in the new household economics. Elson (1994a: 33-45) presents a critical economic theory inspired in part by the work of Sen (1990). Rather than seeing “the gender division of labor and income in the family....as the optimal outcome of free choices, it may be seen as the profoundly unequal accommodation reached between individuals who occupy very different social positions with very different degrees of social power” (38).

She follows up by presenting a feminist critical economics and the bargaining-based critical theory (which informs the construction of the intra-household bargaining model presented below in section 5.3.3). Of special interest is also Elson’s presentation (40) of the emergence of new meso-level institutions; according to her, “rolling back the state means the emergence of new markets and new firms. Reforming public sector services means the emergence of new types”. Her postulate is that even if these are not necessarily male-biased by design, they will be male-biased by omission of women’s rights, unless explicit thought is given to the design of new institutions. Elson also discusses that the general male bias in gender relations means that the extra burden of reproductive work caused by reform of social public services falls mainly on women. She concludes by advocating the need to ensure that targets for human development, and policy instruments for delivering them, are included in macroeconomic policy reforms. This includes issues such as the profile (or allocation/distribution) of public expenditure cuts and the rights of men and women.

Sparr (1994: 13-30) raises similar issues as Bakker in her analysis of gender bias of macro policy reforms. She notes that the assumption of a fully monetarized market-oriented society ignores – or is blind to – a large part of the labor of women which remains unmonetarized inside the household domain. What is perceived as increased efficiency, may instead be a shifting of costs from the monetary economy to the non-monetary economy. She also refines the argument with a detailed presentation of a number of sector issues. Of special interest for our analysis of the agricultural sector are the following two intra-household issues. The first issue is related to the Principal Agent Theory. Research from a number of Sub-Sahara African countries including Tanzania, Kenya and Zimbabwe in Eastern and Southern Africa has shown that, “women farmers may not contribute more labor to export crops if they do not have access to the additional income generated. Export crop output, then, depends on how much power a man has over a woman to increase her labor. This can undermine a government’s attempts to expand agricultural exports, if key crops rely for their cultivation on female household labor.”

The second issue relates to systematically gender-differentiated preferences. Sparr refers to studies indicating that, “in families, men react to increases in their income differently from women”. Men are said to give preference to luxury items, while women give preference to children’s and domestic household needs. Thus increases in income can have greatly different social welfare implications, depending on the recipient’s gender. One would expect the men to give preference, not only to luxury items, but also to “wasteful consumption”, in particular alcoholic consumption, which is common in sub-Saharan Africa. Sparr (24-29) details four mechanisms creating gender bias which are of particular note for this study,

- (i) “Export cropping often does not benefit women”. Quoting research from different countries she presents a picture of a system under change. In all countries there are some “male” and some “female” crops. Promoting “male” crops as export crops might, in Asia, marginalize women, since a large share of the work is done by men. In Africa, a large share of the tasks are conducted by women but the income earned is controlled by men. When the work burden of women increases, they have less time for their own crops. Even if the price of female crops increases, the women may not have access to inputs and be able to utilize the improved opportunities. If paid work is available, the women would prefer to sell their labor and control the income, rather than work for their men and have less control over income.
- (ii) “Women’s unpaid work escalates”. Structural adjustment policies often involve cutbacks to publicly provided social services. In many cases the women will have to increase their unpaid labor to compensate for this reduction in social services. This includes more time caring for sick household members, more hours that children are away for schooling, and ‘too expensive’ public transport, resulting in more time spent on transport and allocated to community work.
- (iii) “Food consumption decreases, anemia increases”. Latin American experience shows that higher food prices under structural adjustment lead to less food consumption, especially for women and girls.
- (iv) “Household structures change”. Sparr refers to research showing that migration is a male survival strategy, not a household strategy, leading to more households becoming female headed (this has been challenged by other researchers). Sparr also refers to research showing fewer grandparents and relatively more married sons and daughters.

Sparr's recommendations for further research in Sub-Saharan Africa include moving from a focus on women to one of gender relations; disaggregating women and households; and, moving gender analysis out of the exclusive realm of the social dimensions of adjustment. The study at hand, utilizing both empirical and PRA methodologies, pursues such a research agenda.

## 4.2. Gender and agricultural production

How then are women and men farmers able to respond to structural adjustment of the agricultural sector? Of particular focus are respective supply responses to price changes, given that prices are the key signaling mechanism of a well-functioning liberalized market economy. In addition, market-institutional arrangements, including product marketing arrangements and credit mechanisms, are potentially gender-biased in their accessibility by the two genders. Before undertaking the empirical analysis, potential gender constraints in the Zambian small and medium-scale agricultural producer context were examined. These included legal constraints, family obligations and work load.

### 4.2.1. Legal gender constraints

In Zambia, women farmers do not have the same possibility to own land and other assets as men farmers, due to traditional and modern ownership and inheritance laws. The tendency under traditional law is for women in general to have no ownership or rights to individual land. For example, a woman will not inherit any land, and a widow will not be allowed to keep on using all the land cultivated by herself and her husband after he passes away. While there are exceptions, this is the general rule in traditional law. Within modern law these general biases are removed; a women can buy land and other assets and register the assets in her own name. However, in Zambia the major share of cultivated land is communal land and traditional law applies. Whether married by traditional or modern law, the inheritance follows traditional law, and the father or brother of a late husband inherit the land. They are obliged to take care of the widow and children, but the widow is not entitled to retain the assets. She would usually be allowed to retain her own plots, but not those of her husband.

One issue which deserves to be particularly highlighted is the gender-bias in the on-going land reforms in sub-Saharan African countries. In Zambia, land ownership and title deeds have in general been limited to certain zones, particularly the white settler areas along the line-of-rail. The major share of the land is either governmental land, such as National Parks, Forest and Game Reserves, or communal land where the chiefs are entitled to allocate land to the villagers, while they have no rights to sell or lease out the land. In the process of economic reforms, a number of countries have embarked or are embarking on major land reforms opening for large scale sale, or as in the case of

Zambia, long term lease of land. One major effect of this reform has been to conserve the existing gender bias in land ownership. The increased possibility for buying or leasing land may serve as an opportunity for more resourceful women, but in general such reforms put women farmers at a disadvantage which might become permanent, unless they are secured access to land on equal footing with men. Refer also to Lastarria-Cornhiel (1997).

The gender bias in the right to land ownership translates into a resulting strong gender-bias in access to collateral and hence credit. Credit schemes have a long tradition in Zambia and have been provided through both parastatal and private organizations<sup>15</sup>. Turning now to primary data, survey results based on a sample of 381 community groups show that in Zambia in 1993 (two years after the structural adjustment reforms were introduced) access to credit at village level was essentially limited to primary cooperative societies, cooperative unions, and relatives/friends (see table C5). Since the cooperative credit sources were terminated the following seasons, access to credit is likely to have become negligible at village level for both male and female farmers. This in turn creates a large demand for contract farming - a method predominantly used by men. Given no other alternative credit sources for inputs at the village level, the bargaining power of remote area farmers is low.

The survey findings show that women farmers in general were claimed to have the same formal access to credit as men, but also that collateral was usually required. Few small-scale or emerging farmers - male or female - had sufficient collateral for commercial bank credit. However, the parastatal co-operatives did provide credit to male farmers in 1993, since they were registered farmers. In this sense land is collateral for co-operative credit. Married women farmers are however not registered, hence were not able to access this source of credit. Therefore, while they might have had the same formal access to credit, this did not translate to real access. This picture is corroborated by the PRA findings, which stress that the inability to provide collateral is the stage where women are losing out in accessing credit.

### 4.2.2. Gender obligations and preferences

Besides institutionalized rules, regulations and laws, sets of social norms guide, force and limit the behavior of men and women. Some gender norms are almost universal, but the specific social expression they find is often culturally unique. In sub-Saharan Africa,

<sup>15</sup> Contract farming is also a common variant of credit provision, but also the most costly. In contract credit, inputs are provided free of charge and the farmer accepts to sell the crop at a reduced price to the credit provider. It is often an insurance or risk sharing arrangement where farmers are not obliged to repay anything in case of crop failure.

including Zambia, the reproductive responsibility, both short term reproduction, i.e. cooking and household chores, and long term social reproduction, i.e. child raising and child care, are the obligations of women. Interestingly, while women are obliged to raise and care for young children, once children are old enough to embark on productive work, they are supposed to be controlled by the man. Notwithstanding, there is however, a clear tendency for children to assist their mother, working to fulfill her obligations – including her agricultural tasks.

Primary data from the 1993 Zambia Community Survey directly reports on how women and men farmers view their gender obligations. Both women and men agree on the overall pattern of family obligations. Women are obliged to take care of the current needs of the family and undertake the work in the household and village, being agricultural production, household chores and child care, while the men have a predominant role in providing inputs for agricultural production, earning money and providing for longer term expenses. Hence the family will depend on the wife for daily, seasonal and annual welfare and survival, while men are supposed to focus on a longer term time horizon and hopefully to improved economic welfare.

Table 4.1 tabulates the indexed survey findings and shows how economic responsibility of women versus men, is perceived by women and by men respectively. The first observation to be made is the gender bias encountered by questions regarding economic gender roles. Taken at face value, the survey would appear to find that there are no household economic responsibilities that men or women consider fully a joint

responsibility on average. Yet it is clear that in terms of labor, women contribute well over half the labor towards production of many crops. Notwithstanding the gender bias evident, the *relative male-female perceived economic responsibility* for various economic tasks as revealed by the survey is of interest. Four clear patterns are evident:

- (i) There is a clear difference in perceptions of the economic responsibility of women versus that of men. Men consistently report that women have a lower level of responsibility for respective tasks, than the level of responsibility reported by women across the same economic tasks.
- (ii) There is however a surprisingly consistency in the survey responses of men and women regarding gender roles; in their perception of gender obligation they rank the tasks in the same order.
- (iii) Across the range of economic tasks, agricultural production is perceived as the task requiring the most contribution by women whether the task is to produce food for own consumption, food crops for sale or even cash crops for sale.
- (iv) Acquisition of, and paying for, any of the items listed, i.e., food, clothing, school uniforms, school fees, text books, fertilizer for food crops, and fertilizer for cash crops are perceived as much more of a male responsibility. To seek wage employment is likewise considered a male responsibility.

Whereas overall these findings verify prior qualitative information and anecdotal evidence, the relatively small degree to which women are perceived as being responsible for buying food runs counter to expectation. On the other hand this further supports a

**Table 4.1. Economic obligations of women versus men in the community as perceived by groups of women and by groups of men. Index by urbanity, centrality and province (solely men's responsibility=1, A Joint responsibility=3, solely women's responsibility=5) and items ranked according to index value by the group of women and by the group of men**

	Production of food for own consumption	Paying the food for the family	Acquisition of clothing	Acquisition of school uniform	Paying school fees	Acquisition of school text-books	Acquisition of fertilizer for food crops	Acquisition of fertilizer for cash crops	Cultivation of food crops for sale	Cultivation of cash crops	Wage employment, if any opportunity
<b>As perceived by the groups of men</b>											
All Zambia	2.5	1.8	1.8	1.8	1.8	1.9	1.7	1.7	2.5	2.5	1.7
Rural	2.5	1.8	1.7	1.8	1.7	1.8	1.6	1.7	2.5	2.5	1.6
Urban	2.7	2.1	2.1	2.0	2.0	2.1	1.9	1.9	2.6	2.6	2.0
<b>As perceived by the groups of women</b>											
All Zambia	2.7	2.0	2.1	2.0	2.1	2.1	1.9	1.9	2.7	2.7	1.8
Rural	2.6	2.0	2.0	2.0	2.0	2.1	1.9	1.9	2.7	2.7	1.7
Urban	2.8	2.3	2.2	2.1	2.2	2.2	2.1	2.1	2.8	2.8	2.3
<b>Ranking of items according to index values</b>											
Overall ranking	2	6	5	8	7	4	10	9	1	3	11
Ranking by men	1	5	6	7	8	4	11	9	2	3	10
Ranking by women	3	7	5	8	6	4	9	10	1	2	11
Number of communities	619	627	623	624	626	622	584	565	587	567	588

division of economic gender roles where women are responsible for work obligations and men interact with the cash economy.

#### 4.2.3. Gender based division of labor

Directly related to gender obligations is the gender division of labor. As discussed above, it is generally the obligation of women to provide food for the family, either by own production, purchase or barter. This in turn is an important determinant constraining the economic options and choices of women farmers. In the area of credit access, responsibility for household food security, results in the greater risk-aversion of women compared to men. With regard to effective access to credit and women's 'choosing' to access credit, constraints on the ability to take on risk is a factor possibly even more important than the legal-cum-collateral barriers identified above. The event of a poor crop or near-failure means that the farmers are left with little or nothing subsequent to debt repayment. Since the chance of crop failure is small, men farmers can afford to run this risk. Women farmers on the other hand can *not* afford this risk, since a poor crop or near-failure for them would mean no food to feed the family. Women tend to spread out their efforts on a range of crops as insurance against crop failure caused by drought, diseases, etc. Women farmers also tend to avoid the high-input high-output crops. Even if they can afford the inputs, which is difficult without access to credit, they are far more reluctant than male farmers. This gender-based risk aversion is then also a contributing factor to certain crops being favored by women farmers and others by men.

The issue of female and male crops has been discussed for a long time. In much of the literature, cash crops are considered male crops and food crops are considered female crops. A number of the food crops are however cash crops as well, and hence commonly grown by both women farmers and men farmers in Zambia. Other crops might become potential cash crops and taken up by men farmers; such shifts have been documented for example for groundnut production in Eastern Province. Hence the picture is not clear, nor static over time. Still, in any given village in Zambia, farmers would clearly identify some crops

as female, some as male, and some as both. Individual and gender-disaggregated data is not available on which crops are grown by women vs. men. However, household crop cultivation data is available, including by gender of head of household. While the crop-pattern of female-headed households is not the same as for women in male-headed households, this data can nevertheless yield some information applicable to women farmers more generally. Using this data, table 4.2 presents a ratio index showing the share of producers for a particular crop being female-headed households divided by the share of all households being female-headed. Since male-headed households usually include both an adult man and an adult woman, one would expect mixed gender households to have a more diversified crop pattern, hence the ratios presented in the table would on average be less than one. Notwithstanding these difficulties, the data reveals a definite pattern in gendered crop choices.

The average ratio for all crops is around 0.80 and with indexed ratios of .31 and .48, cotton and sunflower respectively are the two clearly "male" crops, and – not by coincidence – also the only two pure cash crops. They are grown considerably more frequently by male-headed than by female-headed households in all provinces. All the other crops are grown considerably more frequently by male-headed households in at least one province. Maize is a "male" crop in Southern, sorghum is a "male" crop in Eastern, millet is a "male" crop in Western, groundnuts is a "male" crop in Copperbelt, mixed beans is a "male" crop in Southern, and even cassava could be considered a "male" crop in Copperbelt.

On the other hand; sorghum, groundnuts, cassava are «female» crops across the country, while millet and mixed beans are "female" crops in at least some of the provinces. Maize is a special case. Unfortunately it is not possible to separately identify hybrid maize and local/improved maize varieties. Given other supporting information, it is likely that hybrid maize would turn out as a "male" crop and local "maize" as a female crop. However also this would vary across the provinces, where local and improved maize varieties are grown more frequently in some provinces (e.g.

**Table 4.2. Gender crop pattern by province, Share of producers being female-headed households, relative to share of female-headed households**

Crop	Zambia	Central	Copperbelt	Eastern	Northern	Southern	Western
Maize	0.92	0.90	0.96	0.99	0.90	0.85	0.83
Cotton	0.31	0.55	n/a	0.17	n/a	0.32	n/a
Sunflower	0.48	0.40	n/a	0.67	n/a	0.49	n/a
Sorghum	0.99	1.02	1.46	0.49	n/a	1.11	0.96
Millet	0.84	1.08	0.0	0.70	0.83	1.02	0.71
Groundnut	0.98	1.00	0.65	0.94	0.87	1.13	0.85
Mix.beans	0.80	0.92	0.90	0.63	0.97	0.38	n/a
Cassava	0.94	1.28	0.53	1.83	0.89	n/a	0.82

Eastern Province), and hybrid varieties more frequently in other provinces (e.g. Southern Province).

Overall then, the family obligations of women farmers mean they have to avoid risk and would rather plant drought resistant, locally adapted but also lower yielding crops, while men prefer high-input new crop varieties. Primary data shows that female headed households give preference to food crops like sorghum (both for food and beer brewing), groundnuts and cassava; male headed households give preference to cash crops like cotton and sunflower; and combined cash and food crops like maize, millet and beans are grown equally frequently among the two groups.

The study does not include time use, but community data show that female tasks such as collecting firewood, fetching water, and pounding maize require long walking distances and long working hours (see also appendix C). The gender division of labor for reproductive labor in addition results in women farmers facing a number of time constraints not affecting men's choices. Individual agricultural tasks also are affected by the gender division of labor, where for example weeding and scaring off birds are considered to be an obligation of women and land preparation an obligation of men. The picture is in fact a complicated matrix of genderized crops and genderized work obligations.

Within this overall pattern, large variations are found across households, as well as changes over time depending on changing opportunities. As noted, while in general food crops are female, if they come to be traded at a more commercial scale, they can develop into male cash crops as well. This matrix of obligations could become more gender-balanced under conditions of changing opportunities and market structures (as introduced by structural adjustment for example). But since male farmers in general have the predominance of bargaining power within the household, the male farmer is still the one most likely to benefit from changes in the 'crop' division of labor.

PRA findings report that given a higher price, he (the male head of household) might try to respond by increasing the supply for sale. Usually he would also be able to persuade his wife to undertake the same labor tasks for the now expanded crop as before. Hence her workload would increase, while he retains control over the production. She might however not be in the same position to ensure that her husband does the same tasks as before, if she should manage to respond to higher prices by increasing her production. The outcome is therefore not gender symmetric, nor would be the rational expected supply response.

While there are no nationwide time-use studies undertaken in Zambia, a number of studies have been undertaken in parts of the country. A comprehensive

**Table 4.3. Genderized crop labor allocation (up to end of harvest). Hours spent working on different crops by male, female and child labor in Eastern province (Kumar 1994:55)**

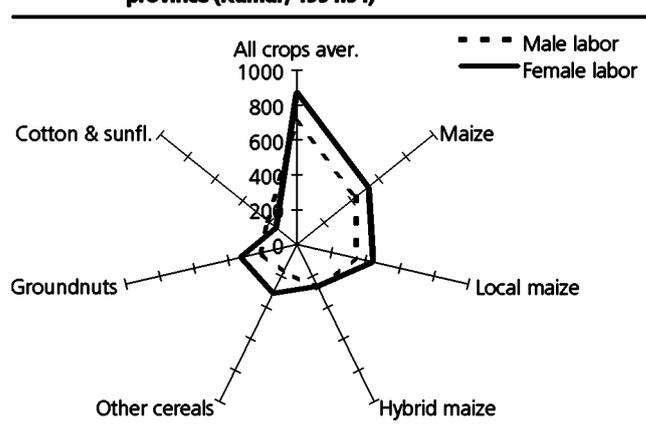
Crop	Female Labor	Male Labor	Child Labor
All crops avge	874.1	703.8	225.9
Maize	521.3	432.7	139.5
Local maize	441.0	345.3	117.4
Hybrid maize	264.9	275.0	64.0
Other cereals	306.5	174.2	83.1
Groundnuts	326.2	211.6	76.4
Cotton and sunflower	152.1	214.8	36.0

survey undertaken in Eastern Province in 1985/86 (presented in Kumar 1994) shows time use by gender and crop under the pre-adjustment public marketing regime. Table 4.3 shows that women farmers supply the majority of labor input (not including food processing) and that the genderized crop pattern in Eastern province in 1985/86 was relatively consistent with the national crop pattern in 1992/93.

Focusing on adult farmers, women farmers provide 55 per cent and men farmers 45 per cent of the labor time. Including child labor, women farmers undertake 48 per cent and men farmers 39 per cent of the workload. Following from the table, but probably better illustrated in figure 4.1, cotton and sunflowers are male crops, hybrid maize a joint crop, while the other crops were predominantly female crops in 1985/86.

The PRA findings also give rise to numerous observations differentiating the responses of women and men – although it should be noted that gender effects were not always as prevalent as expected. For example, households in Northern Province show a gender difference in the choice of Irish and sweet potatoes where Irish potatoes are chosen by men and sweet potatoes by women – both being potential cash crops. Households in the Northern Province also reveal various coping strategies to deal with the declining income from crop sales. These strategies are clearly gender differentiated. Men choose activities such as charcoal burning and wage employment (for farmers in

**Figure 4.1. Genderized crop labor allocation. Hours spent working on different crops by male and female labor in eastern province (Kumar, 1994:54)**



Chafwa which is near Kasama, the provincial capital); wild fruit collection, beer brewing and sales are the choices for women. Previously female dominated activities are becoming more popular among men as their relative earnings potential rises and/or is demonstrated. Vegetables are becoming important crops in villages near major markets, such as in Chafwa. The gender responsibilities are different, but both genders are found to be engaged in growing, while men are clearly more involved in the sales. Sweet potatoes are becoming a success in Chafwa where the most advanced farmers have established nurseries, and they are all men, although the crop is traditionally a female crop.

Some farmers in the Central Province villages were observed to have shifted to growing other crops for sale, replacing hybrid maize for sale. Men were choosing cotton as a cash crop, engaged in charcoal burning, or sold their cattle. Women had shifted into other crops such as soy beans and vegetables. Poor households with few opportunities for growing sufficient crops for subsistence and none for sale, were reported to have turned to work in other farmers fields, either for cash or for food.

In sum, from the literature, the available survey data and the PRA study, three interacting dimensions of the gender bias can be identified as follows:

- (i) legal constraints,
- (ii) gender obligations and preferences,
- (iii) and a complex gender based division of labor.

These constraints are reflected in different preferences and bargaining power of each gender.

#### **4.2.4. Bargaining power within households**

The dynamics of the situation described above, aggravated and exacerbated by conditions of increasing poverty, forms a basis for a continued deterioration of women's bargaining power within the household. In a self-reinforcing cycle, boys are given strong preference to education where the household cannot afford to send all children to school. Girls will leave school earlier than boys because they are called on to support household reproductive and productive tasks (more so, as survival becomes increasingly challenging), because parents are afraid of the girls getting pregnant, and also because they marry earlier than boys. Getting less education, girls are less likely to become/remain income earning bread-winners, hence women have less bargaining power than men in a marriage.

The position and bargaining power of women versus men has additional significance for the community as a whole, due to the predominant role women play in the area of social welfare and household food security. Decreasing bargaining power of women would be

expected to have outcomes in terms of overall household preferences, hence production and consumption priorities. In general, and directly linked to the genderized obligations and roles discussed above, it is expected that women give greater priority to food security and child care (social welfare), while men give relatively greater priority to household income (economic welfare). Overall household priorities then also differ from family to family based upon a range of other dimensions. Potential factors identified based on anecdotal evidence are location relative to the husband's or the wife's family, psychological power, education and hence potential economic power, and economic power determined by inherited or earned assets and income.

However, the PRA teams also reported that women can also have considerable bargaining power. The observations from the Northern Province show that there is little outward evidence of women having a subordinate role in the conjugate households. In most cases there is an elaborate scheme of sharing most operations between the genders, with heavy operations like land preparation mainly carried out by the men. Bias against women follows traditional rules for sharing of labor tasks within the household. In Eastern Province, women in Wachepa village control their own income from their crops which are grown in the same fields as the men's crops. In Malewa village women have separate fields, control the income from their own plots but are obliged to give preference to the men's fields in work allocation.

The PRA findings are cautionary on one hand with regard to assuming too subordinate a role for Zambian women farmers. On the other hand, by virtue of providing evidence for important aspects of women's bargaining power, the PRA findings strongly support an empirical approach which gives importance to bargaining power as a variable which can potentially significantly explain household behavior. In the statistical analysis presented below, bargaining power is measured by relative education and by relative economic power based upon relative income earned by husband and wife (within the last twelve months). Control of income gives a direct ability to prioritize between consumption items, as well as between saving/investment and spending. Not only the level of household income, but also these choices are seen as key to the dynamics of household welfare.

Focusing once again on agricultural production, the gender-biased agricultural supply response has a complex impact on welfare and development, as follows:

- (i) Firstly, a gender-bias in legal constraints, obligations and division of labor, means that women farmers are not able to fully utilize opportunities provided by economic reforms –

unless they are designed with this bias in mind. The result would be less welfare improvements and less economic development compared to optimal use of the opportunities facing men and women i.e. gender bias leads to an inefficient resource allocation and suboptimal welfare outcome.

- (ii) Secondly, lacking access to market, being relatively more averse to risk-taking, and facing different constraints, women may be prompted by economic reforms to de-integrate from markets i.e. result in lower level of supply to market.
- (iii) Thirdly, and resulting also from the labor constraints due to the multiple roles of women and the documented heavy work obligations of women, the additional supply response capacity of women may be limited.
- (iv) Further, women's potential supply response can be 'crowded out'. This can happen as follows. If men 'supply respond' to market signals, and women have lower bargaining power, women may not be able to respond to increased prices themselves as they will have to devote more time to work on the plots of their husbands and end up having produced even less towards household food requirements than before prices increased. PRA findings give some support to this supposition.

Overall then, effects of the gender matrix of obligations and relative bargaining power on household supply responses are complex. In the following two sections, additional insights are sought from the analysis of empirical evidence in this regard, including testing of an intra-household bargaining model.

## 5. Supply response<sup>16</sup>

### 5.1. Supply response over time: 1980-1991

Figures 5.1 to 5.8 show annual prices and marketed volumes of production for the crops for which such data are available over the pre-adjustment period<sup>17</sup>. At this aggregated level, the time series data show large fluctuations, but on average a steady decline in real producer prices. Crop prices offered at farmgate or village level were reduced to 55 per cent of their previous levels over the pre-adjustment period 1981/83 to 1989/91<sup>18</sup>. These prices were set and announced by the government after planting but before the start of each marketing season<sup>19</sup>. Prices were fixed to ensure self-sufficiency, allow for replacement of reserve stocks and take advantage of export markets for maize (Jansen 1988), as well as to avoid large large fluctuations. In reality, prices to a large degree

reflected the estimated total national production based on the Crop Forecast Survey, so that a large estimated production gave a low price and vice versa. Hence farmer's price expectations were based on the price during the previous season, adjusted for the volume of production that year and the current year. Annual prices are therefore the best indicator of the pre-planting producer price expectations of farmers, refer to the appendix E.

While prices thus *fell* very significantly over the ten year period, output of marketed production *increased* more than 40 per cent for maize, and more for all other crops except one. For maize; even if one excludes the bumper harvest in 1989, the increase in supply is still more than 10 per cent.

<sup>16</sup> According to neo-classical economic theory of farm production (see e.g. Ellis 1993:17-44) a farmer will respond to increased relative prices e.g. crop prices by increasing inputs in order to increase crop production. This is called positive supply-response. If the relative crop prices decreased, the farmer is assumed to respond by decreasing her inputs and end up producing less crops than before. Since both price and production changed in the same direction this would still be called positive supply-response. Negative supply-response would be to produce less if relative crop prices increased or to produce more if relative crop prices fell.

<sup>17</sup> 'Marketed' production refers to marketing by official organizations such as NAMBOARD, the cooperatives and parastatal marketing companies, most of which were funded by government. Nominal prices were deflated by the wholesale price index for the period of 1980-85 and the low income CPI for the period of 1985 to 1995 (CSO 1992, 1995).

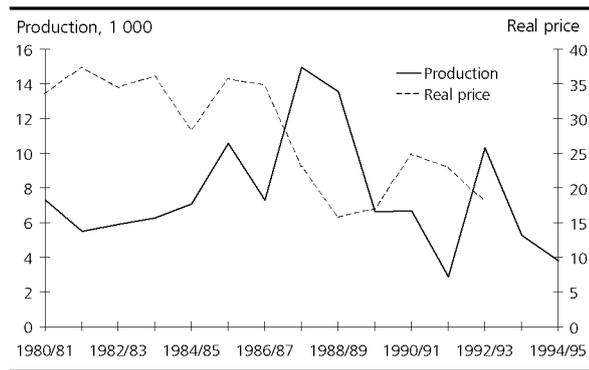
<sup>18</sup> Reported percentage changes of prices and quantities in this section are calculated by comparing the 80-83 and 88-91 three year averages. This captures the pre-adjustment period and also avoids inclusion of the severe drought year of 91/92.

<sup>19</sup> Beginning in the late 1980s, prices for crops other than maize were floor prices i.e. guaranteed minimum prices offered by the official marketing organizations as a safeguard for producers and as part of the pan-national equity pricing policy. The products might therefore have been sold at higher prices than the minimum price for consumption in rural areas due to severe problems in the local supply during the 'hunger months'. Floor pricing for crops other than maize was discontinued after 91/92. For maize, the prices in figure 5.1 are the government purchase prices for hybrid maize, with the exception of the 92/93 price which was a floor price. Thereafter the government discontinued price announcements for maize also.

Interpretation of these patterns over time should be undertaken with care from a number of standpoints. First, and with reference to theoretical supply-response expectations, economic theory predicts that when prices rise, producers will produce more of a given commodity, all other factors remaining equal. Similarly the theory would predict that when prices (or expected prices) fall, producers will produce less. The problem in application lies with the 'all other factors' or *ceteris paribus* clause. Clearly, all other factors did not stay the same and there are other factors besides price which play a key role in explaining producer behavior. One is therefore not able to tell from this data whether farmers on average were actually price insensitive in their supply behavior. Keeping these caveats in mind, overall the aggregate data leads to the observation that the expected fall in aggregate supply, in response to falling prices, was not observed in Zambia during the 1980s.

Second, it is important to note that over the period 1980 to 1990, the rural population increased approximately 32 per cent. Recalling that maize production increased 40 per cent (including the bumper year) or 10 per cent (excluding the bumper year) over the period, *per capita marketed maize production* can therefore be construed as rising or falling depending which years' output figures are used. Recalling the dramatic

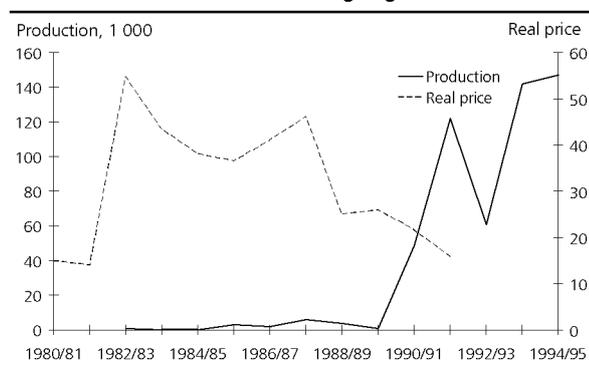
**Figure 5.1. Marketed production and real price of maize 1981-1995, in 1 000 90 kg bags and 1993 kwacha**



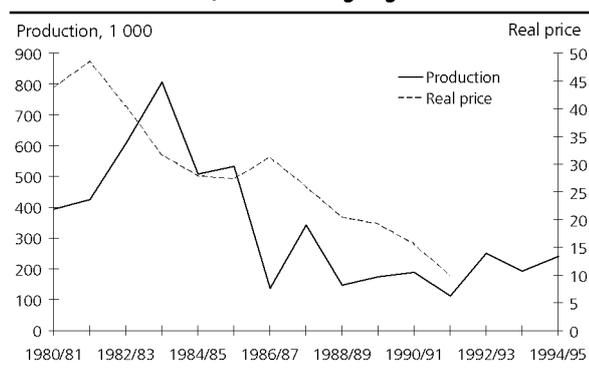
**Figure 5.2. Marketed production and real price of sorghum 1981-1995, in 1 000 90 kg bags and 1993 kwacha**



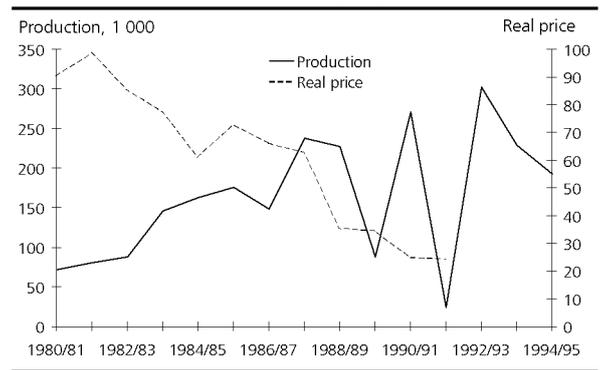
**Figure 5.3. Marketed production and real price of millet 1981-1995, in 1 000 90 kg bags and 1993 kwacha**



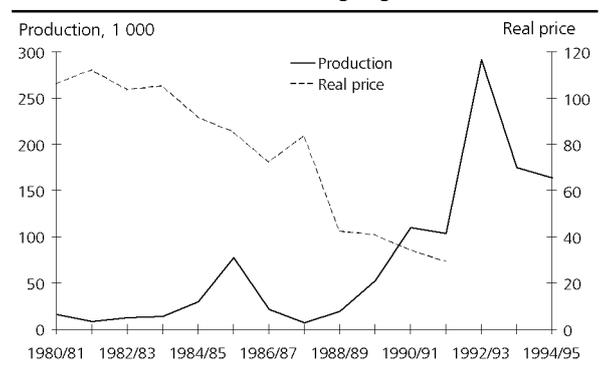
**Figure 5.4. Marketed production and real price of sunflower 1981-1995, in 1 000 50 kg bags and 1993 kwacha**



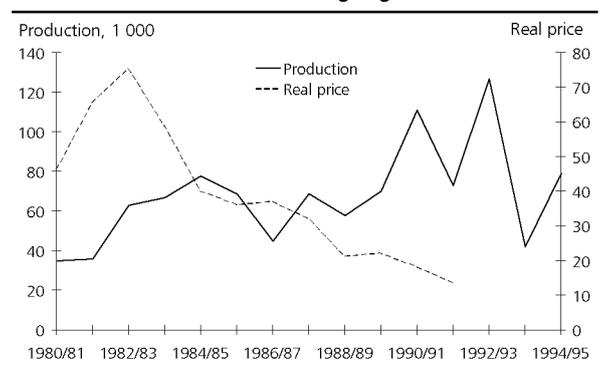
**Figure 5.5. Marketed production and real price of soy-beans 1981-1995, in 1 000 90 kg bags and 1993 kwacha**



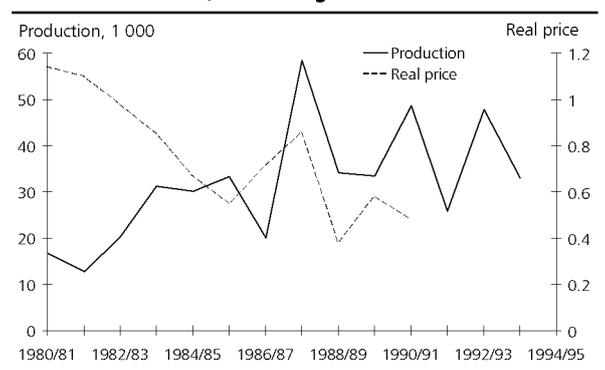
**Figure 5.6. Marketed production and real price of groundnuts 1981-1995, in 1 000 80 kg bags and 1993 kwacha**



**Figure 5.7. Marketed production and real price of rice 1981-1995, in 1 000 80 kg bags and 1993 kwacha**



**Figure 5.8. Marketed production and real price of cotton 1981-1995, in 1 000 kg and 1993 kwacha**



shift in maize production from central to remote provinces discussed in chapter 3, a more informative picture emerges. Farmers in line-of-rail provinces decreased their marketed volume of maize in the presence of falling prices, both measured as aggregate volume of marketed maize and on a per capita basis. Farmers in off line-of-rail provinces on the other hand, increased their production both in overall terms, and on a per capita basis, despite significant declines in the real producer price of maize.

With the exception of the 1988/89 season, none of these pre-adjustment years were exceptional from a climatic point of view and the explanation for increasing production in the face of falling real prices has to be found elsewhere.

## 5.2. Structural factors affecting price

The prices of outputs and inputs are generally the principal focus of price policies that are consciously adopted to create a favorable economic environment. Particularly important are meso-level prices (i.e. community-level prices) because they may vary significantly from average prices. Higher producer prices, and likewise, higher input prices, at the local level directly affect the economic and social welfare of male and female producers.

The comparison of pre- and post-structural adjustment producer prices is not straight-forward because under different marketing and distribution regimes, various costs will be shifted or redistributed between the public system, male and female producers, marketing agents, distribution and transport agents, insurance agents and risk-bearing agents, credit-providing agents and consumers. In comparing the relative equity of two different systems and one can compare the relative benefits/costs accruing to producers, the public system, private intermediaries and consumers. Secondly, and also closely related to the issue of producer supply responses, one can examine the redistribution of benefits (or costs) across different types of producers (remote, central, male, female, small-scale, commercial, etc.).

The pre-adjustment period's positive maize supply-response in the face of falling real prices in remote regions, can be largely explained by such a redistributive shift effected through the subsidies and cross-subsidies of the public marketing and distribution system and the expanding coverage of the pan-Zambian maize pricing system (see chapter 3 for a brief overview). This system created a stable system which managed to retain production levels and significantly raise it in remote areas. The production level was however still considerably lower than what is assumed to be the potential, and the subsidized system

### The role of public agricultural marketing

Lele and Christiansen (1987) list the following functions of public marketing organizations,

- «reducing the inherent risking of agriculture for small-scale farmers;
- ensuring markets and input supply to promote price stability;
- providing revenues for the public sector;
- supporting large-scale investments in processing that the private sector is unwilling or unable to attempt;
- addressing the constraints imposed by inadequate financial markets;
- creating demand for inputs; and assuring supply of food and inputs to low-income households in remote regions, that might not otherwise be reached.»

They underscore that the private sector can provide increased competition and can perform some tasks more efficiently than parastatals. However, in their analysis the public sector will retain responsibility for the provision of a market enabling environment:

- «...but if the private sector is to operate effectively, the public sector must first ensure that certain requirements have been met. These requirements include:
- stimulating the development of an entrepreneurial class capable of undertaking risk;
- encouraging free entry into markets;
- creating adequate infrastructure, transport, and communication networks for the efficient movement of goods; and
- promoting efficient financial markets that are able to support commodity markets.»

If this marketing environment is not in place, neither public nor private marketing are likely to be very efficient.

represented a heavy and unsustainable burden on the central government budget.<sup>20</sup>

While production figures over time which are disaggregated by gender of seller/producer are not available, from a gender perspective two additional issues are important. In most of the provinces, the marketed maize was hybrid maize, a typical high-input, high-output male crop. Most women concentrated on other crops both for food and cash. Female crops like local maize, groundnuts, millet, sorghum, mixed beans and vegetables were not given much attention by the Cooperative Unions and women farmers would usually split their sale between the harvest period and selling their crops in small portions throughout the season at

<sup>20</sup> The increase in production of other crops is also partly a reflection of a switch in public agricultural policy, from a strong concentration on maize to a larger emphasis on other crops as well, a policy change that started in the 1990/91 season and took off after the 1991/92 drought. The significant supply response in other crops also points to substantial allocative inefficiencies of the previous system which earmarked most resources towards supporting (male-producer-dominated) hybrid maize.

**Table 5.1. Producers share of the price paid by final consumers (per cent nominal prices, 1993)**

Province	Soy beans	Cassava	Groundnuts	Maize
Zambia	35	31	12	44
Central	41		11	40
Copperbelt	42	73	20	50
Eastern	16		9	44
Luapula	49	26	20	48
Lusaka			23	57
Northern	30	37	9	37
North western	51	31	14	45
Southern			18	48
Western		31	12	39

Note: <sup>1</sup> The prices paid by the end-user refer to slightly processed products.  
Source: Based on Community Survey data, 1993.

the local market. Hence, there are several reasons to believe that men gained more and received a larger share of the benefits from public marketing than women. However, since women in Zambia usually control less resources than men, they are likely to be more vulnerable<sup>21</sup>. Women took quite some advantage of a public marketing system which significantly supported the stability of household income in two ways: by sharing the risk for crop failure; and by avoiding extremely low prices in bumper harvest years.

### 5.2.1. Marketing margins – a measure of efficiency and distributive outcomes

One of the key premises or expectations underlying SAP design in Africa is that the adjustment of structural and institutional factors will affect men and women farmers' meso-level input and output prices in a favorable (net-profitable) way. It is clear that in order to deduce sensible policy conclusions from the analysis of price spreads and variations, the underlying causes for different price spreads and variations have to be identified. One would expect that comparing pre- and post-structural adjustment prices, the decomposition analysis of marketing margins<sup>22</sup> would be significantly different. The picture is complicated by the fact that marketing margins cannot directly be interpreted as a measure of relative 'before-and-after' systemic efficiency. This is because the producer prices used to calculate comparative marketing margins also reflect a redistribution of costs between agents (as discussed above).<sup>23</sup> Refer also to Jones (1996).

Nevertheless, the examination of marketing margins (or transactions costs), as reflected in farmgate and consumer price differentials, provides important

<sup>21</sup> As Moser (1996) points out, vulnerability is an important characteristic of poverty. Policies which tend to improve security in the sense of stability or lower variation in incomes can thus be seen as reducing the vulnerability dimension of poverty.

<sup>22</sup> The marketing margin is the difference between the price paid by final consumers and the farmgate price received by producers, less any value added by processing.

<sup>23</sup> In addition, relatively 'pure' adjustment or transitional costs caused by inexperience of institutions and agents, uncertainty, and poor information levels may play a role initially.

information regarding the efficiency of marketing and distribution systems. A study by Ahmed and Rustagi (1987) covered African and Asian countries in this regard. While Zambia was not included, the study encompassed neighbor countries like Malawi, Kenya, and Tanzania and found that,

*"The decomposition analysis of marketing margins showed that transport and associated marketing costs explain 39 per cent of the difference in marketing margins between African and Asian countries. A different incidence of taxes explain only 9.4 per cent of the difference, and profits explain only about 24.5 per cent. The rest of the difference in marketing margin (27 per cent) is explained by other transaction costs associated with public marketing."*

Their regional comparisons show that farmers in African countries receive a smaller proportion of the price paid by final consumers of food-grains, than do farmers in Asian countries. The farmers received 75-90 per cent in the Asian countries, 55-60 per cent in West- and North-Africa, whereas farmers in East-Africa received only about 35-50 per cent. Comparing this to Zambian data at the time of adjustment<sup>24</sup>, one finds that the producer share of the price paid by end consumers was low, far below the share received by Asian farmers, but not that different from the shares received by farmers in other East African countries.

Examination of four basic food-items (cassava, maize, soybeans and groundnuts), shows that the producers share for maize was 44 per cent in 1992/93 while the share for groundnuts was 12 per cent (see table 5.1). This estimation of shares is based on prices for basic agricultural products in each of the provinces compared to the price of the corresponding processed food-item in Lusaka, urban<sup>25</sup>. The table shows a very high

<sup>24</sup> The meso level analysis is based on the Community Survey 1992/93 which contains a comprehensive set of price data corresponding to the standard enumeration areas of the Priority Survey 2 (PSII). The CS also includes information on marketing, such as the share of produce sold through different channels like a local cooperative (Primary cooperative society), based on contract farming (trader providing free inputs, sharing risk for crop failure, and buying produce for a lower price, or through ordinary traders and markets at different levels. The information on marketing is utilized in the statistical analysis, at this stage the focus is on prices. In the 1992/93 season the maize produce was still officially marketed (floor prices) by public agencies (provincial cooperative unions), while all other crops were sold to a free market dominated by private traders.

<sup>25</sup> The consumer prices in Lusaka, urban are taken from the national CPI, 2. Quarter 1993. The Lusaka-items food-items are: soybeans, cassava, confectionary groundnuts and maize-flour. The first and the second items are directly comparable, while the third and fourth are processed. For the slightly more processed items the shares turn out higher for maize and extremely low for groundnuts. The maize comparison could have been adjusted taking the costs of milling into consideration, but according to available information of the milling costs, no remarkable effect on the share would emerge. For groundnuts the difference in cost between shelled and unshelled are somewhat higher. An adjustment of the end user price, taking out the costs of processing, would in this case give a higher share.

trade margin for crops (all except maize) sold through the private markets. It is difficult to compare other crops with maize, which was still sold through the public marketing system in 1993, hence it would be premature to draw inferences from the observation that the crops more frequently marketed by women receive an even lower producer price share. *These findings do however directly point to the conclusion that private and liberalizing markets were not functioning well in 1993, with rural farmers receiving a low share of the price paid by the final consumer, and up-stream agents of the production-process taking a major share of the price.*

PRA findings strongly support the expected consequent outcomes for economic and social welfare: low prices to rural farmers have a large influence on households' ability to generate income for non-food consumption, such as clothing, and especially for the ability to pay costs (fees) related to education and health services. Low producer prices also have a negative effect on food security, both in the short and long run.

In the villages where the PRA study was conducted, producer prices had declined rapidly when the floor price system for maize was abolished starting from the 1993/94 season. In 1995, i.e. after 2 seasons with market prices, maize price had dropped to around one fifth of the previous floor price or lower in the villages selected for the PRA. Both the villagers and the district agricultural extension staff said that other villages were facing equally low or even lower prices. The farmers did not believe private marketing to continue. Despite having learned that the public marketing system had been abolished, they expected the Government to turn around and reintroduce public marketing. If these extreme low prices continue, farmers in all non-central parts of Zambia (all areas except the hinterland of large urban markets) would be very vulnerable to increased poverty, even if they manage to switch to other activities.

### 5.2.2. Spatial variation of real prices

Further investigating price spreads and variations, nominal producer and input prices were estimated using local consumer price levels as a deflator. The deflator was estimated using the local weights i.e. community-household expenditure. This purchasing power parity approach derives 'real' prices in a spatial sense and measures the consumption-opportunities of the nominal prices from a local perspective (see Appendix E for more information on the price analysis and findings).

This price study shows that there are large differences in producers prices and costs of inputs across the country. For maize, the market price in the most central areas (Lusaka and Copperbelt) was around 1.5 times the fixed public marketing price which farmers received in remote provinces. For other crops than

maize, the maximum provincial average price varied from 2.5 to 3.6 times the minimum provincial average price. Higher producer prices received by rural farmers located in the central provinces can be attributed to better access to markets in three senses:

- access to well functioning transport systems including better feeder roads;
- larger demand from end-users, processing industries and small-scale private processing coupled with relatively low own-supply capacity (line-of-rail areas rely on inter-provincial deliveries for almost all types of agricultural produce); and,
- a competitive pricing environment both in selling crops and buying inputs (resulting in a higher producers' share of the end-user price);

Conversely, rural producers located in the more remote areas face an opposite situation of poor infrastructure and transport alternatives, poor demand, and dependency on far fewer traders. In general, provinces located along the railway or a main export highway (e.g. Southern, Central and parts of the Eastern) benefit and receive prices above average.

Producer price levels also vary substantially within provinces (including within the central provinces) – outskirts typically receive significantly lower prices. Filtering out the luxury item effect, price analysis of the primary data shows that the provincial maximum is 50 per cent above the provincial minimum price for maize, and varies from 150 per cent to 260 per cent above the provincial minimum price for other crops. Producer prices also vary across centrality levels. The centrality zone maximum is 90 per cent above the minimum for maize, and it varies from 70 to 290 per cent above the minimum for other crops.

Input costs (for hybrid maize-seeds and fertilizer) similarly were found to vary substantially across the country. Fertilizer was sold through the public marketing agency at a limited number of outlets. When available from these outlets, the price was relatively low. In other areas and at other points in time, fertilizer was sold by private traders. Hence the costs reflect agency, availability, transport costs and trade margins. As one would expect, the costs in the northern areas are well above the average. But also farmers located in the line-of-rail areas faced higher costs than average. The likely explanation is that they preferred to buy from private traders rather than waiting for a possible but insecure delivery by the public agency.

The price study shows that high and low producer prices exist side by side. This might occur in areas having poor transportation facilities implying low integration of markets, monopsonistic demand (one or a limited number of traders operating in the area), but also appears to be attributable to the lack of well-

functioning *information system* providing rural farmers with current prices achieved in the district and province markets. Information on current prices might provide important incentives to rural farmers capable of providing transports of their excess produce to the markets offering the best price. Availability of price information, by itself, might largely integrate remote area markets with the larger ones, avoid monopsony based prices, and thus increase market efficiency. Such information systems have proven valuable in some Asian countries.

This study does not include a separate analysis of transport costs, but aggregated information from a cost surface analysis<sup>26</sup> shows that transport costs, though significant, cannot account for more than a part of these large spatial producer price spreads and variations. This finding is also strongly supported by the 1995 PRA which found that a typical producer price for a 90 kg bag of maize was around Kw 2 000 in 6 PRA villages, all in less central or remote provinces. Costs to transport a 90 kg bag of maize to the nearest major urban center varied from around Kw 1 000 to 2 000. Traders were however selling a bag of maize in central provinces for around Kw 10 000, indicating a trading margin of well over 100 per cent for a non-perishable crop with secure demand.

### 5.2.3. Seasonal price variations

In addition to supporting evidence for large price differences between village/farmgate markets and more distant markets, PRA findings point to the existence of very large seasonal price variations. Poor households who are unable to hold some of their crops due to immediate cash requirements at harvest time, or due to the absence of storage facilities, are penalized by being forced to sell 'on top of the season' when supply is relatively plentiful. These households are then more likely to be in food deficit during the peak price season and forced to buy additional maize at peak prices during the hunger months. Local markets have always been characterized by seasonal price variations. Further study would be required to determine whether seasonal price variations have increased significantly post-adjustment, thus aggravating the vulnerability of very poor households.

<sup>26</sup> The Famine Early Warning System (FEWS, 1994) has chosen another approach to the study of cross-sectional price level variation. The purpose of their study was to determine the costs of transporting commodities to and from each district. They have estimated the distance and quality of the transportation network (roads, railroads, ferries/pontoons) and the adjacent transport costs within each district and to the nearest major urban center. These estimates would allow for a more thorough study of how transportation costs versus monopsony/ oligopsony trading power determine the price offered. Such a study is however unfortunately outside the scope of this study, but would allow for a rough comparison of transport costs and prices at provincial level.

### 5.2.4. Transactions cost

The evidence then shows that marketing margins and transactions costs vary widely and are highly affected by location as well as market institutional or structural factors. When public marketing is terminated under structural adjustment, transaction costs obviously disappear from public and parastatal budgets, but this redistribution of transactions costs to private agents, does not in itself assure an efficiency gain.

In *central* areas, competition in the private market may improve efficiency and reduce transaction costs, if the market is regulated to avoid cartels, and viable market-based institutions emerge to provide credit to agricultural producers. This is an empirical question. Even if transaction costs remain the same, the removal of mandatory public marketing at fixed prices could increase the price (both to producers and consumers), and hence both producers and traders could benefit from a redistributive gain, the former from higher prices, the latter from rents associated with fulfillment of functions previously undertaken by the public sector. This is again an empirical question. PRA provide supportive evidence for rising maize prices in both Eastern and Central province over the period 1990 to 1995.<sup>27</sup>

The situation in *other parts of Zambia*, which are not close to the line of rail, is different however. The move from a reasonably well regulated market in remote areas to a volatile private or free market situation with low or lacking competition (monopsony/oligopsony) has not reduced transactions costs and producer prices for maize have fallen. To the degree that the old system cross-subsidized remote areas, especially with regard to transport, these costs are now shifted to local producers. This has resulted in a lower integration of remote areas with markets – a thin market problem (to use the language of the Cornell University study, Sahn 1994) – resulting in higher-than-previous transactions costs. And, where these high costs make it uneconomic for remote producers to participate in the market, a return to household subsistence agriculture results. This indicates a de-integration of markets and directly implies a lower marketed supply response as a consequence of changes in market-institutional and structural factors associated with adjustment. PRA findings from Northern Province also report a return to barter exchange (beans for maize).

### 5.3. Cross-sectional statistical analysis of supply response: 1993

The examination of pre-adjustment time-series on real prices and marketed quantities in section 5.1 pointed to a mixed supply response to price signals by farmers.

<sup>27</sup> PRA findings add the observation that with production levels of maize for many households at below subsistence needs, this forces poor households to buy relatively high-price 'imported' maize from traders.

This highlights the need for a cross-sectional supply-response analysis where community, household and individual factors can be included, particularly the gender-specific supply response. For this analysis, the starting hypothesis expected a diversified supply response varying between medium scale and small-scale farmers, and between women farmers and men farmers. It was expected that small-scale female-headed farm households would give a negative supply response due to their family obligations and time-constraints, and that medium-scale male headed households would offer a positive supply response to higher price and market liberalization.

The results of the cross-sectional analysis do support the main hypothesis of a negative supply response by small-scale women farmers. But in fact all the groups, women farmers and men farmers, small-scale and medium-scale farmers, were found to have a negative (significant) supply response: the lower the producer price level was in the community, the higher the volume of maize produced. Such a negative supply-response is also reported from other local household supply-response analysis.

On the other hand, positive price sensitivity was evidenced by farmers in the supply response to cross-price changes: producers do respond to relative price changes by switching to relatively better paid crops. Significant gender differentiation is in evidence in this regard – while men farmers respond to a broad range of relative price changes (i.e. switching between crops), women farmers only respond to some of these changes. Given their obligations, it is almost impossible for women farmers not to produce the traditional food crops, e.g. they can hardly switch to cotton production.

There are two complementing interpretations of the negative supply-response to crop price-level. First, the analysis supports the hypothesis that farmers respond simultaneously as producers *and* consumers – when prices are higher they can afford to focus more on production for own consumption and/or on other activities. This is the so-called household or income effect. Second, the higher prices are found in central areas, where there are other competing opportunities as well, such as production of perishable products, food-processing and other non-agricultural production, as well as employment for a reasonable pay. However, since all the competing opportunities in central areas are more likely to decline than increase during a period of adjustment, the second interpretation is of limited interest. The remainder of this section reports on the more detailed findings of the cross-sectional statistical analysis, including the modeling and testing of the gender specific supply response.

The cross-sectional analysis uses household and community survey data from the 1992/93 season (CSO

1994a, 1996, EWU and CSO 1993); the statistical tests then provide information on how producer households, male and female farmers, are responding (or not responding) to real producer and input prices<sup>28</sup> and what other non-price factors are significant in explaining the quantity of crops produced.<sup>29</sup> The supply response is estimated by constructing reduced form supply equations for each crop, with crop output as the dependent variable. The equations are specified to explain quantitative supply response based on a set of variables which are expected to be important from the traditional theory of the profit maximizing producer. Total production (per active household member) is expected to be a function of producer price, input prices, off-farm salary, non-farm income<sup>30</sup> and technology. Technology comprises the use of plough, chemical fertilizer, whether there is land available for cultivation, and holding size<sup>31</sup>. Data for labor input was unfortunately not available. The tests control for agro-ecological conditions, centrality, access to markets, and for household demographics such as dependency ratio (which is the number on individuals less than 12 or more than 65 years in the household, relative to all the household members), life-cycle stage and maximum education of either of the spouses in the household (see Appendix F for methodology and sample regression outputs).

From a gender perspective, one would expect a differentiated response to price changes depending on which gender had greater control over a given crop. Unfortunately micro-level data on who in the household was responsible for a given crop is not available. Recalling that the pattern of gender roles and obligations with regard to different crops is a complex matrix (and as the PRA research shows, a pattern subject to change over time depending on opportunities), such analysis is a difficult task. The study approach is to test different

<sup>28</sup> The real prices are estimated using the local consumer price levels as a deflator. The deflator is estimated using the local weights i.e. community-household expenditure. This implies that the real prices measure the consumption-opportunities of the nominal prices from a local perspective. Prices are therefore 'real' in a spacial sense, thus rendering household supply responses comparable across localities.

<sup>29</sup> We recall that well ahead of the 92/93 season all public marketing of all other crops other than maize had been terminated and these prices were set by demand and supply in the market. For maize, public marketing continued (floor prices), but farmers were allowed to sell to private traders as well. Hence one might assume that prices were fixed throughout most of the country with somewhat higher prices in areas close to markets. However, two other factors affect prices; first nominal prices were deflated to local real prices (see previous footnote); second, farmers frequently opted to sell maize at lower-than-floor prices to private traders receiving payment on the spot, rather than selling to a higher official price and receiving payment only after a long delay.

<sup>30</sup> All economic variables and all producer-prices are deflated by the consumer price index.

<sup>31</sup> Holding size (or total area under crop) are divided by the number of active household-members, so that it corresponds to the dependent variable.

hypotheses in three settings: (i) the uniform household, (ii) the male and female-headed household, and (iii) bargaining within households.

### 5.3.1. The uniform household

Under the uniform household approach the household is conceived as one unit where all decisions are made unanimously and collective utility is maximized. Behavior may differ among households according to their composition and circumstances, but the different gendered preferences of members and power relationships are not taken into account. This corresponds to the traditional consumer demand model and may also include the agricultural household production function model. However, households are both producers and consumers. Hence when for example producer prices change, this would affect both the production and the consumption levels<sup>32</sup>. It is therefore not necessary for a producer price increase to yield a positive response. Households may even produce less if the extra profit is sufficient to compensate or increase income, and more resources can be used to produce other goods, e.g., other crops, time for household chores, child care or even leisure time.<sup>33</sup> To quantify these relationships one would need to estimate the cross-elasticities between the different goods produced by the households.

In testing for what factors explained total maize production, *no evidence for a significant response to price was found* using a tobit test on observations for 1358 producers out of a sample of 1600 with no-missing values. Difficulty in tracing price effects from 1993 data may in part be due to the remaining influence of government floor pricing, but the study results cannot be attributed to this alone, since the real price data include sufficient spatial price variation<sup>34</sup>.

<sup>32</sup> Recently models of farm households have been constructed taking into considerations the fact that agricultural households are both producers and consumers at the same time (Singh, Squire and Strauss 1986, Netting 1993). This model combines elements from different traditions, including Becker's theory of the allocation of time which constructs composite goods from a combination of physical goods and the time consumed producing them (Becker 1965, 1991), traditional agricultural economics (e.g. Ellis 1993) and the Chayanov (1986)/ Boserup (1965/1993).

<sup>33</sup> For these reasons, the models we formulate for the regression analysis are not fully specified household functions. We are aware that there are simultaneity problems, and that important variables (especially labor, on which we miss information), are excluded from the analysis. The models are therefore to be regarded as correlation relations rather than structural analysis.

<sup>34</sup> When the liberalized marketing system was introduced in 1992/93, not only price control but also a proper price monitoring system vanished. Price information is still collected, but coverage and quality has not been maintained. The PRA findings report on price information from six villages including both hinterland of cities/ province capitals and remote areas. There is also anecdotal information available, but only in an unsystematic fashion. For the period after 1992/93 (i.e. subsequent to collection of data used for our at-time-of-adjustment study, it would appear that prices in areas close to markets have increased somewhat and are at least stable, while in remote areas the prices are said to have fallen drastically

When the same test was run on separate samples of 643 households producing maize for sale (hybrid maize) and 1352 producing maize for consumption (local maize) *a significant negative maize producer supply response to price was found for maize for sale* (see table F1).<sup>35, 36</sup>

Examining correlations on other variables (besides price) in the regression analysis, more or less all life-cycles and agro-ecological zones have a significant effect on crop production. In general the production per productive household member is highest in the plateau areas along the line-of-rail and in Eastern province, lowest in the semi-arid plains in Western province, with high rainfall areas in the Northern and the rift-valley areas in the middle. Households in any life-cycle stage with children produce less output per active households member. But increased dependency (more children and old people per productive member) tends to again increase the production per active household member. It may either be that the dependents themselves contribute to increased production (while still less than the adults) and/or that more dependents force the adult household members to increase production. Looking at maize-for-sale as against maize production for own-consumption, the

and are now around 15 to 20 per cent of the 1990/91 season price, measured as real prices. Obviously it is difficult to measure the aggregated supply response with this fragmented picture, but such work represents an important future research topic with large policy implications. The total marketed production has varied during these years, but the trend is now a declining production *including* in non-drought-stricken provinces.

<sup>35</sup> A recent paper by Foster and Mwanauo (1995) estimates the long run or dynamic supply response elasticity of maize in Zambia. Their estimates are +1.57 for the maize price and -1.44 for the fertilizer price in the long run and 0.54 and -0.48 in the short run. The model is estimated from a time series aggregate data set spanning the years from 1971 to 1990. Unfortunately the article does not present the data nor does it give the length of the time lag, but still these results are very interesting compared with both the aggregated data and the findings the study at hand presents; dependent on the period, the aggregated information would give a short term supply response either negative or around zero. The Country Economic Memorandum (World Bank, 1992) drew the conclusion that smallholders are not price sensitive. An alternative hypothesis might be that smallholders are rather responding to a stable price over a number of years. In the supply-response models with time-lags that would correspond to time-lags of 5 years or even more. These perspectives may be more interesting after the economic reforms, but proper price information, now lacking in Zambia, is needed to test both long run and modified long run supply response.

<sup>36</sup> The regression analysis also finds a somewhat surprising *positive* hybrid seed price effect which we are unable to interpret without additional knowledge of structural supply conditions surrounding hybrid seed. The consumption (local maize) regression shows a positive effect from fertilizer price. This is not surprising since production of local maize does not demand fertilizer (unlike the hybrid production) and the effect can be interpreted as a substitution effect i.e. switching between crops. The use of fertilizer has a positive effect on the production of both local and hybrid maize, but is several times larger for hybrid maize.

dependency ratio in production-for-sale is not significant. But the life-cycle effects show that households with children tend to produce less for sale, and that this negative effect is larger on production-for-sale than on production for own-consumption.

The ownership of a plough, significantly increases output, indicating that investments in improved technology significantly improve the labor-productivity of households. Ownership of a plough has a positive impact both for production-for-sale and for own-consumption of maize, but it is larger for production-for-sale. The explanation might be that investment in a plough is likely to be achieved by households engaged in cash cropping. The effect of non-farm income shows a clear positive influence on maize production. Increased non-farm income increases total production, and production-for-sale in particular. The likely explanation is that non-farm income allows for higher non-labor inputs to agricultural production (see sample regression output table F1).

When prices are included in the model, none of the centrality-levels give any additional effect. The use of fertilizer has a highly positive and significant effect, but the fertilizer price has not. This last finding may be explained by the fact that fertilizer was often *de facto* rationed as the supply was limited and the price still partly government controlled.

The CS data includes information on marketing channel, such as the share of produce sold through different channels including local cooperatives (Primary Cooperative Societies), sales based on contract farming (where the trader provides free inputs, shares risk for crop failure and then buys produce at a lower contracted price), sales to ordinary traders and markets at different levels (local markets, district markets and public market depots). The only marketing channel variable of significance for maize production is the contract sale (i.e. creditor at farmgate) which is positive. This is contradictory to most other crops, but a very likely explanation is that fertilizer is supplied by contract buyers. Regressing separately for maize produced-for-sale and maize produced for own-consumption, contract sale increases both production-for-sale and for own-consumption. But the response is almost four times higher for hybrid maize. On the other hand, a producer market at farmgate leads to significantly lower production of local maize.

*Regression results for other crops show that in general there is no significant evidence of a marketed positive supply response to an increased producer price.* When analyzing households that are both producers and consumers, this is a reasonable outcome and can be attributed to the income effect. With a fixed production, increased prices give a higher profit, hence a

higher income, and the household can afford to spend their time and other resources for production on own-consumption or on reproductive work.

Increased maize price has a negative effect on the production of groundnuts, cassava and mixed beans. Such cross-price supply response is also supported by PRA findings which report increasing production of other crops in the face of declining maize prices.

The correlation results on use of respective product markets for crops other than maize are diverse. For sorghum, the availability of farmgate buyers and local cooperative markets is associated with a positive supply, while the presence of district markets has a negative response. For millet, local cooperatives solicit a positive response, while the presence of local markets appears to discourage production. For groundnuts, creditors at farmgate (associated with contract farming) shows a negative supply response, while district markets are associated with a positive marketed supply.

### **5.3.2. Effects of the gender of the household head**

The second setting is the analysis of female vs. male-headed households where the household sample was split on the gender of the head of household. This approach assumes that households headed by women and men respectively have different preferences, and hence also different utility functions. This implies, in the case of agricultural households who are jointly producers and consumers, that their demand and supply functions are distinctly different, and gives rise to the hypothesis that the supply-responses of female versus male-headed households are different. Given sample sizes, it was possible to test this hypothesis for maize and groundnut producing households.

Results show that *there is still no significant producer supply response to price for total maize production when we split in female and male-headed households.* When split sample regression results for maize produced-for-sale (hybrid) and maize produced for own-consumption (local varieties) are compared by gender of household head, it is found that *both female and male-headed households show a negative supply response to price for maize for sale, but the effect is twice as large for female-headed households.*

Testing for correlations for total maize production, for male-headed households there is a positive effect of the dependency ratio, and a negative effect of being in a later life-cycle stage. If the household has children they produce less per active household member, but if we focus on those with children, the more children, the higher production per active household member. This is likely to reflect that older children give a substantial

labor input. However, this is not verified among female-headed households.

The effect of increased education is positive and significant on maize production of female-headed households, but not that of male-headed ones. Owning a plough gives a significant effect, but only for male-headed households.

Regression results also show that for total maize production, there is a positive and strong effect for male-headed households from the type of producer markets used by the community. Maize is marketed differently from village to village. For each community the survey ascertained the most common way of marketing the main crop. This common way of marketing the crops in a village has an impact on the total household production for all households in a village. There are however also distinct gender differences. With contract sales (i.e. sales to creditors) the production increases significantly for male headed households but for female-headed households there is no effect from this type of market. This supports the hypothesis that women farmers are restricted in the credit market. If male-headed households have to sell at farmgate level, they tend to produce less maize (in these cases they are likely to earn more by switching to other crops). Local Co-operatives are the only market organizations that solicit a significant positive response from female-headed households; a negative production response in maize production results if women cannot sell in the village but sell at district markets. Some of the findings from the PRA indicates that slightly better off male farmers show a tendency to go for exclusive (small and same economic strata) marketing groups, while women farmers usually have too few resources to form ad-hoc co-operatives. If these findings are representative, women farmers in general as well as poor male farmers are the groups to gain from institutionalized Local Co-operatives. Overall the findings indicate that men farmers increase their production if they can get inputs on credit terms.

When the analysis for groundnut production is done separately for gender of household head, it turns out that the only significant producer price is that of maize for male-headed households, i.e. a cross-price effect. This has the expected negative sign. The size of holding is significant for both genders, but with an almost seven times larger coefficient for the male-headed households. This is an interesting finding which could reflect that men have started to switch to female crops, converting them to cash crops, as public support to maize cultivation is being reduced. It would be reasonable to expect men farmers with larger holding sizes to be in front of such crop pattern changes. «Conversion» trends were frequently reported in the PRA. The PRA findings tells us that when men farmers «convert» female food crops to male cash crops, the

men will do a substantial part of the work. The women will be obliged to provide some work input, but it is too early to tell net outcome effects of these shifts. It is also too early to tell how such conversions affect the marketing conditions for these crops.

Centrality of location only matters for the male-headed households, but the pattern is not clear. District markets are significant for female-headed households, but not for male-headed. To support findings from the tobit analysis, a probit analysis was also run in some cases<sup>37</sup>. Comparing the probability analysis of groundnut production for female versus male-headed households shows that both groundnuts and maize producer prices give have a significant effect for male-headed households -- but not for female-headed households. This means that high producer prices for groundnuts and/or low producer price on maize tend to be incentives for male-headed households to start production of groundnuts.

Overall the results indicate that male-headed households are more price sensitive than female-headed households; that male farmers will increase production if they can obtain inputs on credit terms; and that women farmers respond positively to a well organized very local market. Selling at a district market would also for them mean higher prices, but this potential advantage is not enough to compensate for the disadvantage of having to arrange for transport and sale away from the village.

### 5.3.3. Bargaining within the household

The final approach adopted was to test whether there is an effect from the relative bargaining power of women in the household on supply/production behavior. This modeling approach admits the possibility that the production function of the wife and husband are interdependent and can not be identified separately. The focus in the analysis of this gender dualism is a household model specified to include additional variables for relative bargaining power. The explanatory variables introduced for this purpose were the relative level of education and the relative income of wife and husband<sup>38</sup>. It was expected that if the wife has a higher

<sup>37</sup> Tobit and Probit analysis address different issues. The Probit model addresses the likelihood of producing any groundnuts. The Tobit model (which is used for most of the results presented) addresses the likely value of production. The Probit model is designed to test whether to reject or verify the  $H_0$ : No supply response, for all farmers and for sub-groups of farmers. The Tobit model is designed to estimate the size of supply response for all farmers or for sub-groups of farmers.

<sup>38</sup> Our approach follows the idea from the bargaining school, Sen (1990), Kabeer (1991), Palmer (1992), and Sparr (1994). This tradition builds upon the framework of the time-allocation tradition but does not accept that the household is one unity with one common utility-function. Instead it is assumed that the household members might have different utility-functions. It is then assumed that the bargaining power of each individual will determine the joint

level of bargaining power, her preferences will be reflected to a larger degree in the households' aggregate behavior. If the wife has a large impact on the household's decisions, one would expect more resources to be allocated to household retention of food, child care and household work including food processing and preparation.

The dependent variable in this analysis is not the total production per productive household member as in the previous tests, but rather the consumption share out of total production. The independent variables in the regression model include, in addition to the bargain measurements, the same variables as in the analysis on the uniform household. The sample used is that of male headed households.

The results of the statistical analysis do not show bargaining effects to be a significant determinant for the consumption share of maize (dependency ratio (+), agro-ecological zones, ownership of a plough (+) and use of fertilizer (+) are significant). However, regarding the consumption share of groundnuts, the relative income bargaining variable has a significant and positive effect (see table F2). This indicates that if the wife has high bargaining power, defined in terms of having an income relatively high compared to that of her husband, then the household will retain more for own consumption, and sell less. This supports the hypothesis that women give more emphasis to consumption. The bargaining power measured as relative education has a negative but not significant effect. Maximum education of either husband or wife gives a significant effect (i.e. high education corresponds to a lower consumption share). This latter effect is however only significant at a high level of acceptance, and should be interpreted with caution.

#### 5.4. Participatory rural appraisal: Findings in 1995

The PRA was conducted in 1995, when maize prices in less central and remote areas had dropped to one fifth of 1993 prices and prices for other crops had also fallen dramatically, although not to the same degree as maize prices. As predicted by the 1993 survey analysis, farmers switched to other crops as the relative pro-

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utility function. It seems reasonable to assume that the bargaining power of each individual is determined by two elements, first the ability to provide economic means by each individual and second sociological and psychological power. The measure of the ability to provide economic means can be measured by wage at a labor market and ability to earn income by own production/business. As an alternative we can include indirect measures of this ability. It is common to include educational level as an important variable. In our case we also have information of whether income during the last 12 months came from the wife, from the husband, or from the household as such. These variables will be elements to determine the bargaining power in each household. We assume that bargaining power determined by sociological and psychological factors is randomly distributed and therefore can be included in the random term in a regression analysis.

ducer price of maize fell. However, PRA findings do not corroborate the finding that farmers increased overall production for sale even if the price fell. There is obviously a threshold where farmers withdraw from marketing of crops. A likely interpretation is that farmers may compensate for a modest temporary price fall by producing more for sale. However at a certain price level it does not pay off to produce, transport and sell. Another interpretation is that the contrasting evidence points to different short-run and longer-run supply responses of small-scale farmers.

The PRA survey showed dramatic effects from post-liberalization price changes. In particular, farmers in the more remote areas face low prices, and report having difficulties finding buyers for their crops as the market penetration of private traders is limited in remote areas. The PRA findings from all villages visited support the conclusion that *while producer prices are important, reduced access to credit and agricultural inputs have proved to be even more significant than prices in determining production decisions of women and men farmers.*

These adjusted production conditions have caused a significant shift towards subsistence crops, especially in the Northern Province, as witnessed by the reintroduction of sorghum, finger millet and cassava. The key reason cited by farmers, is the lack of credit, fertilizer and seed for hybrid maize production (which has ensued from the termination of the integrated public marketing system and the abolition of parastatals). The farmers in Central and Eastern Provinces, who have relatively better access to markets for their crops, reported shifting to cotton as a cash earning crop. This has been increasing as *Lonhro* and other commercial companies, have been providing 'free' seeds and credit. The production of other cash crops have either stagnated or declined, but this was also attributed by farmers in Eastern Province to low yields due to drought<sup>39</sup>. Some farmers are also opting for off-farm piece-work as a coping strategy. In Eastern Province for example, small-scale farmers reported working on commercial farms in exchange for food crops, in this case mangoes. While coping strategies of women and men farmers vary, overall gender effects observed by the PRA were less prevalent in the villages than expected. This finding supports the view that gender roles and impacts depend on a complicated matrix of genderized crops and genderized work obligations and should not be oversimplified.

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<sup>39</sup> Another supply response limiting factor is that much of the land previously cropped with hybrid maize and chemical fertilizer has been burnt out, i.e. the soil is so deprived of nutrients that other crops such as cassava show significantly reduced yields or fails completely. The intensively used soils are also suffering from a higher incidence of pests and diseases on other crops such as beans and groundnuts, crops which used to be parts of the Chitemene rotation cycles (shifting cultivation).

It is difficult to say to what extent the dramatic changes in livelihood patterns and welfare which were observed by the PRA teams are caused by the agricultural market liberalization alone. The southern part of Zambia has been hit by a severe drought for the last five years, something which is reflected in the PRA findings from Central and Eastern Provinces. Another strong external factor has been the outbreak of corridor disease killing many cattle. The PRA study found this to be a major effective constraint on the ability of farmers in the Central Province to cultivate their fields, as they normally use oxen for draft power.

All villages visited by the field teams, report that yields for maize have declined during the last few years (other crops show normal yields). This is due to the shift away from higher-yielding hybrid maize to lower-yielding local maize varieties. The emphasis of most analysis is on the relative *market efficiency* of public vs. private marketing systems (i.e. allocative and productive efficiency). However, it would appear that a significant factor which the PRA findings point to, is that the reduced use of agronomic inputs (fertilizer, oxen<sup>40</sup>, hybrid seed) as a result of structural adjustment, has also led to production at a lower level of *technical efficiency*. The farmers also report that they now rarely have any surplus for sale. Increasing the area planted with these lower-yielding traditional crops has compensated for some of the loss of hybrid maize production.

Overall, the PRA observations give rise to the impression that the loss of hybrid maize production has led to a more equal distribution of income between the genders. With regard to welfare though, in both the villages in the Northern Province, a higher share of the female-headed households are categorized as poor than for male-headed (this supports country-wide statistical evidence, see Appendix C). Significant variation across villages was also documented. For example, strong differences in wealth ranking were noted between the two Eastern Province villages -- female-headed households were scoring significantly worse in Malewa village than in Wachepa village. The following sections present further detailed and specific observations from the PRA field teams.

#### 5.4.1. Northern province

Major conclusions derived from the PRA study in Northern Province villages are that rural farmers have not been able to benefit from higher producer prices

<sup>40</sup> While it would appear that the disease and lack of oxen is unrelated to structural adjustment, the strengthened cost-recovery approach to the provision of veterinary services (including the chemical baths that cattle require to stay free of corridor disease) are a part of the structural adjustment program of rationalization of public services. In the wake of the drought households cannot afford these services, hence remaining or new cattle are at increased risk.

expected from liberalization because of their weaker bargaining power in relation to other participants in a liberalized market, such as long distance mobile traders. Married women are especially disadvantaged, because they are unable to travel to long distance urban markets (where prices are higher) due to cultural restrictions and domestic and child care responsibilities. Poor female-headed and male-headed households are also unable to travel to long distance urban markets because of high transport expenses and also because they rarely produce sufficient surpluses to make it worthwhile to travel to such markets.

The overall effect of the removal of credit and input subsidies has been a shift from hybrid maize to low yielding subsistence crops such as cassava, sorghum and finger millet. This has reduced the ability of most households to produce enough staples which can last the whole year. This has in turn, increased the vulnerability of most households due to their increased dependence on the food market, which is controlled by long distance mobile traders. Labor-deficit female-headed households are at a greater disadvantage compared to men and women in conjugal households.

#### 5.4.2. Eastern province

PRA found that production has drastically fallen in both Eastern Province villages in the sample, not only due to the inability of farmers to acquire loans, but also due to the drought that has hit the southern region of Africa. Farmers in both villages rely on rainfall for production and are finding that the timing of field operations with rainfall patterns is becoming increasingly difficult to time.

Farmers in Wachepa and Malewa do not feel they have benefited from the structural adjustment program and are having problems adjusting and adapting to current agricultural policies. Most of the farmers are used to producing their crops on a loan basis and report that credit is increasingly difficult to access, and carries high interest rates, ledger fees and other conditions demanded by the lending institutions. The exception to this is provided by the 19 per cent of farmers in Wachepa who are cotton growers, who have been relatively successful, and who have been able to get in-kind credit from creditor-buyers.

Most farmers in both areas do not have the ability to hold their produce in order to sell at seasonal peak prices primarily due to low levels of production (0.5 lima<sup>41</sup> to 1.5 ha) and the fact that they need the money to purchase immediate household requirements. Farmers in both Wachepa and Malewa have little bargaining power to determine the prices at which they should sell their produce. This is more so if they produce on loan basis (ref. contract farming). Buyers

<sup>41</sup> 1 lima is 50 x 50 meters.

are competing for cotton in Wachepa, whereas in Malewa, *Aliboo* seems to be monopolizing the market. Farmers actively complained about not having any alternative buyers and felt that prices are determined by the buyers rather than the producers partly because farmers are not united in bargaining for the prices. Mostly farmers sell at lower prices out of desperation to meet immediate needs.

In order to cope with a worsening in the livelihood situation, the people in Wachepa have increased the piece work activities and many are relying upon employment in Chipata, the provincial capital. They are not looking for options within agriculture except for increasing cotton production. Increased reliance on piece-work in Wachepa (which is often remunerated in food e.g. mangoes and maize) has resulted in decreased attention to own-production. This in turn has worsened their livelihoods. An influx of cheaper labor from Malawi had also more recently worsened prospects for off-farm income. In Malewa, on the other hand, alternative options exercised were fewer. A few farmers in Malewa have gone into dambo cultivation. This lack of options in Malewa may also be due to the fact that the majority of the people in the village are elderly. Nutritional status has been declining in general in both villages.

Few gender differences were observed in either village which the research team also ascribes as due to limited integration into the market economy. There appeared to be an equal level of participation in agricultural activities by men and women. While lack of credit was a major problem identified, villagers reported that it did not matter who got the loan within the household, that it could be husband or wife.

#### 5.4.3. Central province

Seasonal price differentials range from 35 to 150 per cent for major crops other than cotton. Reasons for price variations in producer prices aside from crop seasonality, included the ability to bargain for price, proximity to trade centers and availability of traders. Farmers in general do not feel they are in a position to take advantage of the opportunities offered by the liberalized market.

In Malakata, both women and men farmers cited size of output (mediated through ownership of work oxen) and the ability to purchase fertilizers and other inputs, as prerequisites to them benefiting from the current marketing arrangements. For resource-affluent farmers in particular, access to market information and consultations with each other, are important in deciding the price, if they are to obtain higher returns from the produce. It was only farmers in Malakata who were able to take advantage of this. The group of these more affluent farmers in the village seemed to favor price liberalization as it enhanced their real incomes.

Disagreeing with this view, poorer farmers considered current marketing arrangements a disincentive, due to high household cash requirements to now needed to cover inputs, food and other expenses. According to the majority, the new marketing arrangements have worsened their poverty status. Incentives such as access to credit which previously enabled some to produce 'more' for the market have been withdrawn. Compounded with factors such as drought and corridor disease, their inability to produce even enough food for themselves has resulted in them being «*always food insecure*».

Under the new regime, farmers report that they are trying to make «*adjustments*» away from the previous hybrid-maize-based economy, by adopting the following coping strategies:

- return to subsistence agriculture (see also PRA findings Keller–Herzog and Munachonga 1995: 23);
- using cattle manure, instead of chemical fertilizer, for those who still have animals;
- crop rotation; and,
- planting lower yielding local maize varieties (which do not require fertilizer) rather than hybrid maize.

The majority of farmers interviewed report reduction in the production of maize. The number of small scale farmers who have benefited from SAP-induced measures is seen as a tiny minority. In Mwanamungule village, only one farmer who is a recent retiree is doing well. Malakata village has some relative advantage over Mwanamungule because of the presence a larger number of traders, and proximity to larger market dealers at Chisamba, Kabwe and Lusaka, the district, province, and national capital respectively. The reduction in the output of maize and other marketed crops has negatively affected farmers' participation in the new marketing system. When farmers lack cash reserves, they may not manage to wait to sell their crops when prices are highest. With the introduction of user fees in health and education, farmers are under increased pressure to sell their crops early to meet these needs. Overall there is a trend to a higher dependence on purchase of maize to supplement inadequate food stocks. According to villagers, for poor households, food insecurity has become a much greater problem. In a gender perspective, the SAP related policies have had a differential impact on men and women, with the latter becoming even more disadvantaged than men, in terms of access to information, inputs, and transport services.

## 6. Welfare effects of agriculture sector structural adjustment

This chapter begins with an overview of poverty and nutrition trends both pre-adjustment and during the initial adjustment years 1991 to 1993. The relatively detailed data available for this latter period show that both poverty and nutritional standards have worsened throughout the initial years of structural adjustment (see also appendices A and B). *Prima facie*, the two leading explanations for this decline in welfare are provided by the drought and the policy reforms. Welfare indicators show that both poverty and nutritional standards also seriously worsened in the provinces which were not severely hit by the drought; it is therefore likely that the policy reforms have been a major factor. In order to redesign policy reforms, there is a need to identify possible improvements in the reforms, both improvements that would benefit the overall population and improvements that would serve to improve the economic and social welfare of certain groups. The later parts of this chapter contribute to this task by identifying factors critical to improved welfare and by analyzing how different factors affect different areas and groups. This empirical analysis, using the 1992/93 cross-sectional data, focuses on differences in the economic and social welfare of male and female farmers and their households rather than poverty incidence. Refer also to Grootaert (1997).

### 6.1. Poverty

While comprehensive multi-dimensional poverty data is not available for the pre-adjustment period, information on average per capita real incomes in 1975 and 1991 shows that during the 1970s and 80s economic welfare was considerably higher in urban than in rural areas. However, this gap declined very substantially from around 4:1 in 1975 to 3:2 in 1991. Recalling the dramatic shift in maize production patterns from central areas to remote areas documented in chapter 3, it is clear that the decline in relative rural-to-urban poverty over the pre-adjustment period coincided with the period of pan-Zambian equity pricing and the public agricultural marketing and distribution system.

Beginning in the 1990s, detailed measures of poverty are available. Poverty was considerably higher in rural than in urban areas. The gap varies with the measure-

ment approach chosen, but is in the magnitude of a 1.5 times higher share of poor people in rural areas, compared to urban areas. Overall Zambia average poverty levels were already high in 1991, yet the share of those who managed to remain *above* the poverty line fell by two fifths between 1991 and 1993, yielding an extremely high poverty share in 1993. According to Chulu (1995) in 1993 76 per cent of the total Zambian population was absolutely poor, 10 per cent moderately poor and only 16 per cent non-poor.

Disaggregated socio-economic data shows that poverty is somewhat higher among female-headed households, both in 1991 and 1993, but the differences compared to male-headed households not that large. Of female-headed households 81 per cent were absolutely poor, while of male-headed households 75 per cent fell into the absolutely poor category in 1993. The data show a clear trend that poverty increases with household size. In terms of distribution, the already large 1991 rural bias of poverty, had increased by 1993, and large differences in poverty levels between provinces were evident. There is not only a clear rural, but also a clear remote bias in poverty. The off-line-of-rail provinces were worse off both in 1991 and 1993<sup>42</sup>. A final observation would be that respecting relative poverty, poverty is more unequally distributed in urban and central than in rural and remote areas. The increased average relative income in rural areas might indicate that the incentive effect of the stable public market in off-line-of-rail provinces had been stronger in remote than in central provinces.

### 6.2. Nutrition

Although there are statistics on nutritional status available from 1970/71, it is even more difficult to assess the impact of increased crop production on nutritional status than on poverty levels in general. In some remote off-line-of-rail provinces malnutrition decreased, while in others malnutrition increased during the 1970s and 80s. During the pre-adjustment period from 1970/71 to 1991, the percentage of

<sup>42</sup> These findings are confirmed by studies assessing poverty by other measures (Iversen 1994 and World Bank 1994).

undernourished children (weight-for-age) increased. However, there was also a small increase in the average weight within each age-group and a somewhat larger increase in the average height within each age-group. One likely explanation is a greater variation—there were more undernourished children, but also more well-nourished children.

During the last 6 years of this period, undernutrition remained more or less the same, while stunting fell dramatically. The probable reason is that in 1985 undernutrition had already started to recover from the drought period of 1981–1985, but stunting was still exceptionally high. The bumper harvests in 1988 and 1989 greatly reduced both stunting and undernutrition. 1991 was a more normal agricultural year and undernutrition again increased somewhat, while stunting continued to decline.

While some of these trends can be explained by changing climatic conditions, one would still have expected that economic growth, public agricultural extension and marketing services and heavy subsidies for the agricultural sector – which did lead to increased agricultural production in the remote half of the provinces – would also serve to improve the nutritional situation. As documented, the stable marketing environment did lead to a tripling in marketed maize production in the remote off line-of-rail provinces with the sharpest rise from 1980 to 1985; however, general and broadly distributed nutritional improvements did not occur as one would have expected.

Two explanations why these improvements did not occur are the following. Firstly, while the public marketing service created a stable marketing environment, ensuring reasonable producer prices for maize also in remote areas, the sole focus was on hybrid maize production. As discussed above, hybrid maize is more a «male» crop and the whole extension system was targeted at male farmers for producing hybrid maize for sale. Their wives would still have to work husbands' plots, hence work more on the cash crop plots as maize production rose, thus leaving less time for labor on own-consumption food crops and child care. Since food provision is more the obligation of women than men, but additional income from cash crops more typically controlled by the husband, lower household food production is not proportionately compensated by food purchases. Hence the family might increase their marketed agricultural production, but end up with less food and a higher risk of undernourished children (Celis, Milimo, Wanmali 1991, Kumar 1994).<sup>43</sup>

<sup>43</sup> It should however be added that even if the extension, credit and marketing system was designed for encouraging male farmers to produce more hybrid maize, also the women farmers adapted and started producing their own plots of maize (hybrid or local varieties) for marketing through the public system. As already discussed, the

Secondly, even if a rural family wanted to buy maize mealie-meal, using money earned from increased marketed maize production, this was not necessarily easy. While the government was heavily subsidizing consumer prices for the staple maize mealie-meal up to 1991, this subsidized maize mealie meal was very often only available in urban areas, and from time to time in district centers. Thus while the public marketing system meant greater equity in access for remote producers, the parallel consumer subsidy system favored central locations. Own-processing in local hammermills was again the task of women and is time- and labor-intensive -- thus conflicting with the additional labor demands of increased for-market production of the crop.

Turning to the adjustment period, available data show that *undernutrition* has increased since 1991 in all of Zambia. Priority Survey data show an increase in national *stunting* rates, from 39 per cent in 1991 to 48 per cent in 1993 and *undernutrition* rates from 22 in 1991 to 25 per cent in 1993. Stunting rates increased in all the provinces except for Northern and Luapula provinces. Even in these two provinces levels of chronic undernutrition are much higher now than during the pre-adjustment period with the percentage of children who are chronically undernourished far above the national average. The increase in undernutrition levels cannot be attributed to the direct effects of drought alone. In fact, the non-drought stricken but remote provinces show *larger* increases in undernutrition rates. Therefore the most likely preliminary explanation is that the rapid change from a public marketing system to a private marketing system with little public supervision or regulation and no transportation subsidies for remote areas, has left poor small and medium-scale farm households and their children in a highly vulnerable condition. The degree of this vulnerability is reflected in the immediate transmission of SAP-induced changes in the producer environment to nutritional indicators. This in itself justifies the attention paid to nutritional status of children.<sup>44</sup>

### 6.3. Statistical findings on welfare effects at micro-level

#### 6.3.1. Method

The cross-sectional data from 1992/93 was examined for support of the hypothesis that women and men

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public marketing system included a branch for so-called Primary Co-operative Societies, being a kind of publically organized local co-operatives at village level. As documented in the cross sectional analysis, in the villages where these were effective, the female farmers, particularly female heads of households, were able to utilize the system and increase their own production for sale.

<sup>44</sup> A more complete longitudinal analysis of the interaction of changes in the agricultural production regime and nutrition would require information for several years from both pre-adjustment and post-adjustment time periods, as well as data to control for other effects, such as health and health care provision/access.

farmers have different preferences for social and economic welfare, preferences reflecting their responsibilities and obligations. It is hypothesized that men have stronger preferences for investments, durables and luxury items, while women favor children's and domestic needs. From this, it would follow that increased income will have different welfare implications depending on the gender of recipient (see Sparr 1994, Elson 1995). Further, it is hypothesized that different bargaining power between the sexes within the household will result in differing collective household behavior reflecting these relative preferences.

The welfare analysis was again conducted for the alternative models of household behavior: the uniform household model, the separate analysis of female versus male-headed households and the intra-household bargaining effects model as introduced above (see section 5.3). As before, analysis used a simplified reduced form regression approach based on single equation regressions<sup>45</sup>. The equations were specified, in turn, for three different dependent variables: total consumption per household member, own-produced food consumption and nutritional standard. *Total consumption* comprises non-food consumption plus food consumption. Food consumption is the total of own-produced and purchased food. Non-food items would include things such as clothing, beer, fuel, soap, medicines, textbooks, batteries, etc. Total consumption achieved is a standard measure of economic welfare. Regression analysis was then used to test the relative influence that farm production, non-farm income, household variables

<sup>45</sup>Each dependent variable is regressed against a set of potential explanatory variables, both gender and non-gender related. The resulting coefficients, attributed variations in household consumption to variations in each of the explanatory variables. Analysis compared the size and sign of these coefficients, and examined the measures of statistical significance associated with them. Support for the hypothesis would come from statistically significant differences in the coefficients for families headed by different genders (in the predicted directions), or from statistically significant results for the explanatory variables representing differences in bargaining power between males and females in the household.

Due to lack of time and resources we have not undertaken the structural analysis, but rather concentrated on a simplified correlation model. To avoid the problem with interdependent variables we have constructed models for the purpose to analyze correlation between welfare and other variables. A simultaneous system takes into consideration that the endogenous variables have an reciprocal influence on each other. In other words; if an exogenous variable causes a change in one of the endogenous variable this variable may in the next turn have an effect on another endogenous variable which in turn have a retrospective effect on the first endogenous variable etc. The correlation models do not take this interdependence into consideration. It is important to bear in mind the limited interpretation of the estimation results when treating the system as we do. Likewise we are not able to model the multi-level nature of the data as recommended by Goldstein (1995). Hopefully we will at a later stage be able to estimate the simultaneous and multi-level system.

(including dependency ratio, life cycle stage, average sick days for family members 12 to 65 years of age, maximum education level of wife or husband) and community variables (including centrality and access to food market) have on total consumption per household member. As discussed above, the total sample was then also separated for male-headed and female headed households, and under the bargaining model, the effect of the inclusion of the bargaining variable in addition to the other explanatory variables was examined (see Appendix F for more detail and sample regression outputs).

*Own-produced food consumption* is a means to achieve higher nutritional status but is also an element of total consumption. Regressions using the household level of own-produced food consumption as dependent variable were used to test the relative influence of farm production, non-farm income, household variables, community variables, gender separation of household heads and the additional inclusion of bargaining variables. Of particular interest was to see whether the bargaining variables showed a different influence on household own-produced food consumption, compared to their influence on total consumption (non-food plus food) since total consumption can be interpreted as a measure of *economic welfare*, while own-produced food consumption can be interpreted as having a more direct relation to *household social welfare*.

The final set of regression analyses investigated the extent to which the real price adjusted household data series are correlated with children's nutritional status – interpreting nutritional status as one dimension and a relatively pure measure of *social welfare*. Nutritional status was measured as weight-for-age (undernutrition) and weight-for-height (wasting) for children under age five. By using nutritional standard as a measure of *social welfare*, the analysis concentrates on one dimension which is central and at the same time vulnerable to the negative effects of high risk agricultural strategies. Other research on Zambian farming households shows that children of poor parents have a better nutritional standard, than children of farmers with somewhat higher economic welfare (measured as total consumption (Kumar 1994)). Included in the analysis on nutritional status of children is the impact of own-production, the impact of total consumption, as well as household variables (dependency ration, life-cycle stage, maximum education) and community variables (levels of centrality). The analysis was undertaken for the uniform household, gender-head separated household and with-bargaining approaches.

Feachem and Jaminson (1991) and Jakobsen (1987) have documented a U-shaped relationship between economic welfare and nutritional status for rural farmers. On average, nutritional status improved with increasing income, but this hides a more complex

pattern. Moving from very poor to poor reduces nutritional status and only further increases in income towards relatively high household economic welfare then result in nutritional status improving once again. To capture such an eventually U-shaped relationship, the regression specifications used include square terms of consumption, production and education in the analysis of social welfare.

### 6.3.2. Economic factors

The principal findings regarding the economic (production-related) factors are that an increased value of total production yields a significant and strong increase in total consumption per household member. Increased production similarly corresponds to more food retained for own-consumption, but has hardly any impact on nutritional status. This may be counter-intuitive but confirms the U- or J-shaped relation between income and nutritional status discussed above. Poor households are stretching their resources too far, and end up adversely affecting the nutritional needs of their children.

The most important conclusions from the separate analysis for female and male-headed households regarding economic production factors are that for male-headed households the effects for total consumption of living in remote areas, are clearly negative and significant. For female-headed households on the other hand, this effect varies a lot more and is not statistically significant. This indicates that female-headed households are either less integrated in the market-economy or that they benefit from public marketing to a larger degree. Building on the previous findings where supply-response analysis showed that women farmers are gaining less from selling to the provincial marketing unions, there are therefore valid reasons to conclude that female-headed households are less integrated in the market economy and, even in central areas, are meeting too many constraints to utilize market opportunities.

The effect of increasing production for food retained for own-consumption in female-headed households is three times the value as for male-headed households. This is in accordance with the assumption that women give more emphasis to food consumption for the household than men and also supports the limited market access by women conclusion.

While there is a positive effect of non-farm income for both female-headed and male-headed households, it is only significant for male-headed households, and varies a lot more among female-headed households. This can indicate that not all female-headed households are able to utilize such an income to improve the productivity of farming, but also that those who do, gain even more from such income than male-headed households. The reason why female farmers are not able to utilize their

income may be that they are more time-constrained, hence if a woman works outside the farm she has to pay others to take care of some of her farm work, child-care and household chores.

### 6.3.3. Social factors

For the social factors the following observations emerge from the regression findings. Dependency ratio has a strong negative impact on economic welfare (per capita total food plus non-food consumption). There may be several explanations for this. First, it may capture that we have used equal weights rather than adult equivalents in the analysis. Second, it may be a result from the fact that children and old people contribute less to the productive work in the household. Third, it indicates that households with high dependency burden give preference to reproductive work rather than to economic welfare.

Respecting differences in the explanation of social factors for the welfare of female-headed versus male-headed households, education level is positively correlated to total consumption both for female and male farmers. But the effect is almost twice in magnitude among male-headed households. One explanation may be that women tend to give more emphasis to social welfare than men, so that their economic welfare (measured as total consumption) does not increase in the same magnitude. An additional explanation may be that women are not able, or do not have the same opportunities, to benefit from their education; i.e. they face discrimination in the market.

The life-cycle and dependency ratio effects for economic welfare are also different for female-headed and male-headed households. The effect of a higher dependency ratio is negative in both types of households, but only significant in male-headed. This isolated effect indicates that male-headed households with dependents give higher preferences to domestic needs, or are more time-constrained than female-headed households. But when we take into consideration the negative effect for economic welfare of being in life-stages with young or older children (which are large for all households, but considerably larger for female-headed households), we see that the total effect of dependency and life-cycle stage gives a stronger negative impact for economic welfare in female-headed households. This indicates that female-headed households are more time-constrained and/or give more emphasis to domestic needs than male-headed households.

Dependency burden has a positive impact on food retained for own-consumption in female-headed households. In male-headed households the effect is negative but not significant. This is likely to reflect that despite the need for cash in both type of households, female-headed households spend a larger share for

consumption when the number of children and old people increases. Male-headed households continue to sell the same share of production.

In connecting genderized supply responses and agricultural crop production to welfare outcomes, theory leads to the following testable hypotheses, first, female-headed households would prefer to utilize increased production to improve the nutritional status of the children in the household; second, that male-headed households with a wife with high bargaining power, would also show a stronger relative preference for utilizing increased production to improve the nutritional status of children; and third, that male-headed households with a wife with low bargaining power would rather utilize increased production to improve economic welfare.

The analysis of social and economic welfare supports a number of these theoretical expectations. The effects of increased crop production on increased economic welfare are significant, but the effects on nutritional status are more ambiguous. Highly significant in the context of the structural adjustment shift to private marketing and distribution systems for small scale farmers is the finding that men farmers are more integrated in markets and more able to gain from easy access to urban markets. Men farmers are also better able to utilize non-farm income to increase agricultural production and economic welfare. Women farmers spend more of their economic resources and their time on family obligations (e.g. child-care, household chores and crop production for own consumption). Due to this gender specific responsibility and division of labor, women farmers appear to be less able to utilize market opportunities.

#### 6.3.4. Bargaining effects

Overall, only some success was achieved in modeling gender bargaining effects. Nutritional status was found to be strongly correlated with sickness in children; this variable thus provided a great part of the explanation in the variance of the dependent variable nutrition – as compared with virtually all other variables, including the study's bargaining variables.

The relative difference in education or income between women and men also did not show a significant correlation with overall consumption from own-production (where it had been expected that higher women's bargaining power would result in higher consumption from own-production.) One recalls however, that for the household consumption share of groundnut production tested earlier, higher women's bargaining power did show a significant positive effect of higher retained share out of own-production. This may indicate that only where a female crop and relatively high woman's bargaining power is found together, is there a measurable outcome to support

bargaining-theory expectations. On the other hand, the lack of statistically significant findings from the simple correlation model may also simply indicate that more work is required to model these complex relationships<sup>46</sup>.

The bargaining power variables did show a significant effect on household economic welfare – defined as total consumption of food and non-food items. Lower priority is given to economic welfare when the wife's income share or educational level relative to the husband's increase. In other words, if the wife has high bargaining power in terms of relative high income or education, the household tends to have lower non-food plus food consumption per capita at a given level of agricultural production, centrality, dependency ratio etc.. This result does give some support to the hypothesis that women give higher preference to reproductive work (social welfare) rather than economic welfare which includes non-food consumption.<sup>47</sup>

A significant new finding of the analysis is the significant U-shaped relation found between wasting and total consumption. This effect does *not* appear because of the inclusion of bargaining power, but because the sample for the analysis is only male-headed households. An increase in total consumption in male-headed households appears to correspond to a decrease in nutritional status for the most poor rural households. However for less poor households, an increase in total

<sup>46</sup> When bargaining power variables were added to the specification of the regression equation for own-produced consumption, total production was no longer significant and the dependency ration became significant and negative. These unexplained relationships between variables (for which we have no ready reasonable explanation) points to the need to further isolate and clarify relative impacts of variables. Further structural analysis and perhaps the application of multi-equation regressions methods are called for.

<sup>47</sup> A study by Siandwazi, Bhattarai and Kumar (1991) of the Eastern province, found that the effect of education reducing malnutrition, not only varied according to whether the mother or the father had achieved this educational level, but also that the spouses' education interacted. Where our study includes bargaining power in the model, bargaining power is measured as the income difference between wife and husband and as the difference in years of education of wife and husband. Both relative income and relative education have a negative impact on total consumption, but only the income share is statistically significant. However, when we take out household maximum educational level (which is included as a variable in the household vector) relative education becomes significant. The likely explanation is that there is a correspondence between maximum and relative education. This also has implications for how well the effects of the bargaining variables – as we have constructed them – reflect purely the influence of the relative bargaining power (which is our objective), or whether they reflect in part the influence of the absolute levels of education/income of either spouse. This is not to imply that 'difference' variables are not extremely useful tools, but rather that they have to be handled appropriately within the structure of model specification. In our case, the results from the specification which includes max education are therefore more persuasive. Given that we do not encounter a change in sign however, this does not change our interpretation of findings.

consumption results in an increase in nutritional status. This result is in accordance with results documented by Feachem et al. (1991) and Jakobsen (1987). Three possible explanations have been offered to explain this relationship. First, the most poor households may require a higher calorie intake to increase their productivity than they gain from the increased production. Second, the increase in marketed production may be a partial result of reduced retention for own-consumption, with the increased income spent on non-food items (including alcoholic beverages). Thirdly, trying to move out of deep poverty requires a strong focus on increased production-for-sale to generate savings towards purchase of productive assets and inputs (plough, oxen, fertilizer) and the family may end up with less food and less time for the daily and annual feeding of children. Whether this is a temporary or permanent situation is difficult to forecast.

## 7. Conclusions and recommendations

Structural adjustment of the agriculture sector as implemented in Zambia in the early 1990s has dramatically altered the producer environment. The policies implemented, including deregulation of agricultural marketing, commercialization of agricultural services and liberalization of financial services represent a radical departure from the previous regime. In the foregoing chapters, the study has presented findings on the impact of these economic reforms on economic and social welfare of agricultural smallholders, particularly regarding how reforms have affected women differently from men. By way of conclusion, the core research questions which have guided the study are revisited and answered based on the evidence and interpretation of the research findings. A series of recommendations regarding redesign of policies follow.

### 7.1. Conclusions

#### 7.1.1. Effects of economic reforms on price and market conditions at the community level

*The expected real producer price increase was not observed.* A main rationale for structural adjustment is to 'get the prices right'. With regard to the Zambian context, a World Bank study (Jones and Kiguel 1994) showed that the direct and indirect taxation of farmers had increased more in Zambia over the last 10 years before 1991 than in any of the other 28 Sub-Saharan African countries included in the study. Hence structural adjustment policies were expected to correct distorted prices and lead to higher prices for farm produce, particularly for crops which were priced below world market prices. The reason it is important to return to this expectation underlying the SAP, is that the expected social and economic welfare outcomes are directly dependent on the validity of this assumption. If producer prices increase, and if farmers respond positively to these price incentives by producing and marketing more, increased economic and social welfare is then expected to result for both women and men farmers.

While systematic and reliable producer price information at the community level is not available

subsequent to the implementation of the reforms, real (inflation adjusted) producer prices appear to have remained around the same level in central areas and declined dramatically in less central and remote areas. In 1992/93 when prices were freed save for floor prices for maize, prices in less central and remote areas for other crops were around one quarter of the central-area prices, a far larger difference than that justified by transport and handling costs. When the floor price of maize was abolished, farmers in remote and less central areas included in the PRA were paid 20 per cent or less of central-area maize prices.

An issue final issue is whether the removal of price distortion – caused by the previous cross-subsidization of remote farmers by central area farmers – has resulted in increased opportunities and production incentives at least for central area farmers. This effect was also not observed. Producer prices in central areas are well below world market prices, in fact, similar to prices offered by the public marketing system pre-adjustment.

*The expected increase in market efficiency did not materialize.* Structural adjustment reforms are intended to result in market conditions characterized by greater efficiency resulting in a net gain in welfare. It is clear that the reforms have removed the burden of the previous inefficient, wasteful and fiscally unsustainable public marketing and distribution and price-control system from the central budget. However, this has resulted in a shift of (previously paid-by-subsidy) transactions costs onto producers. Moreover, the inefficient system of public marketing appears to have been replaced by a new private market system characterized by market imperfections and even greater inefficiency. Using marketing spreads as one measure of *market efficiency*, producer shares of prices in Zambia were found to be extremely low. PRA findings show that in less central and remote areas especially, markets are dominated by one or a few private traders who are able to set margins well in excess of transport costs and normal economic rents (monopsony, oligopsony).

Overall, private marketing has been a failure thus far. It could be argued that a part of these new observed inefficiencies are transitional adjustment costs. The question then becomes the length of the transition period required before the efficiency of the private market performance can be measured; two to five years for private trading to develop; ten to fifteen years for large scale migration from remote rural areas to central rural areas to develop and settle, or even twenty to thirty years for the private ownership (and/or long term lease) to land and investments to develop and settle. In the meantime, these marketing inefficiencies can also be considered as representing social cost; social cost which is in part avoidable through the redesign of policies which are less gender-biased and less damaging in terms of impact on a large number of very poor and food-insecure small-scale producer households.

Two additional conclusions related to efficiency or inefficiency engendered by the economic reforms are of note. First, market conditions facing producers are now such, that small-scale farmers, especially in remote areas are withdrawing from marketed production, leading to less integrated or 'thinner' markets (which one would also expect to be more inefficient for scale reasons). This return to subsistence, and the lower use of agronomic inputs to production has also led to production at a lower level of *technical efficiency*. Second, the area in which the reforms have had a positive impact is in terms of *allocative efficiency* across crops. Removal of the distortion of the previous system favoring maize, and the new policy focus on crop diversification, are likely to result in cultivation patterns more appropriate to agro-climatic conditions in the different Zambian agro-ecological zones. An important side-effect of this process may be improvements in food security during drought years due to the cultivation of drought resistant local varieties. PRA evidence in this regard however shows that currently food-insecurity effects of structural change are dominating any food-security effects of crop diversification. To the extent that the maize-promotion policy translated into an effective male bias (allocation of public/budget resources towards a 'male' crop and allocation of household labor resources to a cash crop whose sale-proceeds were predominantly male controlled) the removal of the previous regime has reduced gender bias.

### **7.1.2. Supply-response to price, market and other local conditions at the community level**

*The expected positive supply response to price over time was not verified.* In general, both economic theory and time-series-based empirical studies lead to the expectation of evidence for positive supply-response behavior (in the sense of a positive relationship

between prices and quantity marketed)<sup>48</sup>. This over-time positive supply-response was not found in the case in Zambia. While average national prices have fallen since around 1980, aggregate crop production has been more or less stable over the pre-adjustment period. However, the spatial pattern changed dramatically. A stable and subsidized public marketing system resulted in farmers in the less central and remote provinces to dramatically increase marketed maize production over especially the latter 1980s, while production of marketed maize in central provinces decreased. The conclusion is that farmers in central areas had other and better opportunities and switched to those. For farmers in remote provinces, it appears that a stable and predictable marketing environment was the most important incentive, causing a steady increase in crop production, despite falling real producer prices.

*The expected negative supply response to price was verified, in cross-sectional analysis at time of adjustment, not only for small scale women farmers, but for both women and men, and small and medium-scale farmers.* Chhibber (1989) reviewed several cross-farm supply-response analyses and found both negative and positive supply-responses, but in any case only low value price elasticities. From a theoretical point of view (Singh, Squire and Strauss, 1986) and from the hypotheses of the gender literature, one would expect small-scale women farmers to tend to act like the prototype combined consumer/producer household (where income effects driven by cash-requirements predominate), and medium-scale men farmers to tend to behave more like prototype producers. Hence one would expect a negative supply-response from female producers, and a positive supply-response from male producers. However, no significant differences were found in the 1992/93 cross-sectional statistical analysis of household supply behavior. Across farms and across crops, a uniform negative supply response to price was observed among both small and medium-scale farmers and among female-headed and male-headed farmer households (i.e. higher production correlated with lower prices).

*The negative supply response holds only up to a certain low-price threshold.* The 1995 PRA findings do not corroborate the cross-sectional statistical findings that farmers increase marketed production if prices fall. A likely interpretation is that, due to poverty and critical household income requirements, farmers will initially compensate for a modest temporary price fall by producing more for sale. However, at a price level below a certain threshold, it does not pay off to produce, transport and sell. Therefore, by 1995, when

<sup>48</sup> Findings from other studies in the literature on supply response differ somewhat with methodology (Chhibber 1989). Time series analyses typically find a positive supply response, while for cross-sectional analysis the findings are more mixed and include negative supply-responses.

the fully implemented economic reforms had caused the dramatic price decline in remote and less central areas, farmers could no longer respond by increasing production to ensure cash income. They then partly withdrew from production for sale and relied on subsistence agriculture and other coping mechanisms for survival.

*Evidence for cross-price sensitivity was found.* The 1992/93 cross-sectional analysis of supply-response to price also showed significant price-sensitivity of producers with regard to cross-price effects e.g. lower maize prices were found to have a positive effect on the production of groundnuts, cassava and mixed beans. In particular, such cross-price response by male farmers results in their cultivation of previously predominantly 'female' crops. Such positive cross-price supply response is supported by PRA findings which report farmers switching to, and increasing production of, other crops in the face of the serious decline in maize prices.

*In designing economic reform programs and predicting welfare outcomes, changed producer cost conditions must be included as an important determinant of supply-response, hence expected welfare outcomes.* The PRA findings from all villages visited also support the conclusion that while producer prices are important, reduced access and/or higher cost of credit and agricultural inputs have proved to be even more significant than prices in determining production decisions of women and men farmers. This leads to the important observation that SAP-outcome expectations for producer-household welfare which are posited on expectations regarding responses to producer prices alone are dangerously oversimplified. Changing producer cost conditions can be equally important and should be factored into expectations. In the Zambian case, it is evident that the removal of broad-based subsidies, led to not only the removal of distortion caused by cross-subsidization, but also led to cost-increases as a result of replacing an inefficient public marketing system with an even more inefficient private marketing system.

### **7.1.3. Gender biases underlying supply-response**

*A legal gender bias, a gender bias in family obligations and a gender bias in division of labor were all confirmed.* All the standard gender biases turned out to be serious constraints on the supply response capacity of women farmers. The legal gender bias constrains women's legal rights to land and other assets and make women extremely vulnerable if the husband passes away. Without land rights, female producers have no access to collateral and hence no effective access to credit other than through alternative institutions designed to account for this (such as credit clubs). The analysis of Community Survey data confirmed that distinct gender

obligations were strongly acknowledged by both women and men, with only differences in degree. Men's gender role in household economic responsibility predominates cash-based transactions relating to the acquisition and purchase of household consumption items and agricultural inputs. Regarding women's obligations across the range of household economic tasks, agricultural production is perceived as the task requiring the most contribution by women whether the task is to produce food for own consumption, food crops for sale or even cash crops for sale. Obligation for household food-production leads to higher risk-aversion in production-related choices by women farmers, because crop failure results in a household food-insecurity and hunger. Data related to gender-biased social tasks such as the distance required to walk for fetching firewood, collecting water, and getting maize ground at the nearest hammer-mill, shows that on average this work-load is high and time-demanding. The focus of the study was however not on the gender biases themselves, but rather on whether and how gender biases constrained women farmers in their agricultural supply response.

Due to legal constraints, family obligations and work load, women farmers are less able to utilize market opportunities, and respond differently, and to a different set of marketing opportunities. As noted above, the study did not find the expected gender-differences in cross-sectional supply-response; not in the sense that small scale women farmers did not evidence the negative supply that the genderized literature predicts – they did, but all other small and medium-scale farmers did as well. As well, the following gender differences were found. Male farmers respond more to market opportunities in the sense that (i) they are more responsive to price changes by switching to relatively better-paid crops, even if these traditionally were considered "female crops" and, (ii) they respond to marketing opportunities such as in-kind-credit-based contract farming, and more distant-from-village, higher-price sales opportunities. On the other hand, women farmers respond less to market opportunities and respond differently in the sense that, (i) they are more time constrained and more obligated to produce for own-consumption hence cannot vary response as much, (ii) women are more risk-averse in responding to opportunities because of their greater responsibility for household food security, (iii) because of lower effective access to credit have more limited choices, and (iv) respond more strongly than men-farmers to well-organized marketing opportunities at the community level.

### **7.1.4. Gender differences in welfare preferences**

*Bargaining power analysis provides some support to the hypothesis that women farmers give preference to social welfare and men farmers to economic welfare.* The

bargaining power analysis shows that if the wife in male-headed households has high bargaining power in terms of relative high income or education, then the household tends to show lower economic welfare per capita for a given level of agricultural production. This may indicate that in these high female-bargaining-power households, greater priority is given to social welfare (labor allocated to 'non-productive', reproductive and social welfare tasks such as feeding and taking care of family, ensuring daily and annual food security). Second, significant evidence for a J-shaped correlation between total income (highly correlated with men's income) and malnutrition was found for the sample of male-headed households only. This implies that for poor male-headed households relative to female-headed households, less attention is given to nutrition, an important dimension of social welfare. Third, the different gender reactions to marketing opportunities (where men respond to prices at distant markets, women more to local opportunities), implies that the gender-defined role of women leads them to stay at home, giving greater priority to household social welfare through production for own-consumption and social reproductive tasks.

## 7.2. Recommendations

The report's recommendations are not intended to be comprehensive. They are presented in order to give suggestions on how findings and conclusions from this study could be used to improve policy design, so as to better achieve the objectives of economic reforms and in order to reduce the adverse impact of gender biases on women farmers.

(i) *To increase efficiency in marketing and distribution of crops, a redesign of marketing policy is needed, one which re-balances private and public sector responsibility.* In order to remediate the very low efficiency and partial failure of private crop marketing, corrective action is required. The policy of complete abdication of public responsibility for marketing and distribution of crops, should be modified to include a public role which complements and supports the capacity of private trading to carry out the marketing and distribution function. Such a policy of ensuring functioning markets would result in improved overall efficiency and significant net welfare gains. Four elements to consider are:

- a) a program for regular local dissemination of price information regarding current prices at different markets;
- b) a policy of countervailing import tariffs to compensate for producer subsidies in country of origin<sup>49</sup>;

<sup>49</sup> The recommendation may require a little explanation since the study has not dwelt on trade policy. The liberalization of the Zambian agriculture sector is already leading to significant regional

- c) public investment in improved infrastructure with priority for remote and less central areas, and including feeder roads;
- d) public marketing support to producers in remote and less central areas, such as support to transport and marketing arrangements by local cooperatives.

(ii) *A stable marketing system is more important for ensuring a positive supply response over time than prices. A stable marketing system in less central and remote areas would serve as an important incentive to ensure a high volume of marketed production and the continued market integration of less central and remote areas also in periods when prices are low and declining. To be effective, this would not require significant subsidization of producer prices and could be structured so as to complement the activities of private traders. Such a policy would also support the food security objective and address the serious decline in nutritional indicators that has been observed under the current policy.* The potential gains from ensuring reserve prices in remote and less central areas are large. Farmers will react positively to a stable low price above a certain threshold combined with the assurance of a (public) reserve buyer. This threshold is likely to be closer to the 1995 prices than the 1993 prices, hence does not need to imply a substantial drain of public funds. Reserve prices can be implemented by providing public support to storage and capital costs; purchases could be undertaken by private traders on public contract. As an efficiency-safeguarding benchmark, regional reserve prices would have to be low enough to avoid traders or farmers from central areas reselling in remote areas.

It is clear that a full return to the mandated pan-territorial pricing system and subsidized consumer prices is not a feasible, nor an efficient solution. The Zambian experience with equity pricing was not positive. The implicit taxation of producers close to urban markets distorted production incentives and lowered food production in central areas. The administrative costs of operating the public marketing

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dislocation, increases in migration and urban unemployment (see PRA findings in section 5.4). This dislocation would be aggravated if Zambian producers also have to compete against imports which are subsidized by governments of the exporting countries. Given that poverty is significantly higher in rural areas in Zambia, an appropriate policy would be one of countervailing tariffs (matching the foreign subsidy), which effectively would simulate that similar liberalization has taken place in the exporting country. If the exporting country similarly liberalized, countervailing tariffs should then be removed. Under the countervailing tariff policy, revenue will accrue to the Zambian government. Under the alternative policy of a liberalized import regime and the abdication of bilateral trade measures, the benefits of the foreign subsidy would accrue to domestic consumers. Since they are likely to be the relatively less poor urban population of Zambia, such a policy would not be appropriate to the poverty distribution profile of Zambia and would not fairly represent the interests of rural producers who would have to compete on a 'non-level playing field'.

system became extremely high, as did indirect costs due to various types of structural problems which effectively resulted in waste. Hence, the benefits of the substantial steps taken towards an efficiency and market-administered price system by the 1992/93 economic reforms should not be foregone by a wholesale policy reversal. Assuming a relatively level playing field vis-à-vis foreign producers, agricultural production in central and naturally high-yield areas can be expected to rise. Some adjustment costs will have to be borne in this regard and this is also expected to include a restructuring towards larger producers at the expense of small and medium-scale producers.

However, the policy of complete liberalization of marketing, distribution and pricing has been found to have serious adverse impacts on household food security in all but the most central and close to line-of-rail areas. This very uneven impact on regional economic development and agricultural supply entails extremely high expected costs of social and rural-to-urban dislocation, losses in social capital and decreases in social welfare (as already found in rapid declines in nutritional indicators, significant increases in the number of absolute poor, withdrawal from marketed agricultural production and increasing search for piece-work employment in central areas). The earlier finding of this study of an unexpectedly strong agricultural supply response by remote, non-central, small and medium-scale producers to stable marketing conditions, implies that these social costs can, in part, be significantly and cost-effectively off-set by appropriate policy intervention. Public support towards the creation of stable conditions in less central and remote areas, in part through a low but guaranteed reserve price, would therefore work towards the policy objectives of household food-security, social investment, agricultural supply and market integration of less central and remote areas.

(iii) *The gender bias in supply response requires both an active policy to off-set the impact of the gender bias and an active policy to reduce the gender biases themselves.*

- a) *A policy to off-set the impact of a gender bias.* Benefits of the current liberal market policy are unequally distributed across the genders because women farmers are not able to respond to the same opportunities as men farmers, are more risk-averse and respond more to a stable marketing situation. A policy to create a stable marketing environment, as found in the previous recommendations, would gain women farmers more than men farmers, thus serve to partially off-set the gender bias in policy impact.
- b) *Policies to reduce gender biases.* The main gender bias mechanisms identified in this study are the legal bias, the family obligations and the work load bias. Policy issues to consider should include:

- Gender equity in land rights, inheritance laws, and implementation of new legal regulations on communal land<sup>50</sup>;
- Affirmative actions to increase male obligations and responsibilities, including for food security and education of girls;
- Priority to public investments which serve to reduce the work load of, and time constraints on women farmers, including improved access to clean water and firewood by investment in rural water supply and forestation programs, focus of agricultural research and extension on women's crops and agricultural methods and technologies accessible to women and applicable to women's tasks.

(iv) *Findings from the bargaining power analysis highlight the need to design a gender sensitive agricultural policy in order to optimize gains in economic and social welfare over a short and long-term time horizon.* Women farmers tend to give a higher preference to social and reproductive tasks and focus on a daily and seasonal time horizon, while men farmers tend to give a higher preference to monetized income and consumption and focus on a longer time horizon. In order to balance these preferences, a policy to enhance the bargaining power of women farmers, by improved education and control of income, is needed. Public economic support and incentives could ensure the more equal education of girls. With regard to increasing women's control of income, especially key are the already recommended measures of (a) marketing reforms to assure producers of local marketing opportunities and reserve prices; (b) legal reforms to enhance women's opportunities; and (c) prioritizing public investment to contribute to reduction in women's work loads.

<sup>50</sup> Land reforms were passed by the Zambian Parliament in October 1995. It remains to be seen how they are implemented. The objective of the reforms is the development of a free land and leasehold market for land in order to increase productivity of land and also to improve the collateral position of small-scale farmers. Unfortunately it does not appear as though the gender bias impact of land reform has been considered. If this is not done, the land reforms are likely to reinforce the gender constraints faced by women farmers.

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# Poverty

## Changes in poverty from 1991 to 1993<sup>51</sup>

Our profile of poverty in Zambia is based on two surveys which took place in October to November 1991 and February to April 1993. Both were conducted under the auspices of the World Bank Social Recovery Project (SRP) and presented in CSO (1993), CSO (1994a), and Chulu (1995)<sup>52</sup>. Unfortunately, information on the consumption of households' own produce was not collected in 1991. To ensure consistency, we had to choose to present information either on total consumption excluding own produce or on income. Neither are the best measure, but our judgment is that the income-based information is the more interesting. Income estimates are usually downward biased, and poverty estimates are hence upwards biased, but it could be argued that this does not affect the comparison of poverty across sub-groups within rural and within urban areas. Given these methodological problems, we chose to focus on comparing poverty across groups and present this information with graphs rather than figures. We also present tabular data at the end of the appendix, and have chosen to present figures calculated using slightly different approaches. As the tables show, the figures are remarkably consistent, and hence there is every reason to accept the level of poverty as valid, while being cautious about the exact figures. The 1991/92 drought affected the southern part of Africa; in Zambia it affected the southern part of the country, comprised of the Western, Southern, Lusaka and Eastern provinces. This drought reduced agricultural output to very low levels in the 1991/92 agricultural season; an increase in poverty should therefore be studied with caution.

## Poverty in a gender perspective

Figure A1 shows that male-headed households were better off than female-headed households in both 1991 and 1993. Poverty increased for both groups, but the increase was higher among female-headed households.

## Poverty by size of household

Figure A2 shows the percentage of extremely poor by size of household. There is a clear trend to increased poverty by increased household size in both 1991 and 1993, and even the *increase* is larger in larger households than smaller ones. This puts a great strain on households to cope with change under structural adjustment, as the average household in Zambia is quite large (about 5.8 persons). The bottom-heavy

**Poverty definitions**

Extremely poor persons were defined as those living in households with an equivalent money income below a certain line of extreme poverty, calculated by the Prices and Income Commission (1991) as the cost of a nutritionally adequate food basket (K961 per month in October/November 1991 and K5910 in February–April 1993). Moderately poor persons were those living in households with equivalent money income above the line of extreme poverty but below the poverty line. This poverty line was calculated by the Prices and Income Commission (1991) as the cost of a nutritionally adequate food basket, plus the average non-food expenditure identified in a household budget survey, i.e. between K910 and K1380 per month in October/November 1991 and between K5910 and K8480 in February–April 1993. Non-poor persons were those living in households with equivalent money incomes equal to or above K1380 per month in October/November 1991 and equal to or above K8480 in February–April 1993. A household's *equivalent* money income is the total money income of the household divided by the sum of the adult equivalent weights for all the persons in the household. Each person in the household was assigned an adult equivalent<sup>1</sup> weight according to their age.

<sup>1</sup> Developed by the Zambian Food and Nutrition Commission based upon FAO recommendations: Adult male 13+ yrs - 1.00, adult female 13+ yrs 0.76, 10-12 yrs - 0.95, 7-9 yrs - 0.78, 4-6 yrs - 0.62, 1-3 yrs - 0.36, 0 yrs 0.00.

Figure A1. Poverty by gender of household head in 1991 and 1993, in per cent

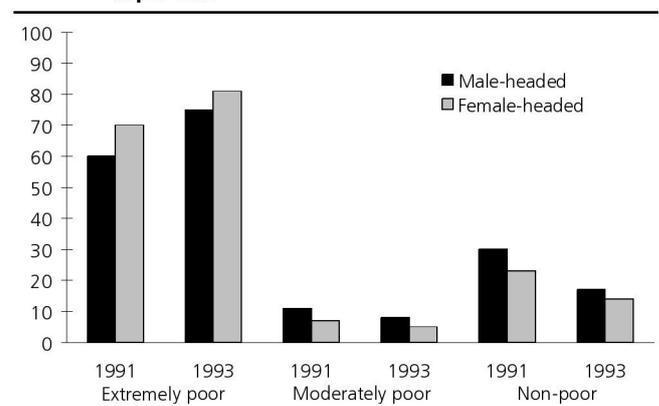
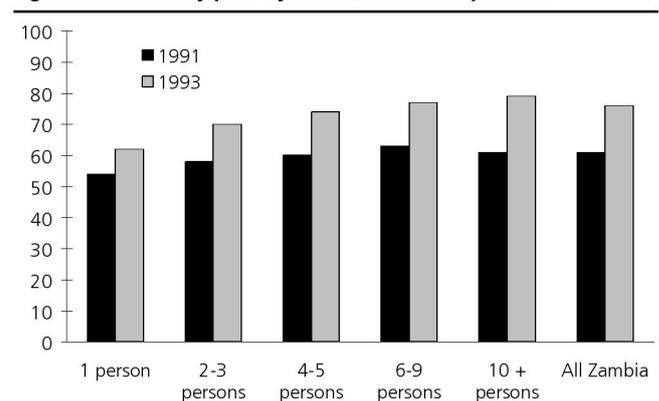


Figure A2. Extremely poor by household size, in per cent



<sup>51</sup>The first country-wide poverty measures for Zambia were calculated only for 1991, and even urban poverty data were first calculated for the late 1980s. For information on the pre-adjustment period, see the data on pre-adjustment economic welfare (1971-1991) presented in table 3.1 of the main text.

<sup>52</sup>The latter is one part of the main data source for the micro level analysis and a presentation of the data is given for that analysis.

population pyramid, coupled with the extended family system prevailing in Zambia, makes the average Zambian household very vulnerable. There is a very heavy dependence on the few persons who earn money by the many persons who are still in their youth and mostly school-going.

### Poverty in socio-economic perspective

Figure A3 displays data by five socio-economic groups. In rural areas, the division is between persons living in small-scale farming households and those living in medium-scale farming households, while in urban areas it is among persons residing in low-, medium-, and high-cost residential areas<sup>53</sup>. The per cent of poor households (extremely plus moderately poor) is presented for in each group.

This confirms the very high incidence of poverty in Zambia and especially in rural Zambia. It also confirms the large increase from 1991 to 1993. In addition, two findings should be especially noted:

- The large increase in poverty from 1991 to 1993 took place in both rural and urban Zambia. In both regions, around half of those who were non-poor in 1991 fell below the poverty line from 1991 to 1993.
- Poverty increased most in the middle groups, i.e. the medium-scale farmers and in the medium-cost urban areas. The incidence of poverty in 1993 was more or less the same across small-scale and medium-scale farmers and across low-cost and medium-cost urban areas.

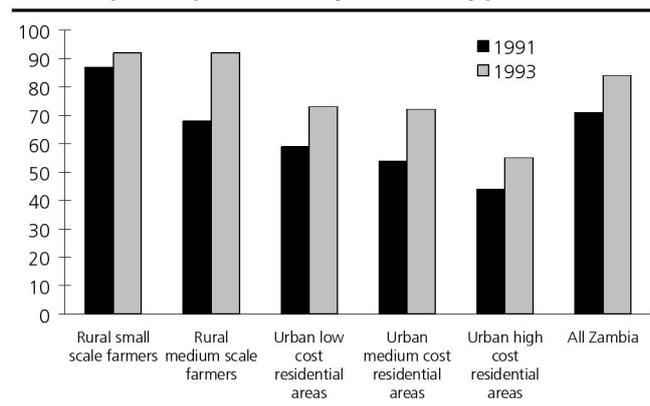
The lack of difference among small-scale and medium-scale farmers is striking. Obviously a number of medium-scale farmers live in drought-stricken and/or remote areas, but quite a number live in somewhat more central and less drought-affected areas. At the time of this survey they had however not been able to utilize or benefit from the market opportunities that structural adjustment of the agricultural sector was intended to give rise to.

The urban communities have seen increased poverty across all the three strata (low-, medium- and high-cost areas) but the absolute levels are much lower in these areas, with the high-cost areas having the lowest incidence of poverty.

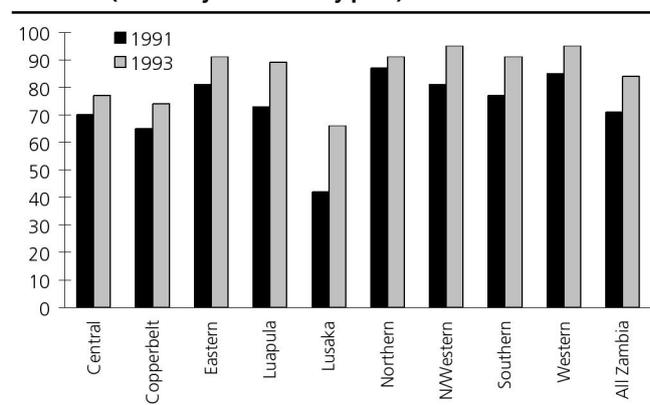
### Poverty by province

Figure A4 shows that there is a clear trend to lower poverty in the line-of-rail provinces both in 1991 and 1993. However, Southern province had a higher poverty incidence than the best of the off-line-of-rail provinces.

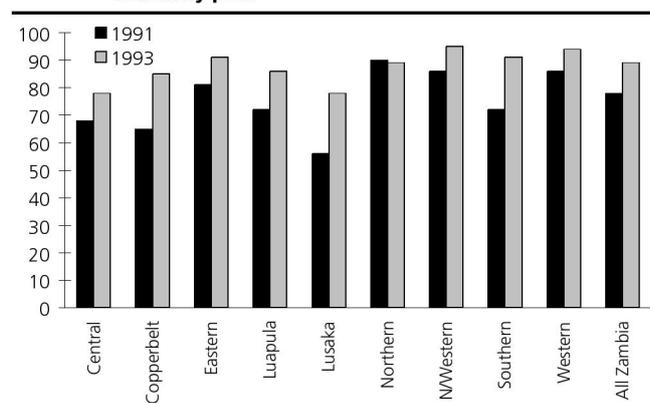
**Figure A3. Poverty by socio-economic group in 1991 and 1993, per cent poor (extremely + moderately poor)**



**Figure A4. Poverty by province in 1991 and 1993, per cent poor (extremely + moderately poor)**



**Figure A5. Rural poverty by province in 1991 and 1993, per cent extremely poor**



To address the impact of agricultural production we present in Figure A5 the information for rural areas only. The trend here is the same: poverty is higher in off-line-of-rail provinces, with the exception of Southern province in 1993, which probably reflects the negative impact of the drought on poverty levels, despite food aid and other support.

There is however an interesting difference between these two figures. The gap between line-of-rail and off-line-of-rail provinces is somewhat less for rural provincial poverty than for total provincial poverty both in

<sup>53</sup> These residential divisions are set by the local government, which sets criteria for the housing standards and demarcates plot sizes according to these three urban categories. The surveys included squatter and shanty areas in the low-cost category.

1991 and 1993 (initial phase of reforms). This might be an indication that the pre-adjustment agricultural policy of offering uniform prices (and large transport subsidies) across the country had the expected positive impact for the off-line-of-rail provinces.

**Depth and severity of poverty**

Thus far we have studied poverty by P0 - poverty incidence or head count. To understand more about the distribution of poverty, we will also present information on P1 (intensity of poverty) and P2 (severity of poverty). Figures A6 and A7 show the P1 and P2 index by province. The depth of poverty (the overall P1 index) for Zambia increased from 0.481 to 0.619 and the P2 index (severity of poverty), increased from 0.383 to 0.514. This is an indication that both the absolute level of poverty and its severity increased dramatically.

**Poverty indices:**

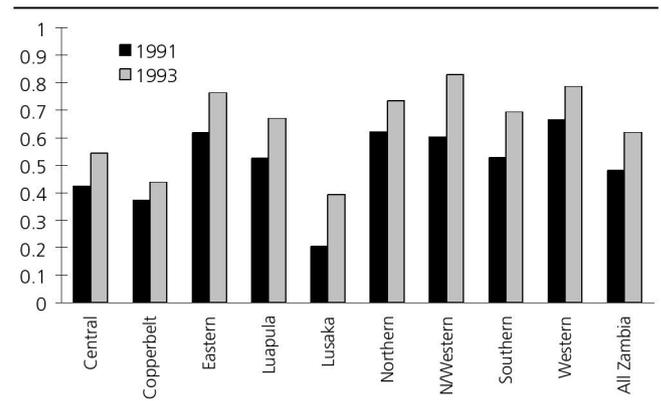
- **P0** = Poverty incidence, the total proportion of persons who are poor, i.e. those identified as extremely or moderately poor.
- **P1** = Poverty intensity or depth of poverty, the average gap between the income of a poor individual and the poverty line. The higher the index number the greater the poverty intensity.
- **P2** = Poverty severity, the inequality in poverty distribution. Poverty severity gives a weight equal to the distance below the poverty line. It gives a higher weight to the poorest persons than those slightly below the poverty line; it is therefore an indication of how severe poverty is at the bottom. Again, the higher the index, the greater the severity of poverty of the poorest individuals. This means the further a person is below the poverty line, the higher the P2 index.

North-western province encountered the highest increase both in terms of average distance from the poverty line (the P1 index), and the severity of poverty of the poorest individuals (the P2 index). Again, the lowest P1 and P2 indices were recorded in the most central provinces (Lusaka and Copperbelt), meaning that these are the provinces with the least severe depth of poverty. Poor persons in these two provinces are on average much less poor than their counterparts in other provinces. Lusaka and Copperbelt are the most urbanized provinces which offer relatively more job and business opportunities than other provinces. The number of poor persons has increased since 1991 in these two urbanized provinces, with Lusaka leading, but these people are less poor than those in other areas. And though poverty has increased in these two provinces, they retain the highest share of non-poor persons.

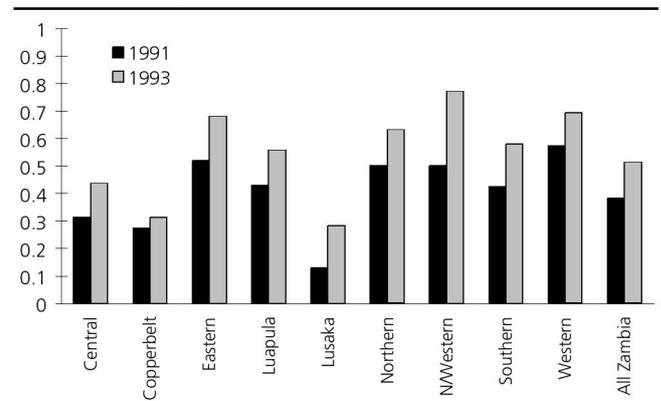
**Poverty measured by total consumption**

Lyngstad (1993) and Iversen (1994) have studied poverty based on a cash expenditure measurement

**Figure A6. Poverty gap by province in 1991 and 1993, poverty index P1**



**Figure A7. Severity of poverty by province in 1991 and 1993, poverty index P2**



rather than on income. The methods of formulating poverty are the same, however. These studies were based on the data of Priority Surveys I and II. The following table highlights the findings when measuring poverty by cash expenditure, and includes the findings from this study which measures poverty by income. It should be added that both give an upward-biased estimate of poverty since production for own consumption is not included.

**Table A1. Poverty, monetary poverty measured by total and by cash expenditure per adult equivalent and by income per adult equivalent. Households**

	Relative poverty line <sup>1</sup>		Absolute poverty line <sup>2</sup>			
	1991 income <sup>3</sup>	1993 total expenditure <sup>1,4</sup>	1991 expenditure <sup>1</sup>	1993 expenditure <sup>1</sup>	1991 income <sup>3</sup>	1993 income <sup>3</sup>
Non-poor: all Zambia	23	22	39	23	29	16
Non-poor: rural Zambia	14	6	13	4	15	8
Non-poor: urban Zambia	31	46	69	51	45	30
Non-poor: female-headed households			31	18	23	14
Non-poor: male-headed households			40	24	30	17

<sup>1</sup> Lyngstad 1991, Iversen 1994.<sup>2</sup> PIC 1991, Chulu 1995.<sup>3</sup> CSO 1993 and 1994a.<sup>4</sup> Incl. cons. of own produce and weight of adult females increased from 0.76 to 1.00.

## Data

**Table A2. Incidence of poverty by gender of household head and household size**

Gender of head	Extremely poor		Percentage change	Moderately poor		Percentage change	Non-poor		Percentage change	Total
	1991	1993		1991	1993		1991	1993		
Male	60	75	15	11	8	-3	30	17	-13	100
Female	70	81	11	7	5	-2	23	14	-9	100
Household size										
1 person	54	62	8	9	9	0	37	30	-7	100
2-3 persons	58	70	12	8	7	-1	34	23	-11	100
4-5 persons	60	74	14	9	8	-1	31	18	-13	100
6-9 persons	63	77	14	11	8	-3	27	16	11	100
10 + persons	61	79	18	11	8	-3	28	13	-15	100
All Zambia	61	76	15	10	8	-2	29	16	-13	100

**Table A3. Incidence of poverty by socio-economic group**

Socio-economic group	Extremely poor		Percentage change	Moderately poor		Percentage change	Non-poor		Percentage change	Total
	1991	1993		1991	1993		1991	1993		
Rural small scale farmers	81	89	8	6	3	-3	13	8	-5	100
Rural medium scale farmers	58	85	27	10	7	-3	32	8	-24	100
Urban low cost residential areas	44	59	15	15	14	-1	41	27	-14	100
Urban medium cost residential areas	40	56	16	14	16	2	46	28	-18	100
Urban high cost residential areas	31	44	13	13	11	-2	56	45	-11	100
All Zambia	61	76	15	10	8	-2	29	16	-13	100

**Table A4. Poverty in Zambia - provincial levels**

Province	Extremely poor		Percentage change	Moderately poor		Percentage change	Non-poor		Percentage change	Total
	1991	1993		1991	1993		1991	1993		
Central	57	69	12	13	8	-5	31	23	-8	100
Copperbelt	51	61	10	14	13	-1	35	25	-10	100
Eastern	75	87	12	6	4	-2	19	9	-10	100
Luapula	65	81	16	8	8	0	27	11	-16	100
Lusaka	29	55	26	13	11	-2	57	34	-23	100
Northern	79	87	8	8	4	-4	14	9	-5	100
N/Western	74	90	16	7	5	-2	18	5	-13	100
Southern	66	86	20	11	5	-6	22	9	-13	100
Western	79	91	12	6	4	-2	15	5	-10	100
All Zambia	61	76	15	10	8	-2	29	16	-13	100

**Table A5. Poverty in Zambia - rural poverty**

Province	Extremely poor		Percentage change	Moderately poor		Percentage change	Non-poor		Percentage change	Total
	1991	1993		1991	1993		1991	1993		
Central	68	78	10	8	5	-3	24	17	-7	100
Copperbelt	65	85	20	9	5	-4	26	10	-16	100
Eastern	81	91	10	5	3	-2	15	6	-9	100
Luapula	72	86	14	8	6	-2	20	8	-12	100
Lusaka	56	78	22	7	4	-3	37	18	-19	100
Northern	90	89	-1	3	3	0	7	8	1	100
N/Western	86	95	9	6	2	-4	8	3	-5	100
Southern	72	91	19	10	4	-6	17	5	-12	100
Western	86	94	8	4	2	-2	11	3	-8	100
All Zambia	78	89	11	6	4	-2	15	8	-7	100

**Table A5. Poverty in Zambia - rural poverty**

Province	Extremely poor		Percentage change	Moderately poor		Percentage change	Non-poor		Percentage change	Total
	1991	1993		1991	1993		1991	1993		
Central	39	49	10	20	16	-4	42	36	-6	100
Copperbelt	50	58	8	14	15	1	36	27	-9	100
Eastern	49	45	-4	10	20	10	41	35	-6	100
Luapula	47	58	11	8	17	9	45	25	-20	100
Lusaka	25	51	26	14	12	-2	60	37	-23	100
Northern	39	70	31	24	12	-12	37	17	-20	100
N/Western	44	58	14	10	20	10	45	22	-23	100
Southern	47	69	22	15	9	-6	38	22	-16	100
Western	54	66	12	13	16	3	33	18	-15	100
All Zambia	44	56	12	14	14	0	45	30	-15	100

**Table A7. Poverty indices by province**

Province	P0		Percentage change	P1		Percentage change	P2		Percentage change
	1991	1993		1991	1993		1991	1993	
Central	0.694	0.774	0.080	0.424	0.544	0.120	0.314	0.437	0.123
Copperbelt	0.647	0.749	0.102	0.374	0.438	0.064	0.275	0.313	0.038
Eastern	0.807	0.909	0.102	0.618	0.763	0.145	0.520	0.681	0.161
Luapula	0.730	0.894	0.164	0.525	0.671	0.146	0.430	0.558	0.128
Lusaka	0.426	0.659	0.233	0.205	0.393	0.188	0.130	0.283	0.153
Northern	0.863	0.912	0.049	0.622	0.734	0.112	0.502	0.632	0.130
N/Western	0.816	0.950	0.134	0.603	0.829	0.227	0.501	0.771	0.270
Southern	0.775	0.909	0.134	0.528	0.693	0.165	0.426	0.580	0.154
Western	0.848	0.948	0.100	0.665	0.786	0.121	0.574	0.693	0.119
All Zambia	0.712	0.837	0.125	0.481	0.619	0.138	0.383	0.514	0.131

## Appendix B

## Nutritional status and malnutrition

We focus on nutritional status as one important dimension of *social welfare* and an *outcome of the development process*. We should add that adequate nutritional status is also an important element of *human capital* and an *input to the development process*. Nutrition has both a health dimension and an agricultural food-security dimension. This dualism of nutritional work may be both a strength and weakness. In the case of Zambia, the food-security dimension of the agricultural sector has received the most attention. It has been a policy goal to ensure low-cost food security for urban areas. This is not to say that nutritional objectives have not been included in the agricultural sector policy, but it has not been given priority. There is, however, a growing concern that the adjustment policy requires a food-security policy to be implemented in remote rural areas. For now, the focus is on nutritional status as an end goal and a dimension of social welfare.

### Measures of nutritional status

Nutritional status is measured by three indicators<sup>54</sup>, as follows:

- stunting, measured by height-for-age;
- wasting, measured by height-for-weight and
- undernutrition, measured by weight-for-age.

Since various studies have been conducted at different times of the year, it is difficult to compare nutrition levels based on weight, i.e., weight for height and weight for age, due to the effect of seasonality. To the extent that a comparison of nutritional status is based on weight measured during different seasons, this will measure not only changes between two years, but also seasonal changes. It is therefore difficult to separate annual changes from the usual cyclical intra-annual changes. Hence, a nutrition indicator based on height independent of weight is most likely to capture yearly trends, even though measured during different seasons. This is a real problem in Zambia, since some surveys have been conducted over the whole year, while others cover only a few months.

This presentation focuses on national information, but in order to disentangle the effects of the devastating drought in 1991/92 from policy-reform effects, we need to distinguish between drought-affected provinces and provinces which were less seriously affected. Hence we have gone beyond the

national level and presented some post-adjustment information at the provincial level.

### Anthropometric indicators

*Stunting* or too-low height for age is a measure of chronic undernutrition and is therefore indicative of a cumulative problem of the past. *Wasting*, or too-low weight for height, measures acute undernutrition. *Undernutrition* or too-low weight for age, is indicative of short-term or long-term undernutrition, or both. In addition, the definition of «too low» has varied over time. Stunting, wasting and undernutrition are usually measured as the share of a certain population group, usually children from 3 to 59 months, below a certain threshold set by a healthy reference group. The threshold used to be set as a certain percentage of the median, but was changed to be measured in standard deviations below the mean. From a statistical and nutritional scientific point of view, the latter approach is an important step forward. Using 2 standard deviations as the threshold, the reader would know that in a healthy population you should expect to find 5 per cent below the threshold, not more and not less. However, since old material usually only gives information according to percentage threshold, comparison is difficult.

### Nutritional status in the pre-adjustment period, 1970/71 to 1991

The national nutritional status survey conducted between 1969 and 1971 is the most comprehensive nationwide survey of the rural population. Data were collected in all provinces except Luapula from 7550 individuals over a complete year (UNDP/FAO 1974a, 1974b and Wold 1987). This survey was an important component of the program of the new National Food and Nutrition Commission and helped to place food security and nutrition on the policy agenda. However, one and a half decades will pass before the next survey with anthropometric indicators is conducted. In 1984/85 the Central Statistical Office conducted a 12-month Household Budget Survey with an anthropometric module. The budget data were never published, but a report on the anthropometric indicators was published several years later (Kaite 1991). Since around 1990, several surveys comprising an anthropometric module have been conducted. In December 1989/January 1990, a module was attached to the Crop Forecast Survey (CFS) (Cogill and Zaza 1990). The first Priority Survey (PSI), which included an anthropometric module, was conducted in October and November 1991 (CSO 1993).

<sup>54</sup> For children 3-59 month, refer to separate box on anthropometric indicators.

**Table B1. National malnutrition levels 1970/71-1991**

	1970/71 FAO/NFNC	1985 CSO,NFNC,PIC	1990 CSO,UNICEF,PIC	1991 PS I
<i>Undernutrition:</i> Weight-for-Age, percentage below 80 per cent of the median in reference population <sup>1</sup>				
Zambia		26.5		26.8
Rural	24.7	31.4	29	30.7
Urban		23.5		22.2
<i>Stunting:</i> Height-for-Age, percentage below 90 per cent of the median in reference population <sup>1</sup>				
Zambia		41.0		28.1
Rural		48.0	38.5	33.1
Urban		36.8		22.1

<sup>1</sup> Because nutrition figures from 1970 and 1985 are only presented using the percentage below the median in the reference National Center for Health Statistics (NCHS) population, data for other years are presented in the same format to allow comparison.

As table B1 shows, rural undernutrition levels of children under five years of age increased between 1970/71 and 1991. However, this increased undernutrition was not a linear development: all of the increase took place during the 15-year period to 1985, then remained steady during the latter half of the 1980s. Unfortunately, no information on stunting is available from 1970/71 for the whole country. With 1985 as the starting point, stunting shows a remarkable reduction during the second half of the 1980s, falling from 48 per cent to around 35 per cent in 1990 and 1991. During the 20 years from 1970 to 1990, Zambia experienced half a decade of rapid economic growth, followed by stagnation and almost a decade of decline before world-market copper prices increased around 1990 and led to increased export earnings. Unfortunately, there are no anthropometric data available from the period of economic growth/stagnation, but it is remarkable that nutrition status deteriorated as much as it did from 1970 to 1985<sup>55</sup>. During the 1970s the public marketing system was well established and served to ensure production and marketing in the line-of-rail provinces. In the off-line-of-rail provinces it was formally in place in the later half of the 1970s, but an complete one-stop system providing extension, credit, hybrid seeds, fertilizer and picking up the bags after harvest was only established during the early 1980s. During the 1980s there were no increase in crop production in the line-of-rail provinces, but a considerable increase in the off-line-of-rail provinces. This was followed by a considerable overall drop in stunting, but no overall reduction in undernutrition. We have already seen that by the end of the 1980s, which favored agricultural crop producers in remote provinces relative to central ones (because the pen-

Zambian prices implied a relatively larger transport subsidy for remote farmers), poverty was still higher in the remote provinces. For nutrition we would expect a more complex picture. The transport subsidies to crop producers in remote provinces were matched with large subsidies to reduce the price of maize mealie meal. As stated, mealie meal was hardly available in rural areas and these subsidies went in reality to urban consumers. However, we did not succeed in tracing information about the provincial distribution. As expected, the picture is less clear for nutritional status. The large reduction in stunting occurred in Luapula and Western provinces, two off-line-of-rail provinces, but also in two line-of-rail provinces, Copperbelt and Southern. Undernutrition changed considerably in two provinces, it fell in Luapula but rose in Northern Province, both off-line-of-rail provinces. The increased production might have been a period when male farmers produced more for sale, requiring their wives to undertake female work tasks on cash crop plots and ending up with less time for production for own consumption and hence less food and increased malnutrition for the small children.

During the period 1981–1985, Zambia, like many southern African countries, experienced drought conditions which negatively affected crop production. In 1982, maize production was about half the 1981 level, which then remained relatively low but increased gradually to a bumper harvest in 1988. Another good harvest occurred in 1989. Even though maize production levels were higher in 1990 than 1981–1983 levels, maize production declined to about 60 per cent of 1988/89 levels and declined even further in 1991. Hence in 1985 weight had already have improved, whereas stunting remained high. On the other hand, in 1990, 1991 and early 1992, children retained their height from the bumper harvests in 87/88 and 88/89, while undernutrition had started to increase.

<sup>55</sup> The figures from 1970/71 have been published in two versions, one correct (UNDP/FAO, 1971; Wenlock, 1981; CSO 1987) and one incorrect (UNDP/FAO 1974a and b) and have confused even experts for years; refer to Wold (1987) for a detailed outline. Trends in development of undernutrition and stunting have also been shown by Hunt et al. (1994) using the median figures for each age group.

### Nutritional status during the adjustment and drought period (1991–1993)

Between 1989/90 and 1993, four nationwide surveys were conducted: the two already presented (the module attached to the Crop Forecast Survey (CFS) in 1989/90 and the Priority Survey I (PSI) in 1991) and two additional ones, the Demographic Health Survey (DHS) of 1992 (Kaite, Nestel and Rutseine 1993) and the Priority Survey II (PSII) of 1993 (CSO 1994a). Unfortunately, the DHS survey only gives national figures; hence we concentrate on the three other surveys, which give information from 1989/90, 1991, and 1993.

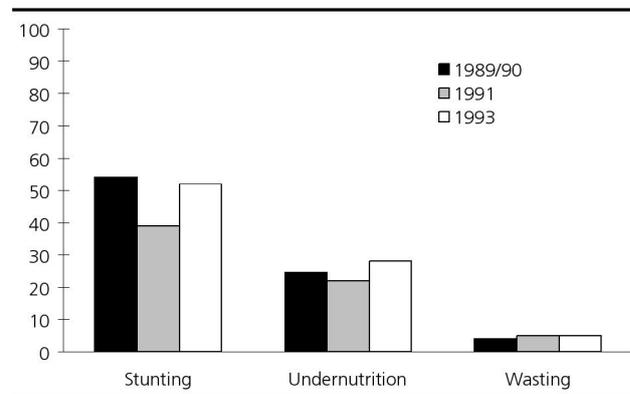
During this period the main focus must inevitably be to disentangle the effect of the drought, rather than trying to sort out the impact of adjustment in line-of-rail and off-line-of-rail provinces. As stated above, the major agricultural-sector adjustments were implemented only in 1993 and 1994. At the same time, the district profile of the old policy might have been balanced by adjustment being implemented in other sectors, and we would thus expect hardly any impact.

Figure B1 and table B3 show the prevalence of national rural malnutrition between 1989 and 1993. Except for Northern province, where there was a decline in rural stunting, there was an increase in stunting rates between 1991 and 1993. Rural stunting rates increased by 26 per cent in Copperbelt, 13 per cent in Luapula, and 20 per cent in North western province. Smaller increases were observed in the rural areas of the Southern half of Zambia where the drought occurred. Rural stunting rates increased by 7 per cent in Eastern, Lusaka and Southern provinces and by 2 per cent in Central province.

While the drought-affected provinces received food relief during 1992 and 1993, the northern areas of Zambia did not. Although maize marketing was partly controlled until the 1993/94 season, consumer maize prices had increased greatly because of the withdrawal of subsidies on maize and agricultural inputs, so that households who had food deficits in the northern half had to pay relatively large amounts of money to buy the staple food. Hence, households in the northern half were more likely to see an increase in food prices because of the food deficit at the national level. In addition, in a province such as Luapula, where trading is a major livelihood for a good portion of the population, the liberalization of the market in the post-adjustment period led to changes in the terms of trade for the traders. While it used to be profitable to go to Zaire and bring in essential goods for resale in Zambia before adjustment, ceased to be so since goods were freely flowing into the country. The change in terms of trade destroyed the market for local export/import

and increased food insecurity among the population groups who had been involved in trading. When we compare stunting rates in line-of-rail and off-line-of-rail provinces, we find no consistent district bias towards either remote or central provinces.

Figure B1. Malnutrition at national level, rural areas only.  
Per cent



**Data****Table B2. Provincial malnutrition levels 1985–1991, using percentage below median cutoffs**

Province		85 HBS/PIC	PSI 91
Central	Stunting	37.2	32.1
	Undernutrition	25.6	25.0
Copperbelt	Stunting	46.6	24.1
	Undernutrition	25.6	24.0
Eastern	Stunting	38.9	28.3
	Undernutrition	25.3	27.0
Luapula	Stunting	53.1	30.3
	Undernutrition	36.7	27.0
Lusaka	Stunting	30.3	22.2
	Undernutrition	20.8	22.1
Northern	Stunting	47.2	39.8
	Undernutrition	29.3	38.6
North-Western	Stunting	29.3	24.3
	Undernutrition	20.4	21.7
Southern	Stunting	40.8	22.4
	Undernutrition	20.4	17.0
Western	Stunting	43.4	29.2
	Undernutrition	30.1	29.7

**Table B3. Provincial malnutrition status 1989/90 -1993. Total and rural only. Using standard deviation from median**

Province		Total (rural and urban)			Rural only		
		PSI 91	DHS 92	PSII 93	CFS 89/90	PSI 91	PSII 93
Central	Stunting	45.8	39.1	52	49	56	58
	Undernutrition	21.6	21.6	25	23	22	29
	Wasting	4	3.3	3	6	3	4
Copperbelt	Stunting	37.2	33.9	48	52	36	62
	Undernutrition	21.2	22.9	21	28	21	27
	Wasting	6	5.3	5	2	4	2
Eastern	Stunting	47.2	47.9	54	58	48	55
	Undernutrition	24.2	24.9	27	25	23	28
	Wasting	5	3.2	6	4	4	6
Luapula	Stunting	44.2	55.5	52	67	41	54
	Undernutrition	25.5	40.2	30	36	29	31
	Wasting	9	6.0	6	8	6	6
Lusaka	Stunting	32.0	32.4	40	44	34	41
	Undernutrition	19.4	23	16	15	23	21
	Wasting	9	8.6	8	3	9	7
Northern	Stunting	55.6	57.0	54	62	60	56
	Undernutrition	32.2	35.9	31	29	35	34
	Wasting	8	6.8	4	4	7	5
North-Western	Stunting	33.4	42.1	46	41	32	52
	Undernutrition	22.4	26.1	16	22	23	19
	Wasting	12	4.3	3	4	10	4
Southern	Stunting	33.2	35.5	40	49	36	43
	Undernutrition	17.0	25.8	22	19	21	22
	Wasting	6	3.3	7	0	7	7
Western	Stunting	38.7	41.8	47	51	41	48
	Undernutrition	25.9	25.9	33	22	27	35
	Wasting	1	3.2	6	3	1	6
Zambia	Stunting	39	40	48	54.1	39	52
	Undernutrition	22	25	25	24.7	22	28
	Wasting	6	5.1	6	4.1	5	5

## Appendix C

## Gender disaggregated data

Table C1. Employment opportunities for men and women by urbanity. Measured by an index. Many=100 A few=50 None=0. Average index value given in table

	Men	N	Women	N
<b>All Zambia</b>				
Farming				
Permanent	13	593	11	591
Temporary	28	593	25	593
Peak season	40	593	38	593
<b>Rural</b>				
Farming				
Permanent	13	367	11	365
Temporary	30	367	27	367
Peak season	44	367	42	367
<b>Urban</b>				
Farming				
Permanent	14	226	9	226
Temporary	16	226	16	226
Peak season	21	226	19	226

Table C2. Distance to hammer mill by urbanity, centrality and province. Per cent. N (number of communities) = 542

	Less than 10 km	Between 10 and 20 km	Between 20 and 30 km	More than 30 km
<b>Zambia</b>				
Rural	44.9	26.3	6.6	22.2
Urban	92.6	7.4	0.0	0.0
<b>Centrality</b>				
Lusaka, Ndola, Kitwe	89.4	10.6	0.0	0.0
Cities along the line-of-rail	100.0	0.0	0.0	0.0
Provincial towns	86.7	6.7	0.0	6.7
< 50 km to L N K or cities along the line-of-rail	73.7	21.1	0.0	5.3
< 50 km to provincial towns	60.0	33.3	0.0	6.7
District centers	40.0	16.0	12.0	32.0
< 50 km to district centers	53.3	28.3	3.3	15.0
> 50 km from L N K or cities along the line-of-rail	80.0	0.0	20.0	0.0
> 50 km from provincial towns or district centers	26.0	30.0	10.0	34.0
<b>Province</b>				
Central	87.5	4.2	4.2	4.2
Copperbelt	86.0	14.0	0.0	0.0
Eastern	71.0	19.4	0.0	9.7
Luapula	51.6	25.8	0.0	22.6
Lusaka	94.4	5.6	0.0	0.0
Northern	29.4	38.2	11.8	20.6
North western	43.8	25.0	18.8	12.5
Southern	76.9	11.5	7.7	3.8
Western				

**Table C3. Distance to dry firewood by urbanity, centrality and province. Per cent. N (number of communities) = 542**

	Less than 5 km	Between 5 and 10 km	Between 10 and 15 km	More than 15 km
<b>Zambia</b>	71.2	12.9	6.8	9.0
Rural	87.8	9.0	1.7	1.5
Urban	42.7	19.6	15.6	22.1
<b>Centrality</b>				
Lusaka, Ndola, Kitwe	34.3	13.7	17.6	34.3
Cities along the line-of-rail	59.6	22.8	10.5	7.0
Provincial towns	52.2	17.4	17.4	13.0
< 50 km to L N K or to cities along the line-of-rail	93.7	6.7	0.0	0.0
< 50 km to provincial towns	88.0	8.0	0.0	4.0
District centers	68.3	20.0	8.3	3.3
< 50 km to district centers	85.3	11.2	1.7	1.7
> 50 km from L N K or cities along the line-of-rail	75.0	18.8	0.0	6.3
> 50 km from provincial towns or district centers	90.8	8.2	0.0	1.0
<b>Province</b>				
Central	88.2	7.8	0.0	3.9
Copperbelt	49.4	17.2	14.9	18.4
Eastern	88.3	5.0	3.3	3.3
Luapula	56.9	34.5	5.2	3.4
Lusaka	46.7	14.7	10.7	28.0
Northern	89.0	3.7	4.9	2.4
North western	75.0	12.5	3.1	9.4
Southern	80.8	11.5	5.8	1.9
Western	84.4	8.9	6.7	0.0

**Table C4. Distance to source of drinking water by urbanity, centrality and province. Per cent. N (number of households) = 10143**

	0 km	Between 0 and 5 km	More than 5 km
<b>Zambia</b>	94.1	5.8	0.1
Rural	88.1	11.8	0.2
Urban	97.9	2.1	0.0
<b>Centrality</b>			
Lusaka, Ndola, Kitwe	98.2	1.8	0.0
Cities along the line-of-rail	97.7	2.3	0.0
Provincial towns	94.6	5.4	0.0
< 50 km to L N K or to cities along the line-of-rail	92.3	7.6	0.2
< 50 km to provincial towns	95.9	4.1	0.0
District centers	92.7	7.3	0.0
< 50 km to district centers	84.9	14.8	0.2
> 50 km from L N K or cities along the line-of-rail	83.9	16.1	0.0
> 50 km from provincial towns or district centers	88.7	10.1	0.2
<b>Province</b>			
Central	97.8	2.2	0.0
Copperbelt	97.9	2.1	0.0
Eastern	89.7	10.2	0.1
Luapula	91.8	8.2	0.0
Lusaka	97.7	2.3	0.0
Northern	91.1	8.7	0.2
North western	84.1	15.7	0.2
Southern	85.3	14.6	0.1
Western	93.0	6.9	0.2

**Table C5. Access to credit. Availability, collateral requirements and gender differences. Per cent of rural communities**

	Commercial private bank	Primary co-operative societies	Cooperative union	Money lender	Relatives and friends	Credit club
<b>Availability of credit for people in the community</b>						
Total	100	99	99	100	100	100
Not stated	2	2	1	4	3	3
In village	3	27	16	6	31	2
In boma/town	50	19	43	7	2	5
Not available	45	51	39	83	64	90
No of community groups	381	380	382	374	377	377
<b>Collateral requirements when credit is available</b>						
Total	100	99	100	101	100	102
Not stated	39	43	39	77	64	79
Land	46	24	36	4	4	5
Group	3	16	11	0	0	2
Others	1	3	4	5	6	2
No	11	13	10	15	26	14
No of community groups where credit is available	210	186	233	64	136	38
<b>Gender differences when credit is available</b>						
Total	100	100	100	100	99	100
Not stated	41	43	39	78	64	80
All women	47	42	46	5	21	8
Female heads only	2	2	3	0	0	0
With male relatives only	2	3	4	5	5	0
No	8	10	8	12	9	12
No of community groups where credit is available	210	186	233	64	136	38

Source: Community Survey, Interviews with mixed (women and men) groups.

## Appendix D

## Marketed agricultural production data

Table D1. Marketed agricultural production in bags<sup>1</sup>. 1981 to 1995

Crop:	Maize	Sorghum	Millet	Sun-flower	Soy-beans	Ground-nuts	Paddy rice	Mixed beans	Cotton
Unit:	90 kg 1 000	90 kg 1 000	90 kg 1 000	50 kg 1 000	90 kg 1 000	80 kg 1 000	80 kg 1 000	90 kg 1 000	kg 1 000
1980/81	7 328	2	n/a	394	72	16	35	8	16 762
1981/82	5 497	2	n/a	426	81	9	36	4	12 766
1982/83	5 901	1	1	609	88	13	63	0.9	20 455
1983/84	6 267	3	0.2	808	146	14	67	1	31 259
1984/85	7 069	12	0.4	509	163	30	78	5	30 254
1985/86	10 607	10	3	533	176	78	69	10	33 356
1986/87	7 296	4	2	139	149	22	45	21	20 155
1987/88	14 989	31	6	343	238	7	69	0.6	58 529
1988/89	13 551	4	4	148	228	20	58	5	34 153
1989/90	6 628	2	1	175	88	53	70	4	33 545
1990/91	6 678	11	49	190	271	110	111	66	48 710
1991/92	2 877	7	122	114	24	104	73	130	25 892
1992/93	10 331	59	61	252	303	292	127	177	47 843
1993/94	5 292	41	142	194	229	175	42	152	33 092
1994/95	3 829	86	147	241	193	164	79	153	n/a
I:1981-83	6 240	1.67	1.00	476.33	80.33	12.67	44.67	7.00	16 660
II:1989-91	8 950	5.67	18.00	171.00	195.67	61.00	79.67	25.00	38 800
II/I per cent	143.43	339.52	1 800.00	35.90	243.58	481.45	178.35	357.14	232.89

<sup>1</sup> The figures denote marketing by official organizations (NAMBOARD, the cooperatives and parastatal companies most of which were funded by government). For some crops such as sorghum, millet, groundnuts, paddy rice and mixed beans, there was in addition to the above arrangement local level and private trading.

## Appendix E

## Prices

### Price analysis: Time-series or cross-sectional

The debate on the best approach for studying human behavior is an old and classic one and would in general follow the professions, economists arguing for time-series and other social sciences such as sociologists arguing for cross-sectional analysis. There seem to be no disagreement that the best would be to combine these approaches in a panel study. In theory we would advocate to undertake a large survey as the PSII/CFS/CS in a *normal* agricultural season before the economic reforms were implemented and afterwards in another *normal* agricultural season when the economic reforms were well implemented and the situation had settled. For several reasons that is neither preferred nor very realistic. If we had enough resources we would conduct such a survey over some years before and some years after the reforms to be sure to capture at least one *normal* agricultural season before and after reforms. From an academic point of view that would be interesting. For policy purposes one would only be able to justify such an approach if it was used to develop a statistical model used to forecast responses of potential policy changes.

Hence we have chosen to combine these two approaches. First we undertake a supply-response based upon aggregated information on price and production over the years before adjustment and then we embark on a cross-sectional statistical analysis at the time of adjustment. This appendix provides methodological notes and presents data supporting these exercises.

### Price expectations of Zambian small- and medium-scale farmers

Analyzing supply response is not that straight forward in a country with such a huge lack of information as in Zambia. It is important to stress that farmers react to an expected price and not a *de facto* price. Whether public or private marketing, the price will also vary with the national level of production. No farmer would expect the same high price after a bumper harvest as in seasons with scarcity. Hence farmers are reacting to an expected price in a «normal» or average agricultural crop season. With other words, farmers are not reacting to an expected average price but to an expected value of their production.

Since farmers in general and especially women farmers are risk averse they will also react to the expected risk, after a series of low production years, they might not be convinced that a normal year would follow. Such an expectation about higher risk would reduce the expected volume of production, the expected volume

of sale, and the expected monetary returns to the farmer.

Unfortunately there is not much information on how farmers in Zambia form their price expectations. We would strongly argue that especially in the stable marketing situation in the past the *de facto* price is the best estimate for the farmers price expectations. The great advantage of using the current price is that this price already is adjusted for the production level and hence could serve as an estimator both for the price and if multiplied with the volume, also the value of the crop production in the current year.

In stable markets one could advocate a time lag, arguing that farmers are reacting to the observed price in previous years. We have already argued that in the case of Zambia, one would then need to adjust for agricultural crop production. As we will return to, another approach would be to use the average price over a number of years, arguing that farmers accumulate their knowledge over a long time horizon. Our experience during the PRA gives some support to the long time horizon approach. During the PRA we learned that a large number of farmers were convinced that the lack of public marketing of maize in 93/94 and 94/95 was just a break and it was only a matter of time before the Government again would revitalize the public marketing agencies. The long time horizon approach is however a tricky one in the case of Zambia, due to the additional complication caused by the extreme inflation and the farmers restricted access to knowledge of inflation. Still this approach yields interesting information worth considering.

### Methodological notes on the cross-sectional price analysis

This section presents the basic principles, concepts and methods used in the processing of the CS price information. The processing is based on well known methods both as concerns correcting for partial and total non-response, identifying outliers, imputations and estimations. Aggregates are based on weighted price ratios for each comparable item within the involved communities and where the ratios have the average price of Lusaka, urban as a basis and reference.

### Survey data – some areas for further improvements

The CS-survey provides various types of information - among this also prices on consumer items, important output products and input products. The CS is however not especially designed for collecting information for price studies. Several weaknesses might have had influence on the results. The CS uses a group of

community heads as the observation unit. Although the observation unit for many purposes is relevant and also cost-efficient some problems might appear when collecting price information. The price information collected should be actual prices on important consumer items, producer prices and input prices – when sold either at the local market (community) or at the nearest district center market. If the important items/products - due to seasonal variations etc. – were not available during the surveying period the group of heads should provide price-guesses, i.e., prices as they were when the item last were available in the local or district center market. Several problems are inherited in this - some might be critical or have a distorting effect on results, at least at lower levels of aggregation.

One problem is related to the principle of asking the observation unit to indicate the important products of the community and provide the information requested. The problem is that this is done without providing the interviewer with fairly detailed descriptions of some common representative items as a basis for the interview.<sup>56</sup> Although there are much sense in asking the respondents to indicate the important items - the lack of some common basis for collecting prices taking quality-aspects into consideration most likely have contributed to the quality-problems of data. Parts of the price-variations is undoubtedly the result of deviations due to uncontrolled qualitative aspects of the items. A more preferable approach for the price collection would be using a fixed set of representative items giving a fairly detailed description of the most typical items and focusing on the important qualitative aspects and also using a standardized unit (although there are local variations in the units). The survey should in addition collect prices for local brands or qualities. For such items the interviewer needs some further specifications of the information to be collected – to secure a common quality standard and comparability.

A second problem concerns the types of prices collected – actual prices and/or price-guesses. When important items are non-available during the surveying period two aspects seem important – do respondents remember the true prices for the items, and do prices refer to a period in time where prices are high or low compared to the surveying period? The time-lags between the surveying period and the last actual prices might in some occasions be substantial. The use of the last actual price as an estimate gives an indication on the local price level but might just as well be misleading and turn out to be an outlier. The mixture of actual prices and in some cases the respondents estimates (true or not) implies that the studies - for some communities – might end up comparing prices from different seasons or different phases of the

seasons. Large price level differences between on- and off-seasons will most likely have a larger impact on the rural estimates – areas where the availability of items seems more scarce and the probability for recording price-guesses is higher. Coding actual prices and price guesses separately during the interview would also give substantial contributions the quality aspects of the price information.

The size of the sample and the number of selected communities within provinces and districts does not seem ideal for price analysis. The sampling issues should be reexamined for further surveys. The major problem in a price-context is related to a high sampling error on detailed levels – but also at slightly more aggregated levels (district) – and in some cases it turns out to be unacceptably high. A part of this problem is the size of the non-response which contributes – especially for rural areas – to weak estimates on district levels.

Non-response - 51 per cent of the possible cells (total but most frequently partial non-response) will in general have different causes. In the Zambian survey we expect that the phenomenon mainly reflects two reasons: the items are normally not sold/consumed in the sampling-area – or are temporarily non-available (off-season etc.). We expect the first reason to be the important one. We believe that – due to issues discussed in this section – the survey showed have a substantial portion of observations which could be labeled extreme values - outliers. Such problems might even have several other causes than mentioned e.g. measurement errors (when converting from one unit to another etc.) or entry errors – to mention some typical problem-issues. In spite of the possible sources for errors we see reasons for being careful in the process of correcting the identified outliers. Studies on a detailed level shows that there are surprisingly large differences in the price levels within districts and also between closely related/located districts. Such differences might be the result of types of errors in a statistical sense but do more likely reflect aspects like distances/transport to markets, low integration of markets, availability of items, seasonal aspects etc. The studies on a detailed level confirms that there are large and most likely true price level differences existing in a transitional economy like the Zambian.

### **Sources, principles and methods**

Main input data for the study have been the Community Survey 1993 (CS), the Priority Survey II 1993 (PSII), the Crop Forecast Survey 1992/1993 Season (CFS) and Post Harvest Survey 1992/1993 Season (PHS). The CS is performed at community level, while the PSII and the CFS is at household level. PHS-figures are at district level. For weighting purposes the CPI weighting structure and population figures

<sup>56</sup> A list of items were provided however without giving any kinds of details.

from the 1990 Census of population, housing and agriculture have also been used in the calculations.

The CS provides price information for a large number of items - some common all over the country while others were typical local items not found elsewhere. Among the items provided some representative items had to be selected – fulfilling some basic criteria. The dominant criteria were: the representative item should be available in more than one province and also found in Lusaka, urban (the reference area); the item should be typical both for rural and urban consumption – and last the total number of observations within a province/district had to be sufficient to provide reliable estimates of the aggregated price ratios. For the list of representatives – see table E1.

The main sources for weighting in the consumer-part were PSII, CS and CPI. In estimating producer prices and input prices, information from the CFS and PHS have been used.

**Table E1. Items in the consumer price level index, by consumer groups**

Consumer group	Item, quantity
1. Food	
1.1 Cereals	Maize-meal, 25 kg Cassava-meal, 1 kg Rice, 1 kg
1.2 Meat and fish	Capenta, 1 kg Dry fish, 1 kg Beef, 1 kg Chicken, 1 kg Pork, 1 kg
1.3 Other food items	Cabbage, 1 kg Dry beans, 1 kg Rape, 1 kg Pumpkin, 1 kg Cooking oil, 2,5 kg Sugar, 2 kg Salt, 1 kg
2. Other consumer items	
2.1 Clothing	Men's shirt, 1 piece Chitenje, 2 meter
2.2 Fuel	Firewood, 1 kg Charcoal, 90 kg Paraffin, 1 liter
2.3 Other household items	Soap, 500 gram Aspirin, 1 tablet Battery, 1 piece

## Data

**Table E2. Nominal producers prices and input prices grouped by province and by centrality. Kwacha/unit**

	Beans	Cassava	Cotton	Ground-nuts	Maize	Millet	Sorghum	Sunflower	Hybrid maize-seed	Fertilizer
Unit:	90 kg	90 kg	1 kg	80 kg	90 kg	90 kg	90 kg	90 kg	1 kg	50 kg
<b>Zambia</b>	14 636	3 386	39	12 137	3 490	4 529	8 701	5 763	186	6 974
<b>Province</b>										
Central	17 208	.	37	11 730	3 144	5 597	4 428	8 084	175	6 184
Copperbelt	17 552	7 889	.	20 199	3 917	5 538	17 568	.	162	8 925
Eastern	5 469	.	36	9 086	3 541	2 579	6 549	3 154	193	6 556
Luapula	20 523	2 812	.	20 834	3 770	5 342	.	.	161	6 634
Lusaka	.	.	.	23 562	4 457	5 301	5 187	6 642	224	6 202
Northern	12 455	4 030	.	9 232	3 008	3 903	7 248	.	215	8 157
North western	21 416	3 435	.	14 685	3 637	.	10 302	.	198	5 779
Southern	.	.	74	17 995	3 783	5 582	7 608	5 089	146	8 579
Western	.	3 446	.	12 341	3 020	4 427	4 273	.	253	4 881
<b>Centrality</b>										
Kitwe, Lusaka and Ndola	33 691	.	.	37 432	7 348	.	.	.	314	10 878
Other towns along line-of-rail	26 845	.	47	20 801	3 563	3 994	3 540	6 034	161	7 731
Other province capitals	21 129	3 743	41	16 516	3 847	2 826	.	2 139	197	7 873
Within 50 km from line-of-rail	17 584	8 635	55	18 605	4 008	4 894	12 972	5 735	168	7 892
Within 50 km from province capitals	13 313	3 452	35	10 685	3 542	2 480	.	1 703	188	7 117
Other district centers	15 220	3 078	38	11 476	3 163	4 771	9 129	6 595	190	6 545
Within 50 km from district centers	13 664	3 379	36	9 801	3 316	5 244	5 932	5 103	194	6 468
More than 50 km from line-of-rail	.	.	54	17 325	3 368	4 629	3 731	6 268	154	7 444
More than 50 km from other centers	14 457	3 353	34	11 839	3 431	4 451	9 009	6 432	203	6 759

**Table E3. Real producer prices and input prices grouped by province and by centrality. Aggregated. Kwacha/unit**

	Beans	Cassava	Cotton	Ground-nuts	Maize	Millet	Sorghum	Sunflower	Hybrid-maize-seed	Fertilizer
Unit:	90 kg	90 kg	1 kg	80 kg	90 kg	90 kg	90 kg	90 kg	1 kg	50 kg
<b>Zambia</b>	15 317	3 532	37	12 415	3 519	4 585	8 389	5 683	190	7 044
<b>Province</b>										
Central	15 946	.	33	10 900	2 904	5 227	4 072	7 274	161	5 722
Copperbelt	16 262	7 373	.	18 731	3 649	5 212	16 222	.	151	8 292
Eastern	5 477	.	35	9 114	3 564	2 794	7 166	3 211	196	6 609
Luapula	22 645	3 154	.	23 593	4 144	5 975	.	.	177	7 370
Lusaka	.	.	.	23 358	4 441	5 256	5 119	6 593	224	6 214
Northern	12 790	3 856	.	9 039	2 989	3 808	7 393	.	214	7 967
North Western	23 908	3 830	.	15 852	3 948	.	10 854	.	217	6 326
Southern	.	.	81	18 596	4 007	5 623	7 037	5 478	153	9 001
Western	.	4 156	.	14 362	3 559	5 291	4 599	.	294	5 782
<b>Centrality</b>										
Kitwe, Lusaka and Ndola	27 453	.	.	30 660	6 054	.	.	.	259	8 974
Other towns along line of rail	25 351	.	48	20 587	3 629	4 305	3 482	6 092	163	7 839
Other province capitals	20 927	3 464	37	15 550	3 526	2 588	.	1 882	181	7 194
Within 50 km from line of rail	15 789	7 683	56	18 773	4 096	5 118	11 468	5 960	168	8 137
Within 50 km from province capitals	13 974	3 434	34	10 595	3 487	2 371	.	1 629	190	6 996
Other district centers	16 915	3 288	35	11 828	3 173	4 710	9 219	6 037	197	6 592
Within 50 km from district centers	13 807	3 572	33	10 045	3 330	5 294	5 826	4 653	199	6 527
More than 50 km from line of rail	.	.	57	17 744	3 433	4 901	3 400	6 409	155	7 574
More than 50 km from other centers	15 219	3 594	34	12 816	3 522	4 606	9 190	6 154	209	6 903

**Table E4. Real price of agricultural produce per unit (deflated by low income CPI)<sup>1</sup>, 1981 to 1995**

	Crop:	Maize	Sorghum	Millet	Sunflower	Soybeans	Ground-nuts	Paddy rice	Mixed beans	Cotton
Unit:		90 kg	90 kg	90 kg	50 kg	90 kg	80 kg	80 kg	90 kg	kg
	CPI									
1980/81	40.2	33.58	22.39	14.93	43.78	90.30	106.22	46.27	n/a	1.14
1981/82	42.8	37.38	21.03	14.02	48.48	98.62	112.15	65.42		1.10
1982/83	53.1	34.46	30.13	54.61	40.49	85.31	103.58	75.33		0.98
1983/84	67.9	36.08	27.47	43.45	31.66	77.32	105.30	58.91		0.85
1984/85	100.0	28.32	26.90	38.10	27.88	60.90	91.67	40.00		0.67
1985/86	154.0	35.71	27.76	36.53	27.24	72.79	85.29	36.08		0.55
1986/87	224.3	34.77	32.99	41.02	31.21	65.98	72.22	37.00		0.71
1987/88	346.9	23.06	21.91	46.12	25.94	62.70	83.60	32.00		0.86
1988/89	793.5	15.75	13.02	24.94	20.42	35.29	42.44	21.25		0.38
1989/90	1 674.4	16.97	16.13	25.98	19.19	34.47	40.76	22.07		0.58
1990/91	3 225.0	24.81	14.73	21.71	15.62	24.85	34.32	18.16		0.48
1991/92	9 590.6	22.94	10.57	15.88	9.81	24.21	29.22	13.58		n/a
1992/93	27 718.0	18.04	n/a	n/a	n/a	n/a	n/a	n/a		n/a
1993/94	42 209.2									
1994/95	56 158.6									
I:1981-83		35.14	24.52	27.85	44.25	91.41	107.32	62.34		
II:1989-91		19.18	14.63	24.21	18.41	31.54	39.17	20.49		
III per cent		54.57	59.66	86.92	41.60	34.50	36.50	32.87		

<sup>1</sup> These prices were set and announced by Government at the beginning of each marketing season (May/ June) for the coming planting season. Prices were announced one year prior to marketing. Beginning in the late 1980s, prices for crops other than maize were floor prices. Government stopped announcing these prices in 1991\1992. For maize, the price announced in 1992\93 (K5000\bag) was a floor price. This also marked the end of price announcements for maize by government. Thereafter, farmers and buyers had to bargain for prices. The nominal prices were deflated by the wholesale price index for the period of 1990-85 and the low income CPI for the period of 1985 to 1995, (CSO 1992, CSO 1995).

## Regression specification and sample regression outputs

### Supply response analysis

#### Variable list

Variable	Description
$Q_m$	Production of maize
$Q_c$	Production of non-maize crops
$PQ_c$	Probability of producing a specific non-maize crop
$PS_m$	Probability of producing maize for sale
$QC_m$	Consumption share of production of maize
$p_i$	Vector of relative input prices: fertilizer price, hybrid maize-seed price
$p_m$	Relative maize price
$p_c$	Relative price of other crops
$p$	Vector of relative prices
$Ag$	Vector of agricultural inputs at household level: Land available for cultivation, total area under cropping, ownership of equipment (plough), use of inputs: fertilizer, hybrid seeds
$w$	Off farm salary, i.e. a vector of agricultural sector salary at community level: (piecework) agricultural wage for men, (piecework) agricultural wage for women
$Y_{non}$	Non-farm income
$A_{com-e}$	A community vector comprising: agro-ecological zones*, producer markets*, access to food market
$A_{com-n}$	Centrality*
$A$	A vector comprising $A_{com-e}$ and $A_{com-n}$
$H_e$	A household adult vector comprising: dependency ratio, life cycle stage*, average number of days being sick, maximum education level of wife or husband
$H_n$	A household family vector comprising: dependency ratio, life cycle stage*, child sickness indicator, maximum education level of wife or husband
$H$	A vector comprising $H_e$ and $H_n$
$Bw$	A vector comprising the difference in income and education between wife and husband; income share (wife - husband), measured as income by wife/ income by wife + husband and relative education (wife - husband) measured as difference in years of education (years by wife - years by husband)

\*Refer to specification below.

#### Regressions and models

Any small or medium scale farmer in Zambia will grow some crops for own consumption. We assume that the area cultivated for these crops are exogenous and not affected by prices. Maize is the main crop for sale and we assume that the production of maize is only affected by the relative maize price/income elasticity and not by other crops prices/cross price elasticities. It is however reasonable to assume that the production of other crops for sale are determined by both the specific crop price and the maize price/by cross price elasticities.

We have used three different types of supply response production regressions;

- Probit regression where we are estimating the probability that a certain household will cultivate a certain crop: groundnuts (for all households and separate for female headed and male headed households) and maize for sale.
- Tobit regression where we estimate the total production of a crop assuming a theoretical normal distribution starting below zero, while the observed values obviously are restricted to non-negative ones. Tobit estimates are presented for total maize

production (for all households and separate for female headed and male headed households), groundnuts, cassava, millet, sorghum, mixed beans, and maize for sale

- Ordinary regression analysis of the consumption share of a certain crop: maize and groundnuts

*We have tested three different models:*

- A uniform household model for all households, - tested for all left side variables
- Separate models for female headed and male headed households, tested for the probability of producing groundnuts and for the production of maize and groundnuts.
- Bargaining power household model for producing households, tested for the consumption share of maize and groundnuts.

### Supply response/production functions

Total maize production per household member and maize production for sale, for all households or separate for female headed and male headed households:

$$(1) Q_m = a_1 + b_1 p + c_1 Y_{non} + d_1 Ag + e_1 H_e + f_1 w + g_1 A_e,$$

where  $p = p(p_m, p_i)$

Total production of a non-maize crop, for all households or separate for female headed and male headed households:

$$(2) Q_c = a_2 + b_2 p + c_2 Y_{non} + d_2 Ag + e_2 H_e + f_2 w + g_2 A_e,$$

where  $p = p(p_m, p_i, p_c)$

Probability for production of a specific non-maize crop:

$$(3) P Q_c = a_3 + b_3 p + c_3 Y_{non} + d_3 Ag + e_3 H_e + f_3 w + g_3 A_e,$$

where  $p = p(p_m, p_i, p_c)$

Probability of producing maize for sale:

$$(4) P S_m = a_4 + b_4 p + c_4 Y_{non} + d_4 Ag + e_4 H_e + f_4 w + g_4 A_e,$$

where  $p = p(p_m, p_i)$

Consumption share of maize production, model includes bargaining within the household:

$$(5) Q C_m = a_5 + b_5 p + c_5 Y_{non} + d_5 Ag + e_5 H_e + f_5 w + g_5 A_e,$$

+  $h_5 B_w$  where  $p = p(p_m, p_i)$

Consumption share of a specific non-maize crop, model including bargaining within the household:

$$(6) Q C_c = a_6 + b_6 p + c_6 Y_{non} + d_6 Ag + e_6 H_e + f_6 w + g_6 A_e,$$

+  $h_6 B_w$  where  $p = p(p_m, p_i, p_c)$

### Detailed variable specification

The regressions includes a long list of variables and some of them need some further explanation.

*Dependency ratio* is defined as the ratio between number of «non-productive» members in the household (person below the age of 12 years or older the 65 years), relative to all the household members.

*We divide the households into four life-cycle stages;*

- households where the husband and/or the wife is older than 40 years old, and non of the members is younger than 16 years.
- households where there is at least one child younger than 7 years and no children between 7 and 16 years.
- households with children between 7 and 16 years. (we split between group 2 and 3 because it is expected that household with older children will have less dependency burden since the older children take care of the younger)
- households where all members is between the age of 16 and 40 years.

Level 4 is the reference level in the analysis.

*The agroecological zones used in the regressions are defined as follows;*

- Luangwa-Zambezi, rift valleys, this region is characterized by low rainfall and a short growing period.
- Central, Southern and Eastern, plateaus, characterized by moderate rainfall and a longer growing season.
- Western, semi-arid plains, moderate rainfall and a longer growing period, but with less fertile soil than the plateaus.
- Northern, high rainfall zone, high rainfall, long growing season, relative infertile soils.

Level 4 is the reference level which all the others are compared to in the regression.

*There are six centrality levels included in the rural analysis. They corresponds to the last six overall centrality levels as outlined in appendix 3.3., and they are defined as follows;*

- Hinterland within 50 km from towns along the line of rail;
- Hinterland within 50 km from the provincial capital;
- District centers;
- Hinterland within 50 km from district centers;
- Remote areas to Lusaka, Ndola, Kitwe and other towns along the line of rail; and
- Remote areas to provincial capitals or districts centers.

Level 1, the most central areas, is the reference in the analysis.

*Description of the different producer markets:*

- Farmgate: Sale from location of the production. For maize this will often be from the farmers house since the shelling and packing usually are done there.
- Creditor at farmgate: Sale to a trader who is also a creditor in some sense, usually by providing inputs free of charge. The trader will usually share the risk with the farmer. If the production fails due to climatic constraints, then the farmer have no obligations. On the other hand the price is considerably lower than on the free market.
- Local cooperatives: real cooperatives where a group of farmers or a whole community join each other in marketing.

- Local markets: Any market which is not the main market.
- District markets: The main market in the district
- Public market depot: A public depot which is buying from farmers, local cooperatives and traders.

**Sample regression outputs: Supply-response**

In the following sample outputs the significance is reported by stars (or no stars):

- \* - significance at 10 per cent level
- \*\* - significance at 5 per cent level
- \*\*\* - significance at 1 per cent level.

**Table F1. Production of maize for sale and maize for consumption, tobit regression**

Regressor	Sale		Consumption	
	Estimate	Std.error	Estimate	Std.error
<b>Continuos variables</b>				
intercept	54.2***	(9.02)	10.49***	(1.99)
producer maize price	-0.26***	(0.09)	0.0085	(0.018)
fertilizer price	-0.00023	(0.00044)	0.00017*	(0.000096)
hybrid maize-seed price	0.022*	(0.013)	-0.0029	(0.0027)
non-farm income	0.00015	(0.000065)	-8.76E-6	(0.000016)
dependency ratio	6.85	(5.03)	4.74***	(1.07)
max. education	0.16	(0.22)	0.029	(0.048)
agric. wage for man	0.0013	(0.0023)	0.00011	(0.00052)
agric. wage for woman	0.0026	(0.0026)	0.00092	(0.00061)
<b>Classification variables</b>				
life-cycle level				
(i)	-14.22***	(4.91)	-1.44	(1.12)
(ii)	-17.13***	(4.95)	-4.05***	(1.14)
(iii)	-15.53***	(4.42)	-3.99***	(1.03)
agroecological zones				
(i)	-12.46***	(3.53)	1.56**	(0.68)
(ii)	-4.56**	(2.17)	2.94***	(0.50)
(iii)	-9.56***	(3.73)	-1.80**	(0.75)
owner of plough (default=no)	8.80***	(1.79)	0.75*	(0.40)
land available for cultivation (default=no)	1.95	(1.64)	0.013	(0.36)
centrality				
(ii)	-7.77**	(3.22)	1.15	(0.71)
(iii)	-0.13	(3.07)	0.48	(0.69)
(iv)	-1.16	(2.41)	0.674	(0.54)
(v)	-0.85	(3.44)	0.044	(0.76)
(vi)	-7.17***	(2.76)	-1.04*	(0.60)
use of fertilizer (default=no)	31.56***	(1.82)	4.37***	(0.37)
use of respective producer markets (default=no use):				
farmgate	3.47	(3.77)	-3.57***	(0.87)
creditor at farmgate	27.4***	(7.01)	6.72***	(1.55)
local cooperatives	1.87	(2.73)	-0.13	(0.63)
local markets	-6.80	(4.30)	1.31	(0.94)
district markets	-2.82	(1.86)	0.10	(0.41)
public market depot	-0.35	(1.92)	0.15	(0.43)
Log-likelihood	-3251.11		-4572.39	
# observation	1 600		1 600	
# nocensored	643		1 352	
#censored	957		248	

**Table F2. Consumption share of groundnuts, bargaining model, linear regression**

Regressor	Estimate	Std.error
<b>Continuos variables</b>		
intercept	0.86***	(0.27)
producer price groundnuts	0.00057*	(0.00035)
producer price maize	-0.0024	(0.0019)
total area under crop	-0.028	(0.022)
non-farm income	-0.00000073	(0.0000014)
dependency ratio	-0.086	(0.14)
education (max. of wife and husband)	-0.011*	(0.0064)
relative education (wife-husband)	-0.0058	(0.0070)
Income share (wife-husband)	5.9E-5**	(2.9E-6)
agricultural wage for man	-0.000098	(0.000072)
agricultural wage for woman	0.000093	(0.000082)
<b>Classification variables</b>		
life-cycle level		
(i)	-1.40	(2.12)
(ii)	0.77	(2.00)
(iii)	0.61	(1.80)
agroecological zones		
(i)	0.16	(0.088)
(ii)	0.086	(0.062)
(iii)	-0.058	(0.098)
owner of plough (default=no)	-0.068	(0.050)
land available for cultivation (default=no)	0.0066	(0.042)
centrality		
(ii)	0.076	(0.087)
(iii)	-0.067	(0.088)
(iv)	0.071	(0.070)
(v)	0.0043	(0.090)
(vi)	0.074	(0.081)
farmgate	-0.078	(0.13)
creditor at farmgate	0.088	(0.26)
local cooperatives	-0.069	(0.079)
local markets	0.28**	(0.13)
district markets	-0.060	(0.052)
public market depot	-0.0099	(0.054)
Significance for model	0.1390	
R-square	0.1238	
# observations	299	

## Analysis of welfare impacts

### Variable list

Variable	Description
Z	Utility
ET	Total consumption
N	Nutritional status
FT	Food consumption
NT	Non-food consumption
EF	Food consumption from own production
NF	Food consumption <i>not</i> from own production
$L_F$	Labor at farm
$L_N$	Labor off-farm
w	Off farm salary, i.e. a vector of agricultural sector salary at community level: (piecework) agricultural wage for men, (piecework) agricultural wage for women
$Y_{non}$	Non-farm income
I	Income from other sources than work, e.g. inheritance
Q	Farm production
p	A vector of relative prices
$A_{com-e}$	A community vector comprising: agro-ecological zones*, producer markets*, access to food market
$A_{com-n}$	Centrality*
A	A vector comprising $A_{com-e}$ and $A_{com-n}$
$H_e$	A household vector comprising: dependency ratio, life cycle stage*, average number of days being sick, maximum education level of wife or husband
$H_n$	A household vector comprising: dependency ratio, life cycle stage*, child sickness indicator, maximum education level of wife or husband
H	A vector comprising $H_e$ and $H_n$
Bw	A vector comprising the difference in income between wife and husband and the difference in education between wife and husband

\*Refer to specification of production model.

### The household utility function

The household utility function (Z) can be defined as follows:

$$(1) Z = Z(ET, N, L_F, L_N)$$

where

$$(2) ET = Y_{non} + Q(L_F, H_e, A_{com-e}, p) = L_N^*w + I + Q(L_F, H_e, A_{com-e}, p)$$

$$(3) N = N(FT, H_n, A_{com-n})$$

$$(4) ET = NT + FT = NT + EF + NF$$

This is a simultaneous system which is solved by maximizing the utility function with subject to equation 2-4. The solution gives the demand functions, which we assume to be linear in all variables:

$$(5) ET = a_1 + b_1w + c_1H + d_1A + e_1I + f_1p$$

$$(6) EF = a_2 + b_2w + c_2H + d_2A + e_2I + f_2p$$

$$(7) N = a_3 + b_3w + c_3H + d_3A + e_3I + f_3p$$

$$(8) L_F = a_4 + b_4w + c_4H + d_4A + e_4I + f_4p$$

$$(9) L_N = a_5 + b_5w + c_5H + d_5A + e_5I + f_5p$$

The simplified models (equation 10-15), or the pseudo-relations, are derived from the above equations. The simplified models is the ones we have used in the estimation. In these models the dependent right-hand side variables are treated as exogenous. A small increase in for example non-farm income, is hence assumed to be caused by an increase in the exogenous off-farm salary which exactly correspond to the increase in income. Variables which are assumed to have no direct impact on the left -hand side variables is not included in these models. This is the case with for example the indicator for sickness among children in the analysis on consumption.

Both Q and Y can be expressed by the same variables as the demand functions. Manipulating with these equations gives us:

Total consumption per household member:

$$(10) ET = a_1 + b_1Q + c_1Y_{non} + d_1H_e + e_1A_{com-e}$$

Own produced food consumption per household member:

$$(11) EF = a_2 + b_2Q + c_2Y_{non} + d_2H_e + e_2A_{com-e}$$

Nutritional status for children:

$$(12) N = a_3 + b_3ET + c_3Q + d_3H_n + e_3A_{com-n}$$

The equation for total consumption per household-member, included bargain power can be specified:

$$(13) ET = a_1 + b_1Q + c_1Y_{non} + d_1H_e + e_1A_{com-e} + f_1B_w$$

The equation for food consumption from own production when including bargain power can be expressed:

$$(14) EF = a_2 + b_2Q + c_2Y_{non} + d_2H_e + e_2A_{com-e} + f_2B_w$$

Nutritional status for children included bargain power can be specified:

$$(15) N = a_3 + b_3ET + c_3Q + d_3H_n + e_3A_{com-n} + f_3B_w$$

### Sample regression outputs: Welfare

**Table F3. The uniform household model: regression results on total consumption, female- and male-headed households**

Regressor	Male-headed households		Female-headed households		
	Estimate	Std.error	Estimate	Std.error	
<b>Continuos variables</b>					
intercept	2 856.2***	(414.5)	4527.8***	(1 170.9)	
value of production	7.5***	(1.1)	15.0***	(3.5)	
sickness among productive members	29.9***	(9.66)	-11.7	(13.3)	
dependency ratio	-1 725.2***	(357.3)	-804.8	(600.2)	
education (max. of wife and husband)	170.2***	(18.5)	96.6**	(39.8)	
income non-farm production	20.0**	(9.66)	32.0	(27.0)	
distance to food market	-6.26*	(3.31)	-3.31	(6.50)	
<b>Classification variables</b>					
cycle	level				
	(i)	466.9	(418.2)	-1 399.8	(1 135.8)
	(ii)	-482.8	(401.8)	-2 479.6***	(1 162.3)
	(iii)	-1421.3***	(364.1)	-3 237.6***	(1 093.1)
sale (default=no sale)		-155.9	(138.7)	196.1	(298.4)
centrality	(ii)	-176.9	(240.6)	366.4	(454.7)
	(iii)	-105.5	(250.4)	-8.6	(521.1)
	(iv)	-313.5*	(184.3)	49.3	(387.1)
	(v)	-481.2*	(272.5)	-660.8	(577.0)
	(vi)	-392.3*	(203.3)	178.0	(428.9)
Significance for model	0.0001		0.0001		
R-square	0.1940		0.2113		
# observation	1205		388		

Table F4. Regression results on total consumption when including bargaining power, excluding max education (only male-headed households)

Regressor	Estimate	Std.error
<b>Continuos variables</b>		
intercept	3983.8***	(515.6)
value of production	4.7***	(1.4)
dependency ratio	-1995.5***	(459.1)
non-farm income	-2.0	(14.0)
sickness among productive household members	41.8	(547.8)
relative education (wife-husband)	--81.1***	(24.6)
income-share (wife-husband)	-4.9**	(2.2)
distance to food market	-7.59**	(3.43)
<b>Classification variables</b>		
cycle	level	
	(i)	41.8 (547.8)
	(ii)	-146.3 (533.1)
	(iii)	-1278.8 (492.0)
sale (default=no sale)		-84.7 (159.0)
centrality level		
	(ii)	-158.9 (298.2)
	(iii)	-163.9 (286.5)
	(iv)	-697.6*** (222.6)
	(v)	-609.9* (310.8)
	(vi)	-691.8*** (236.6)
Significance for model	0.0001	
R-square	0.1210	
# observation	879	

## Recommended studies

This study has documented that the structural adjustment implemented by the MMD Government from 1991 in Zambia has dramatically altered the producer environment for any small or medium scale farmer in Zambia. It further shows that women farmers in remote and in less central areas are the definite losers. The emerging issue for further studies is whether the findings are restricted in time and space. Any country specific case during a certain period is a mixture of unique, regional and general processes. One could expect the situation in other countries and in other periods to be both worse and better, but in many cases not that different. The natural environment mix in Zambia is not that different from other countries in southern Africa, the infrastructure is probably somewhat better than average and the gender norms and roles are again not that different. The public marketing system in pre-adjustment Zambia probably had a more complete coverage than in neighbour countries. Implementation of reforms were definitely faster and more comprehensive than in neighbour countries. Hence it will be correct to state that this study has contributed to more general and regional insights but other country studies will be needed to sort out the general, regional and country specific findings. That would also allow for a comparative study at a later stage.

The main study recommendation is to carry out another country specific study in a country in southern or eastern Africa somewhat different from Zambia. It is recommended to choose either a country where the new economic environment has settled over some years and/or a country where the economic reforms are implemented at a more adapted and slower pace. Uganda and Zimbabwe are potential candidates where data are or soon will be available. As demonstrated by the Zambia study, a comprehensive approach yields synergic effects, but it is obviously also possible to focus on one or a few of the issues in a separate dedicated study

The policy recommendations presented are all well advocated by the finding of the study. The policy recommendations give some details but are still quite general. Further work is needed to turn the policy recommendations into implementable policies. Studies are needed to learn how to improve the design of structural adjustment policy packages and how to reduce or balance the gender bias in agricultural production, marketing and welfare.

This study was only possible due to a well designed sampling and data collection approach, but the analysis

shows that there is a need to redesign future data collection in order to allow for improved analysis.

### A new country specific study

The main objective of a country specific study should be to test the hypotheses behind the main findings from the Zambia study:

- Do the expected real producer price increase reach women farmers and are they able to respond by increasing production and welfare?

### Research questions

Research questions follow from the main findings from the Zambia study:

### Price and markets

- Does the expected real producer price increase materialize at community level across the country ?
- Does the expected increase in market efficiency, measured as the share of consumer price reaching producer, materialize at community level across the country ?

### Supply response at national, community, household and individual level?

- Does the agricultural sector at the national level respond positively to price changes over time, as expected ?
- How do small scale women farmers and other groups of small and medium scale farmers respond to price changes at community level in cross-sectional analysis at time of adjustment ? Do they respond negatively to a price increase as predicted by the Agricultural household theory, positively as predicted by traditional economic theory for producers, or are they rather not price sensitive ?
- Do small scale women farmers and other groups of small and medium scale farmers respond positively to cross-price changes at community level ?

### Gender biases underlying supply-response

- Do you find a legal gender bias for women farmers as predicted by gender theory ?
- Do you find a gender bias in family obligations for women farmers as predicted by gender theory ?
- Do you find a gender bias in division of labor for women farmers as predicted by gender theory ?
- How is the gender bias reflected in the behaviour of women versus men farmers ?
- Do men farmers respond more to market opportunities in the sense that
  - they are more responsive to price changes by switching to relatively better-paid crops, even

- if these traditionally were considered «female crops» and,
  - do they respond more to marketing opportunities such as in-kind-credit-based contract farming, and more distant-from-village, higher-price sales opportunities.
- Do women farmers respond less to market opportunities and respond differently in the sense that:
  - women farmers are more time constrained and more obligated to produce for own-consumption hence cannot vary response as much,
  - women farmers are more risk-averse in responding to opportunities because of their greater responsibility for household food security,
  - women farmers respond less to market opportunities because of lower effective access to credit and hence more limited choices, and
  - women farmers respond more strongly than men-farmers to well-organized marketing opportunities at the community level.
- Does the bargaining power of the wife affects how the preferences of the wife versus the preferences of the husband affect the crop mix and crop production level for a farmer couple household, as predicted by gender theory?

#### **Gender differences in welfare preferences**

- Do women farmers and men farmers give different preferences to social and economic welfare such as food production for own consumption, buying food for own consumption, non-food consumption, leisure and drinking, agricultural investment, time for child care, and avoiding malnutrition; as predicted by gender theory.
- Do these different preferences have an impact on how a given level of agricultural production yields social versus economic welfare for farmer households with a female versus a male head, as predicted by gender theory?
- Does the bargaining power of the wife affect how the preferences of the wife versus the preferences of the husband affect this process for a farmer couple household, as predicted by gender theory?

#### **Dedicated studies**

#### **Studies to develop, test and monitor policy recommendations**

The recommendations from the study highlight four issues where an improved and adapted policy is needed. Further work is needed to prepare a sound base of knowledge and experience for a redesigned policy. Implementation is obviously a policy issue for the government, but many of the proposals require testing in small scale such as at district or provincial level and close monitoring. Testing and monitoring

should aim both to learn about the impact and the detailed design.

- To increase efficiency in marketing and distribution of crops, a redesign of marketing policy is needed, one which re-balances private and public sector responsibility.
- A stable marketing system is more important for ensuring a positive supply response over time than prices. A stable marketing system in less central and remote areas would serve as an important incentive to ensure a high volume of marketed production and the continued market integration of less central and remote areas also in periods when prices are low and declining. To be effective, this would not require significant subsidization of producer prices and could be structured so as to complement the activities of private traders. Such a policy would also support the food security objective and address the serious decline in nutritional indicators that has been observed under the current policy.
- The gender bias in supply response requires both an active policy to off-set the impact of the gender bias and an active policy to reduce the gender biases themselves.
- Findings from the bargaining power analysis highlight the need to design a gender sensitive agricultural policy in order to optimize gains in economic and social welfare over a short and long-term time horizon.

#### **Data collection recommendations**

This study used a combination of a quantitative and a qualitative approach which turned out to be very useful. Made very simple, survey information was used to test the price and marketing effects of structural adjustment and whether farmers responded to those changes by changing production and welfare. Villages where farmers production and welfare was the best was selected for the following participatory rural appraisal (PRA). The PRA was used to learn why changes took or not took place and why or why not farmers responded to the continuing changes. Survey information at three levels are necessary to understand the effects of economic reforms. The information should include:

- households and individual level information on production, resource allocation, time use (not included in this study but highly needed) and bargaining power (in addition to education and income, also information on agricultural decisions, Kumar 1994).
- community information on prices and marketing.

It is recommended to include also villages in more central areas to learn about how the different socio-economic and gender groups are able to utilize better economic opportunities.

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