4

Green Revolution Delayed: Maize Production

The preceding two chapters have examined the two important assets of rural households, land and labor. This and the next two chapters will examine the activities of rural households that generate the means of survival. The activities of households that constitute their livelihood strategies are broadly classified into two categories: own farm production and off-own farm activities (hereafter referred to as "off-farm activities"). Own farm production in the study villages were dominated by maize (the staple crop) and tobacco (the major cash crop), as these two crops together accounted for 83 percent of the total area cultivated in the study villages. The analysis of this chapter concentrates on the production of maize, while the next chapter focuses on tobacco production and marketing. Off-farm economic activities are the subject of analysis in Chapter 6.

This chapter is organized as follows. The next section begins with a description of maize production at the national level. It then conducts a micro-level analysis of maize production in the study villages. By examining the level of self-sufficiency, production cost structure, and crop income related to maize, the analysis highlights some reasons behind the low production levels and food insecurities faced by the smallholder households.

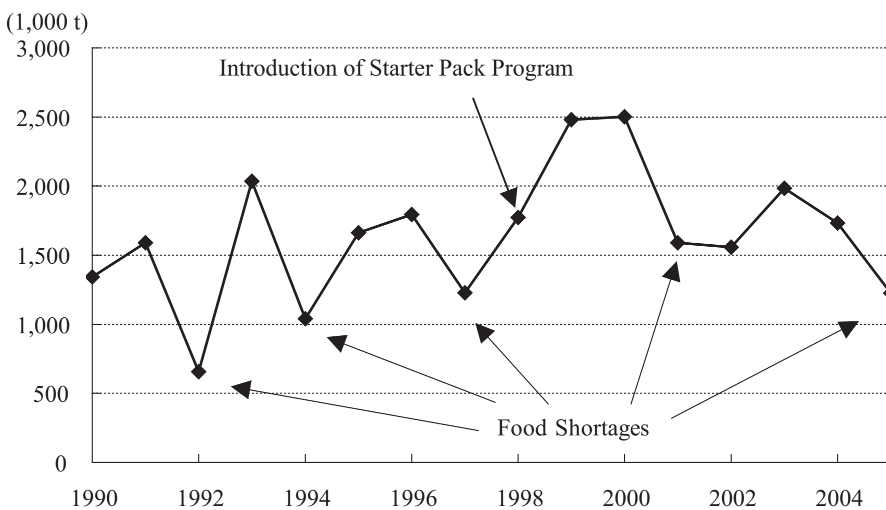
4.1 Maize Production at the National Level

Maize is the staple food in Malawi and by far the most important crop for smallholder households. The production of maize is largely rain-fed, and the national production level fluctuates widely depending on the weather conditions of the year. As Figure 4.1 shows, throughout the 1990s and the first half of the 2000s, Malawi experienced occasional food shortages due to insufficient maize production caused by bad weather.

The two main types of maize grown in Malawi are local varieties (called *chimanga cha makolo*, meaning "maize of ancestors") and modern varieties such as hybrids. A recent national-level survey (Government of Malawi 2005) reported that 54.5 percent of farmers grew at least some hybrid maize. However, this figure must be read with caution because many farmers do not purchase hybrid seeds every year but recycle them (i.e., they use seeds from their own farm for several consecutive years).[1] Therefore, the use of genuine hybrid seeds at the national level would be much less than what the national survey suggests. The yield from these recycled hybrid seeds declines by 10 to 40 percent (Morris 1998).

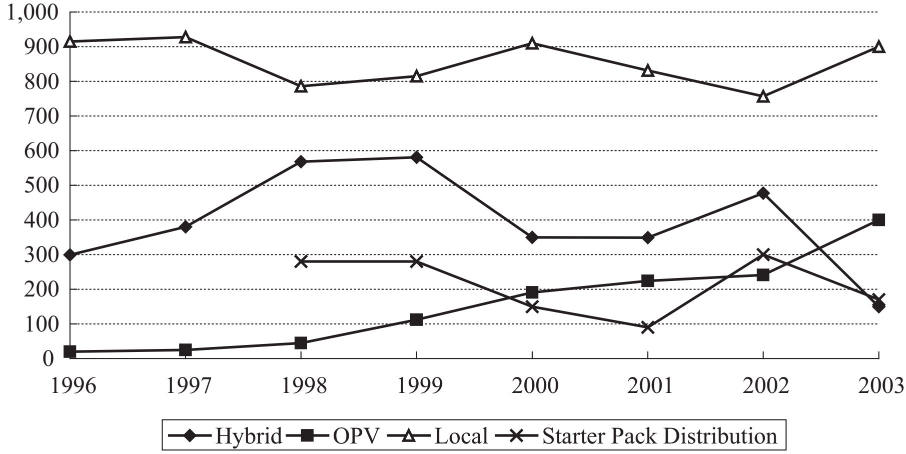
Both local and hybrid maize varieties have advantages over others. The advantages of local varieties over hybrids include their better taste (Peters and Herrera 1994, p. 314), ability to be stored for a longer period, and less loss when being milled into flouring (Smale and Heisey 1995, p. 366). On the

Fig. 4.1 Maize Production in Malawi, 1990–2005



Source: FAOSTAT.

Fig. 4.2 Area Planted in Maize by Variety (1,000 ha) and Starter Pack Distribution (10,000 Packs) in Malawi



Source: Chimimba (2004) and Economist Intelligence Unit (various issues).

other hand, the advantages of hybrids (and other modern varieties) are their better yields per hectare and early maturity. Given the small farm sizes that most households operate, the better yield of hybrids is a major merit. The early maturity also contributes to household food security because many households exhaust their maize stock before the next harvest, and an early harvest shortens the lean period (Smale 1995; Peters 1999).

At the national level, a large proportion of maize farms at the time of this study were planted with local varieties (Figure 4.2). Between 2000 and 2003, local varieties accounted for 59 percent of the area planted in maize. On the other hand, the area planted in hybrid varieties fluctuated widely over the period. This was because the scale of the free distribution of packages with modern seed varieties (maize and legumes) and fertilizer, called the Starter Pack (Levy 2005), varied each year.[2] The idea behind the introduction of the Starter Pack program was that increased yields over some years would improve household food security and boost sales of maize, pushing smallholder farmers over a threshold where they would be able to purchase modern varieties of seeds and fertilizer themselves (Peters 2006, p. 324; Levy 2005, p. 281). The program started in 1998 with 2.8 million packages and the scale of distribution was maintained in 1999. The result was that the area planted in hybrid maize during the two years increased dramatically. However, the free distribution was scaled down in 2000 to 1.5 million and even further in 2001 to 0.9 million, resulting in a drop in the area planted with hybrid maize. After the famine of 2002 (Devereux and Tiba 2007), the scale of free distribution was expanded again, but the types of seeds in the packages shifted from hybrid to open pollinated varieties (OPV), thus expanding the area planted with OPV in 2002 and 2003 (Figure 4.2). These policy changes greatly affected the area planted in modern varieties of maize during the period. On the other hand, the area planted in local varieties remained virtually unchanged during the period. Contrary to the intention of the Starter Pack program, most farmers continued to devote larger proportion of their farms to the local varieties unless they were provided with free seeds of the modern varieties (Figure 4.2). This seems to indicate that a Green Revolution in Malawi is yet to be seen.

4.2 Maize Production in the Study Villages

This section examines the degree of household self-sufficiency, production cost structure, and crop income related to maize among the sample households. Based on the analyses, it also clarifies the reasons behind the non-adoption of new technology (i.e., the combination of modern varieties of seeds and fertilizer) by most smallholders.

4.2.1 Degree of Household Self-Sufficiency in Maize Production

Self-sufficiency in maize production is a major priority for most smallholder households. This is not simply because maize is used to make Malawi's staple meal of stiff porridge (called *nsima*). During the lean period of January to March, it often becomes very difficult to purchase maize due to the shortage of supply and high prices. The malfunctioning of the food market causes people to lack confidence in the market, thereby inducing the rural households to grow as much maize as possible to secure their consumption needs (Alwang and Siegel 1999, p. 1472). Because of this food security concern, maize was cultivated by every sample household and constituted 64 percent of the total area cultivated in the six study villages.

Despite the food-security-driven planting pattern, the degree of self-sufficiency in maize production among the sample households was far from adequate. The average household maize production per adult equivalent unit (AEU[3]) in the sample was 175 kg, falling short of the minimum requirement of 200 kg.[4] This indicates that, on average, the sample households were not self-sufficient in maize production.

Looking at the overall average masks large variations among the villages and households. As Table 4.1 shows, per AEU maize production in Kachamba,

TABLE 4.1 Use of Fertilizer in Maize Production among Sample Households

	Kachamba (*n* = 31)	Belo (*n* = 30)	Horo (*n* = 32)	Bongololo (*n* = 33)	Mulawa (*n* = 28)	Mbila (*n* = 32)	Total (*n* = 186)
Households using fertilizers	9 (29%)	7 (23%)	19 (59%)	21 (64%)	22 (79%)	21 (66%)	99 (53%)
Of which used starter packs	0 (0%)	0 (0%)	6 (19%)	10 (30%)	21 (75%)	6 (19%)	43 (23%)
Amount of fertilizer used* (kg/ha)	71	15	90	77	123	105	71
Maize production (kg/ha)	1,093	485	331	1,503	1,341	732	865
Maize production per household member** (kg)	186	127	45	148	153	77	123
Maize production per AEU*** (kg)	260	182	64	206	228	109	175

* Total amount of fertilizer used, irrespective of types.
** Irrespective of age and gender.
*** Adult Equivalent Unit (AEU): male 15 years or older = 1; female 15 years or older = 0.8; male or female 14 years or under = 0.5.

TABLE 4.2 Rate of Household Maize Production per AEU* (%)

	Kachamba	Belo	Horo	Bongololo	Mulawa	Mbila	Total
Less than 50 kg	6	7	69	15	21	47	28
50–100 kg	23	27	13	18	21	13	19
100–150 kg	13	17	9	15	11	13	13
150–200 kg	6	3	6	6	0	6	5
200–250 kg	10	3	0	6	11	3	5
More than 250 kg	42	43	3	39	36	19	30

* Adult Equivalent Unit (AEU): male 15 years or older = 1; female 15 years or older = 0.8; male or female 14 years or under = 0.5.

TABLE 4.3 Months in Which Households Exhausted Own Maize Stock (%)

	Kachamba	Belo	Horo	Bongololo	Mulawa	Mbila	Total
After next harvest	42	53	6	3	14	6	20
March or later	6	0	9	48	11	25	17
January–February	23	7	28	18	14	31	20
November–December	26	3	19	12	14	6	13
October or earlier	3	20	19	6	14	19	13
Unknown	0	17	19	12	32	13	15

Note: Data are for maize production in the 2002/03 season in Kachamba and Belo, and the 2003/04 season in the other study villages.

Bongololo, and Mulawa was above the minimum requirement, while the other three villages were below. Particularly inadequate were Horo and Mbila, where production was severely affected by erratic rain in 2004/05.

Horo was the worst hit, averaging only 64 kg per AEU, even though the use of fertilizer had been above the six-village average. The village variations can also be seen in Table 4.2 that shows the distribution of households across production levels. Households with more than 250 kg of per AEU maize production accounted for only 3 percent in Horo, while those in Kachamba and Belo accounted for more than 40 percent. Across the sample, 30 percent of households produced more than 250 kg of maize per AEU, which is well above the self-sufficiency level. On the other hand, 28 percent produced less than 50 kg per AEU, falling far below the minimum requirement. Similarly, 20 percent retained maize stocks until the next harvest (meaning they attained self-sufficiency), while 13 percent exhausted their stocks before October, more than six months prior to the next harvest (Table 4.3). These signify the existence of large differences in the degree of maize self-sufficiency among the households.

4.2.2 Production Cost Structure and Maize Income

The production cost structure of maize in Table 4.4 shows both variations and similarities across the study villages. Large variations can be seen in planted area, production per hectare, and crop income (gross revenue minus costs). The variations in the area planted with maize can be attributed to the different degree of land scarcity in each village, as discussed in the previous

TABLE 4.4 Production Cost Structure of Maize (MK/ha)

	Kachamba (n = 31)		Belo (n = 30)		Horo (n = 32)	
Average area of maize farming (ha/household)	0.599		1.114		0.444	
Production (kg/ha)	1,093		485		331	
	%	MK	%	MK	%	MK
Gross revenue from maize (1)		**14,943**		**5,541**		**5,292**
Input costs (2)	**100%**	**7,358**	**100%**	**2,468**	**100%**	**10,204**
Seeds	13%	941	22%	552	6%	591
Fertilizer	35%	2,573	23%	572	62%	6,296
Manure	1%	55	4%	89	4%	395
Annual depreciation and maintenance of tools, oxcarts, and oxen	18%	1,307	12%	288	4%	384
Hired transport/machinery	4%	319	4%	88	1%	113
Hired labor	28%	2,097	36%	879	21%	2,177
Land rent	1%	66	0%	0	2%	211
Interest payment	0%	0	0%	8	0%	38
Net crop income, (1) minus (2)		**7,585**		**3,074**		**-4,912**

TABLE 4.4 (Continued)

	Bongololo (*n* = 33)		Mulawa (*n* = 28)		Mbila (*n* = 32)	
Average area of maize farming (ha/household)	0.489		0.611		0.563	
Production (kg/ha)	1,503		1,326		732	
	%	MK	%	MK	%	MK
Gross revenue from maize (1)		**18,040**		**16,106**		**9,234**
Input costs (2)	**100%**	**11,395**	**100%**	**9,805**	**100%**	**7,110**
Seeds	11%	1,294	12%	1,146	9%	628
Fertilizer	38%	4,357	62%	6,112	70%	4,968
Manure	0%	0	0%	0	4%	283
Annual depreciation and maintenance of tools, oxcarts, and oxen	14%	1,645	9%	856	8%	582
Hired transport/machinery	1%	100	5%	468	1%	54
Hired labor	29%	3,311	12%	1,222	8%	544
Land rent	3%	372	0%	0	0%	0
Interest payment	3%	317	0%	0	1%	50
Net crop income, (1) minus (2)		**6,645**		**6,301**		**2,124**

	Total (*n* = 186)	
Average area of maize farming (ha/household)	0.631	
Production (kg/ha)	863	
	%	MK
Gross revenue from maize (1)		**10,819**
Input costs (2)	**100%**	**7,184**
Seeds	11%	**818**
Fertilizer	50%	**3,582**
Manure	2%	**125**
Annual depreciation and maintenance of tools, oxcarts, and oxen	11%	**775**
Hired transport/machinery	2%	**179**
Hired labor	22%	**1,561**
Land rent	1%	**87**
Interest payment	1%	**58**
Net crop income, (1) minus (2)		**3,635**

Note: MK = Malawi kwacha.

chapter. For example, the relatively large area of maize farms in Belo (1.11 ha on average) was possible because of the abundance of land there, while the small size of maize farms in Horo (0.44 ha) was due to the increasing population pressure on the land in the village. The variations in production level and crop income per hectare can be explained by two factors. One was the effect of the erratic rain in the 2004/05 season which adversely affected the production level in Horo and Mbila. Another was the level of fertilizer use. The low production level per hectare in Belo was mainly due to the low usage of fertilizer. In Belo the low productivity caused by the low level of fertilizer application was compensated by the larger size of maize farms.

A major similarity in the production cost structure of maize across the villages was the high cost of fertilizer and hired labor. The most expensive input in maize production was fertilizer which accounted for 50 percent of total production cost, followed by hired labor (22 percent). An exception from this cost structure pattern was that of Belo where the low level of fertilizer use in the village considerably reduced the total cost and, at the same time, the gross revenue per hectare due to the low production level.

The scale of farm operation does not seem to affect maize productivity. Table 4.5 classifies the sample households into three categories according to maize-farm size and shows the production cost structure of each category. It is clear from the table that no relation exists between farm size and production per hectare. This is also supported by the fact that the correlation coefficient between maize-farm size and maize production per hectare was insignificant in all the villages.[5] The absence of economies of scale in maize production stems from the lack of mechanization in smallholder production and the divisible nature of productivity-enhancing inputs (fertilizer and modern varieties of seed). In fact, Table 4.5 clearly indicates that the households applying more fertilizer achieved higher productivities, irrespective of the scale of operation.

At the same time, however, net crop income from maize did not increase as the level of fertilizer application (and consequently the production level) increased. This was because the high gross revenue achieved by applying fertilizer was reduced by the high cost of purchasing fertilizer. The correlation coefficients between maize income and the amount of fertilizer used were positive but statistically insignificant in two villages, and negative in other villages of which two were statistically significant. This suggests that the increased application of fertilizer did not increase net crop income. In addition, when production fails due to bad weather, households that use more fertilizer may experience higher deficits than those that do not because of the cost of fertilizer.

TABLE 4.5 Production Cost Structure of Maize by Scale of Operation

A. Six-village Total

	Scale Range of Maize Farm					
	Less than 0.5 ha		0.5–1 ha		More than 1 ha	
Number of sample households	93		63		30	
Average area of maize farm (ha/household)	0.301		0.717		1.475	
Production (kg/ha)	1,047		852		767	
Fertilizer application (kg/ha)	108		62		61	
	%	MK	%	MK	%	MK
Gross revenue from maize (1)		12,952		10,468		9,824
Input cost (2)	100%	9,269	100%	6,700	100%	6,187
Seeds	13%	1,203	12%	804	10%	589
Fertilizer	53%	4,934	48%	3,214	50%	3,100
Manure	2%	154	3%	202	0%	28
Annual depreciation and maintenance of tools, oxcarts, and oxen	7%	647	10%	702	15%	930
Hired transport/machinery	2%	189	3%	168	3%	184
Hired labor	18%	1,669	23%	1,564	21%	1,317
Land rent	3%	288	0%	22	0%	26
Interest payment	2%	185	0%	24	0%	13
Net crop income, (1) minus (2)		3,683		3,768		3,637

B. Kachamba

	Scale Range of Maize Farm					
	Less than 0.5 ha		0.5–1 ha		More than 1 ha	
Number of sample households	16		11		4	
Average area of maize farm (ha/household)	0.365		0.675		1.330	
Production (kg/ha)	798		1,067		1,492	
Fertilizer application per ha (kg/ha)	57		50		110	
	%	MK	%	MK	%	MK
Gross revenue from maize (1)		10,549		14,010		21,063
Input cost (2)	100%	4,493	100%	6,395	100%	11,843
Seeds	20%	882	13%	825	10%	1,167
Fertilizer	48%	2,137	29%	1,849	34%	4,061
Manure	0%	0	2%	138	0%	0
Annual depreciation and maintenance of tools, oxcarts, and oxen	14%	627	6%	370	28%	3,360
Hired transport/machinery	4%	172	6%	387	3%	387
Hired labor	15%	662	44%	2,826	22%	2,654
Land rent	0%	13	0%	0	2%	214
Interest payment	0%	0	0%	0	0%	0
Net Crop Income, (1) minus (2)		6,056		7,615		9,220

TABLE 4.5 (Continued)

C. Belo

	Scale Range of Maize Farm					
	Less than 0.5 ha		0.5–1 ha		More than 1 ha	
Number of sample households	5		12		13	
Average area of maize farm (ha/household)	0.346		0.772		1.726	
Production (kg/ha)	998		583		405	
Fertilizer application per ha (kg/ha)	53		16		13	
	%	MK	%	MK	%	MK
Gross revenue from maize (1)		11,535		6,649		4,622
Input cost (2)	100%	9,372	100%	3,081	100%	1,351
Seeds	10%	954	25%	772	32%	430
Fertilizer	24%	2,256	13%	399	38%	514
Manure	0%	0	6%	185	4%	56
Annual depreciation and maintenance of tools, oxcarts, and oxen	6%	556	12%	356	18%	239
Hired transport/machinery	8%	722	2%	62	4%	50
Hired labor	52%	4,884	42%	1,308	4%	50
Land rent	0%	0	0%	0	0%	0
Interest payment	0%	0	0%	0	1%	13
Net crop income, (1) minus (2)		2,163		3,568		3,271

D. Horo

	Scale Range of Maize Farm					
	Less than 0.5 ha		0.5–1 ha		More than 1 ha	
Number of sample households	19		12		1	
Average area of maize farm (ha/household)	0.216		0.711		1.596	
Production (kg/ha)	366		153		1,190	
Fertilizer application per ha (kg/ha)	131		53		188	
	%	MK	%	MK	%	MK
Gross revenue from maize (1)		5,859		2,445		19,048
Input cost (2)	100%	10,085	100%	4,937	100%	38,654
Seeds	9%	937	8%	394	2%	752
Fertilizer	63%	6,322	68%	3,370	57%	21,867
Manure	9%	883	5%	235	0%	0
Annual depreciation and maintenance of tools, oxcarts, and oxen	7%	673	5%	252	1%	352
Hired transport/machinery	0%	0	0%	0	3%	1,003
Hired labor	8%	782	10%	507	38%	14,680
Land rent	5%	488	2%	117	0%	0
Interest payment	0%	0	1%	63	0%	
Net crop income, (1) minus (2)		-4,226		-2,492		-19,606

E. Bongololo

	Scale Range of Maize Farm					
	Less than 0.5 ha		0.5–1 ha		More than 1 ha	
Number of sample households	22		9		2	
Average area of maize farm (ha/household)	0.316		0.742		1.246	
Production (kg/ha)	1,541		1,425		1,608	
Fertilizer application per ha (kg/ha)	116		61		70	
	%	MK	%	MK	%	MK
Gross revenue from maize (1)		18,497		17,095		19,298
Input cost (2)	100%	12,955	100%	9,491	100%	12,146
Seeds	11%	1,394	12%	1,184	11%	1,308
Fertilizer	47%	6,137	28%	2,688	32%	3,863
Manure	0%	0	0%	0	0%	0
Annual depreciation and maintenance of tools, oxcarts, and oxen	4%	529	22%	2,084	29%	3,582
Hired transport/machinery	1%	191	0%	0	1%	112
Hired labor	25%	3,228	36%	3,451	26%	3,170
Land rent	7%	863	0%	0	0%	0
Interest payment	5%	615	1%	84	1%	110
Net crop income, (1) minus (2)		5,541		7,604		7,152

F. Mulawa

	Scale Range of Maize Farm					
	Less than 0.5 ha		0.5–1 ha		More than 1 ha	
Number of sample households	15		7		6	
Average area of maize farm (ha/household)	0.293		0.805		1.179	
Production (kg/ha)	1,227		1,771		1,070	
Fertilizer application per ha (kg/ha)	114		144		102	
	%	MK	%	MK	%	MK
Gross revenue from maize (1)		14,721		21,290		12,836
Input cost (2)	100%	6,888	100%	13,587	100%	8,605
Seeds	24%	1,631	10%	1,349	8%	683
Fertilizer	54%	3,706	67%	9,059	61%	5,260
Manure	0%	0	0%	0	0%	0
Annual depreciation and maintenance of tools, oxcarts, and oxen	11%	784	6%	873	10%	887
Hired transport/machinery	3%	205	5%	710	5%	438
Hired labor	8%	562	12%	1,596	16%	1,336
Land rent	0%	0	0%	0	0%	0
Interest payment	0%	0	0%	0	0%	0
Net crop income, (1) minus (2)		7,833		7,703		4,231

TABLE 4.5 (Continued)

G. Mbila

	Scale Range of Maize Farm					
	Less than 0.5 ha		0.5–1 ha		More than 1 ha	
Number of sample households	16		12		4	
Average area of maize farm (ha/household)	0.313		0.637		1.335	
Production (kg/ha)	1,070		572		645	
Fertilizer application per ha (kg/ha)	149		80		114	
	%	MK	%	MK	%	MK
Gross revenue from maize (1)		12,794		6,842		9,318
Input cost (2)	100%	11,104	100%	5,836	100%	5,185
Seeds	11%	1,240	9%	546	3%	172
Fertilizer	67%	7,391	67%	3,927	81%	4,186
Manure	1%	140	10%	575	0%	0
Annual depreciation and maintenance of tools, oxcarts, and oxen	7%	723	10%	612	8%	405
Hired transport/machinery	1%	166	0%	20	0%	0
Hired labor	11%	1,265	3%	157	8%	421
Land rent	0%	0	0%	0	0%	0
Interest payment	2%	180	0%	0	0%	0
Net crop income, (1) minus (2)		1,690		1,006		4,133

Note: Figures for Kachamba and Belo were converted to 2004/05 prices using the rural CPI. Exchange rates in 2005 fluctuated between 115 and 121 Malawi kwacha (MK) per US dollar.

A comparison of production cost structure of maize among income quartiles results in a similar conclusion. As Table 4.6 shows, households in upper income quartiles used more fertilizer and thus achieved higher maize production per hectare than those in lower quartiles. However, the production cost (particularly of fertilizer and hired labor) of those in upper quartiles was also high, resulting in a low net crop income. Increased maize production through the application of fertilizer certainly improves the food security situation of households. Given the fact that it often becomes very difficult to purchase maize through markets during the lean period, keeping enough maize stock in household granaries is particularly important. On the other hand, households can achieve food security only through purchasing expensive fertilizer. Those who produced enough maize did so at the expense of bearing high production costs.

4.2.3 The Reason for a Limited "Green Revolution"

As discussed earlier, the adoption of improved technology in maize production with the use of fertilizer and modern seed varieties has been limited

TABLE 4.6 Production Cost Structure of Maize by Income Quartiles (totals for the six villages, MK/ha)

	Quartile 1 (richest)		Quartile 2		Quartile 3		Quartile 4 (poorest)	
No. of sample households	45		46		47		48	
Average area of maize farm (ha/household)	0.746		0.623		0.519		0.643	
Production (kg/ha)	1,036		873		863		673	
	%	MK	%	MK	%	MK	%	MK
Gross revenue from maize (1)		13,544		10,664		10,553		8,209
Input costs (2)	100%	10,683	100%	5,193	100%	5,003	100%	6,956
Seeds	7%	732	16%	819	17%	875	12%	866
Fertilizer	54%	5,717	47%	2,435	44%	2,223	49%	3,398
Manure	0%	37	1%	65	1%	30	5%	352
Annual depreciation and maintenance of tools, oxcarts, and oxen	9%	975	15%	793	13%	632	9%	652
Hired transport/machinery	3%	341	2%	87	1%	62	3%	181
Hired labor	25%	2,634	17%	889	23%	1,169	19%	1,328
Land rent	1%	123	2%	105	0%	0	1%	100
Interest payment	1%	122	0%	0	0%	12	1%	79
Net crop income, (1) minus (2)		2,861		5,470		5,551		1,253

Notes: 1. Figures for Kachamba and Belo were converted to 2004/05 prices using the rural CPI.
2. Exchange rates in 2005 fluctuated between 115 and 121 Malawi kwacha (MK) per US dollar.
3. Income quartiles were obtained by ranking all sample households in each study village according to income per adult equivalent unit (AEU), and dividing them into four equal groups.

in Malawi. The literature on the adoption of technology points out three reasons for the non-adoption of new technologies by farmers. First, information on a new technology may have not reached farmers. Second, farmers know the technology but for some reasons have a preference for other methods. Third, although farmers desire to adopt the technology, some constraints prevent them from adopting it (Langyintuo 2005, p. 26). The first reason does not apply to Malawi because after the free distribution of the Starter Packs, virtually all farmers know well about the use of hybrid seeds and fertilizer as well as their advantages, especially the high productivity and early plant maturity. The second reason used to be true until the 1980s because the hybrid varieties at that time were dent types while Malawians prefer flint types because the hard grains of flint maize have a higher flour-to-grain extraction rate and are resistant to weevils. However, in the early 1990s, new varieties of semi-flint hybrid maize close to the hardness of the local flint type were developed (Smale 1995). Since then the new hybrids have been widely accepted for home consumption, although many people in the study villages stated their preference for the local varieties because of their taste and storability.

The major reason farmers have been slow to adopt improved technology is the cost of purchasing fertilizer and seeds. Although farmers know the advantages of the technology and would like to adopt it, fertilizer and modern varieties of seeds are far more expensive than they can afford. As a result, the average use of fertilizer per hectare on the maize farms of the sample households was only 71 kg (Table 4.1), which was less than one-third of the recommended amount of 250 kg (Langyintuo 2004, pp. 24–25). Even with this small amount of fertilizer used by the sample households, the cost of fertilizer alone accounted for 50 percent of the total production cost (Table 4.4). Were a farmer with a maize farm size of the sample average (0.63 ha) to buy the recommended amount of fertilizer and hybrid seeds, he or she would have to spend MK 12,159.[6] This amount is equivalent to more than half of the average annual household income of the sample households. With the absence of access to credit for maize production, most farmers cannot purchase the recommended amount of inputs.

Adoption of improved technology is further inhibited by the high risk in agricultural production. As was seen in Figure 4.1, farmers in Malawi occasionally experience production failure caused by erratic rain. Investing in high-cost inputs under such conditions increases the risk of income loss because the higher productivity and the resultant income of the improved technology may not be enough to compensate for its higher cost. For example, assuming that the recommended amount of fertilizer and hybrid seeds were purchased and other production costs were the same as those in Table 4.4, the minimum yield needed in order to avoid a deficit in net maize income would be 1.84 tons. This figure is very close to the mean yield of hybrid maize in a drought year (1.9 tons) reported by Smale (1995, p. 826, citing Jones and Heisey 1994), suggesting that the adoption of the technology would not guarantee a net maize income in a year of bad weather. Thus, the high cost of inputs and the high risks in production were the two main reasons behind the limited adoption of improved technology.

Conclusion

This chapter has examined the features of maize production in the study villages. It has highlighted the low level of self-sufficiency in general and the wide disparities between households in self-sufficiency levels. From the analysis of the production cost structure of maize, the chapter has revealed that although the use of fertilizer increased the level of production, the high cost of fertilizer decreased the net income from maize. Although smallholder farmers know the advantages of improved technology, its high cost deters the adoption of the technology, delaying a Green Revolution in Malawi.

Notes

1 In the six study villages, most farmers reported that they grew "hybrid" maize but only a few of them bought the seeds, implying that the "hybrid" seeds were in fact recycled ones.
2 The Starter Pack program was renamed the Targeted Input Program in 2000.
3 The adult equivalent unit is a method used to convert people of different ages and sex to standard consumption units as follows: male 15 years or older = 1; female 15 years or older = 0.8; male or female 14 years or under = 0.5.
4 This figure is sited by Alwang and Siegel (1999, p. 1461), Peters (2004b, p. 18), and Gladwin et al. (2001, p. 181). Other writers site different figures such as 155 kg (Bryceson 2006, p. 189) and 165 kg (Devereux and Tiba 2007, p. 173, citing FAO).
5 The correlation coefficient in each village was as follows: 0.278 in Kachamba, -0.348 in Belo, 0.052 in Horo, -0.033 in Bongololo, 0.196 in Mulawa, and -0.216 in Mbila. All of them were statistically insignificant at the 5 percent level.
6 This cost was calculated using the price in Bongololo in 2005.