APPENDIX-III

AGRICULTURE

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CHAPTER 1 AGRICULTURAL CONDITION

1.1 Salient Feature of the Agriculture Sector

1.1.1 Land Use and Agro Ecological Zones

As of a total 75,261,200 ha of the national land of Zambia, 46.9 percent, 35,273,000 ha is categorized as arable land, of which 5,265,000 ha (7.0% of total land and 14.9% of the agricultural land) is seen as agricultural land. Of the total agricultural land of the country, 360,000 ha (6.8%) is estimated irrigable and actually only 155,912 ha (43% of the irrigable land) is under irrigation.

Table 1.1.1 Total Land Use in Zambia (1996)

Items	Thousand ha	Percent (per total area)	Percent (per Arable land)
Total Area	75,261,200	100.0%	
Land Area	74,339,000	98.8%	
Arable Land	35,273,000	46.9%	
Agricultural land	5,265,000	7.0%	100.0%
Area Planted	2,057,513	2.7%	39.1%
Irrigation Potential	360,000	0.5%	6.8%
Land under Irrigation	155,912	0.2%	3.0%

Source: Total area to arable land from the top: Agricultural Statistics Bulletin 1995/1996 (MACO 1997)
Irrigable and irrigated land: "CROPWAT Exercise Report for Zambia"
(The Centre for Environmental Economics and policy in Africa)
Area Planted: CSO Data for planted area of 2009/10

In Zambia, land is divided into three zones based on the agro-ecological characteristics: zone I, II, and III. As shown in Table 1.1.2, Zone I shares 42% of the total land area of the country, where small grains are the major crops. Due to the limited rainfall (800mm on average), it is a risk prone area. Zone II, on the other hand, is blessed with better soil fertility and is characterized as commercialized area. Zone III covers the northern high rainfall area of the country including Luapula and Northern provinces, wherein 1,200mm or more annual rainfall can be anticipated. However, soil is highly leached and acidic and therefore low in fertility.

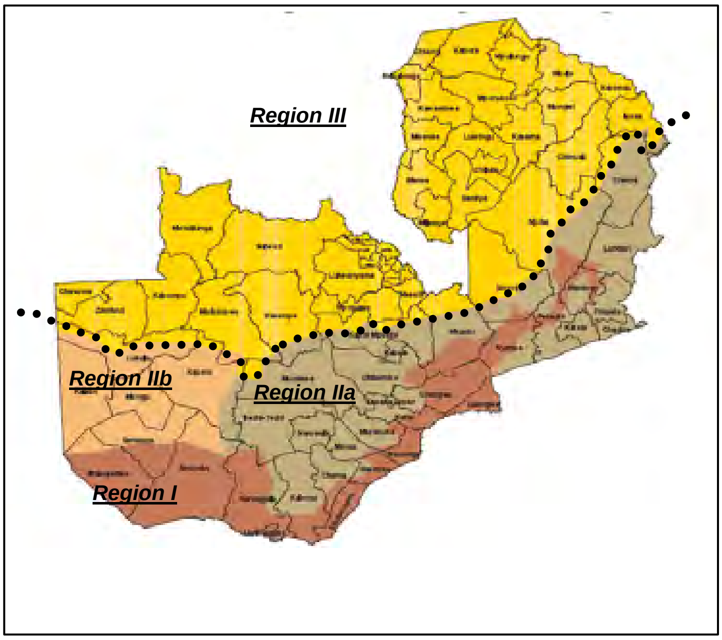


Figure 1.1.1 Agro-ecological Zones in Zambia
Source: Zambia Agricultural Research Institute

Table 1.1.2 Agro-ecological Zones

Zone	Area (%)	Characteristic
Zone I	42%	Dominated by small grain production such as sorghum and millet. Annual precipitation is averaged less than 800mm, which is unpredictable. Coupled with primitive farming practice using hand hoes, this zone is in a high risk of food insecurity.
Zone II	12%	Most commercialized area of the country with relatively fertile ferrous soil and an annual rainfall of between 800mm and 1,000mm. In addition to maize as the most common crop, cash crops including cotton, wheat, and soybean, are also cultivated.
Zone III	46%	Blessed with the annual rainfall of 1,200mm or more, cassava, maize and finger millet dominate the area with subsistence basis. Crop production potential is low because of low soil fertility that is highly leached and acidic and. Study area is located in Zone III.

Source: "CROPWAT Exercise Report for Zambia" (The Centre for Environmental Economics and policy in Africa)

Based on the National Census 2000, it is projected that nearly 90% of the rural population, 65% of the total population, is engaged in agriculture. According to Living Conditions Monitoring Survey Report (2006), they are distinguished into three categories: small (less than 5 ha), medium (5 to 20 ha) and large (more than 20 ha) scales. As of 20005/06, small scale population shares 91.7% of the rural population and 96.2% of the total number of farmers. In addition to those categories, some farmers are also categorized in "out-growers" who practice farming based on the formal or informal contract with commercial producers.

Table 1.1.3 Rural Population in Zambia(2006)

Category	Population	Percentage (per rural pop.)	Percentage (per total no. of farmers)
Small scale (<5ha)	**6,980,935**	**91.7%**	**96.2%**
Medium scale (5-20ha)	267,991	3.5%	3.7%
Large scale (20ha<)	9,057	0.1%	0.1%
Farmers Total	7,257,983	95.3%	100.0%
Fish farming	354,489	4.7%	
Non-agriculture	7,612,472	100.0%	
Rural Population Total	4,098,751		
Urban Population	11,711,223		
Zambia Total	**6,980,935**	**91.7%**	**96.2%**

Source: Living Conditions Monitoring Survey Report (CSO 2006)
Note: definition of scales is based on Agricultural Statistics Bulletin 1995/06 (MACO 1997)

Table 1.1.4 shows the population distribution by province. The largest population is found in Copperbelt province where mining is the major industry and accommodate a lot of mine workers. Northern and Luapula provinces share 12.8% and 7.9% respectively. As of year 2004, 83% of population lives in rural area in Luapula, while 79% in Northern provinces.

Table 1.1.4 Population Distribution by Province (2004)

Category	Rural	Urban	Total	Percent
Central	823223	313243	1,136466	10.3%
Copperbelt	354,208	1,307,961	1,662,170	15.1%
Eastern	1,155,060	359,545	1,514,605	13.8%
Luapula	713,429	150,067	863,496	7.9%
Lusaka	277,680	1,255,804	1,533,484	14.0%
Northern	1,115,907	292,462	1,408,369	12.8%
North Western	486,184	171,436	657,620	6.0%
Southern	1,045,661	315,983	1,361,645	12.4%
Western	708,705	126,919	835,625	7.6%
Zambia Total	6,695,845	4,296,693	10,992,538	100.0%

Source: Living Conditions Monitoring Survey Report (CSO 2004)

1.1.2 Crop Production in Zambia and its Comparison by Province

Concerning the crop plantation and production in Zambia, maize is outstanding. As shown in Figure 1.1.2 and Table 1.1.5, planted area of maize reached as much as 1,242,268 ha, which accounts for 60.4% of the total planted area of the year in the country. As such, maize production stands out in terms of the production; it was 1,080,558 tons in total, while the second largest crop, groundnuts, reached only 255,782 tons. This result clearly suggests the importance of maize in this country. Note that cassava is also an important crop in the country but, as it takes more than two years to grow, accurate statistic is rarely available.

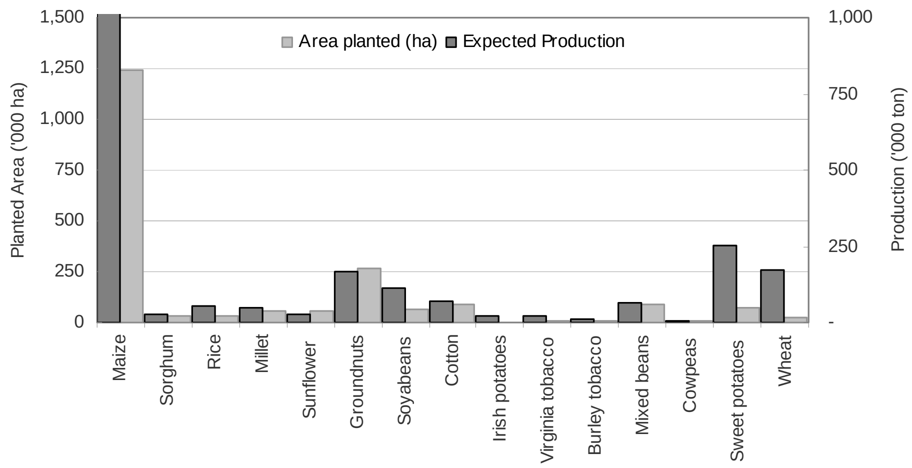


Figure 1.1.2 Production of Different Crops (2007/08)

Source: CSO Data for planted area of 2007/08

The raw data is shown below:

Table 1.1.5 Production of Different Crops (2009/10)

Crop	Area planted (ha)	%	Area to be harvested (ha)	Expected Production	Yield (MT)	Expected Sales	Quantity of basal fertilizer used (MT)	Quantity of Top dressing used (MT)
Maize	1,242,268	60.4%	1,080,558	2,795,483	2.25	1,352,012	94,448	96,724
Sorghum	34,251	1.7%	28,908	27,732	0.81	7,259	267	242
Rice	35,841	1.7%	30,788	51,656	1.44	26,338	97	99
Millet	56,789	2.8%	50,808	47,997	0.85	13,929	5	6
Sunflower	54,450	2.6%	51,602	26,420	0.49	1,147	134	121
Groundnuts	268,803	13.1%	255,782	164,602	0.61	58,585	96	90
Soyabeans	62,331	3.0%	60,777	111,888	1.80	85,387	6,644	1,815
Cotton	85,073	4.1%	81,706	72,482	0.85	413	486	336
Irish potatoes	1,425	0.1%	1,415	22,940	16.10	21,017	992	360
Virginia tobacco	11,984	0.6%	11,758	22,074	1.84	13,872	4,344	1,703
Burley tobacco	8,618	0.4%	8,381	9,809	1.14	1,193	2,028	1,553
Mixed beans	85,177	4.1%	81,575	65,265	0.77	27,772	375	250
Cowpeas	6,416	0.3%	6,026	2,722	0.42	449	50	24
Sweet potatoes	70,755	3.4%	68,993	252,867	3.57	123,793	44	28
Paprika	363	0.0%	351	533	1.47	450	22	13
Wheat	27,192	1.3%	27,192	172,256	6.33	170,750	9,097	8,763
Barley	181	0.0%	181	1,089	6.03	1,089	54	58
Popcorn	5,597	0.3%	5,149	7,846	1.40	6,118	332	398

Source: CSO Data for planted area of 2009/10

Production of maize, the major staple food in Zambia, has increased nearly twice in the past decade: from 638,134 tons in 1998 to 1,211,566 tons in 2008. As shown in Figure 1.1.3, this increase is significantly supported by the growth in the area under maize production, which has also increased from 510,372 ha to 928,224 ha during the same period.

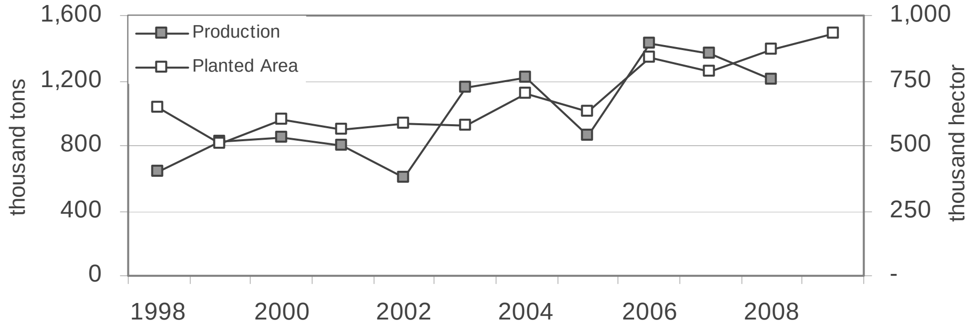


Figure 1.1.3 Maize Production in Zambia (1998-2008)

Source: TSB Northern Province (2009)

The raw data are shown in the Table 1.1.6 and Table 1.1.7 below:

Table 1.1.6 Maize Production in Zambia (1998-2008)

Year	ZAMBIA	Central	Copper belt	Eastern	Luapula	Lusaka	Northern	N/West ern	Southern	Western
1998	638,134	144,347	29,493	194,292	9,216	22,731	44,225	20,287	149,386	24,158
1999	822,057	100,865	64,145	284,356	21,117	32,909	62,388	23,365	200,574	32,337
2000	850,466	117,303	58,454	279,964	15,250	20,177	38,523	21,092	251,946	47,757
2001	801,889	162,272	68,080	196,317	14,998	58,127	43,496	19,196	211,281	28,120
2002	601,606	130,655	64,300	202,385	15,714	48,355	38,022	19,558	63,093	19,525
2003	1,157,860	342,856	144,458	201,521	14,860	177,865	79,881	33,114	127,277	36,028
2004	1,213,599	331,856	141,483	260,469	20,462	58,590	91,878	47,783	211,976	49,102
2005	866,187	204,230	118,737	169,315	31,883	33,061	118,017	40,814	120,518	29,612
2006	1,424,439	416,835	165,329	285,519	37,774	61,180	123,239	71,971	230,105	32,487
2007	1,366,158	405,282	130,601	225,178	32,225	84,127	138,057	70,765	238,570	41,353
2008	1,211,566	329,294	150,248	267,596	40,008	41,199	171,232	60,561	115,421	36,007

Source: TSB Northern Province (2009)

Table 1.1.7 Area under Maize Production in Zambia (1998-2008)

Year	ZAMBIA	Central	Copper belt	Eastern	Luapula	Lusaka	Northern	N/West ern	Southern	Western
1998	510,372	65,260	27,064	160,291	12,952	15,018	35,875	19,372	120,830	53,710
1999	597,454	75,061	31,601	205,253	11,926	18,091	44,880	20,062	138,213	52,367
2000	561,491	61,425	40,112	192,472	11,276	15,177	37,435	17,949	144,550	41,095
2001	583,855	89,494	33,273	178,688	12,869	28,482	41,533	18,474	131,840	49,202
2002	575,686	83,047	36,410	170,302	10,052	25,629	31,396	18,187	148,723	51,940
2003	699,276	129,262	62,122	186,789	10,264	50,518	50,859	22,736	139,468	47,259
2004	630,769	118,300	57,166	168,644	12,776	19,812	53,575	28,907	117,514	54,075
2005	834,980	130,130	64,598	202,373	23,252	29,322	92,685	34,977	172,746	84,897
2006	784,525	147,916	71,048	206,570	19,205	26,787	68,599	42,515	150,875	51,010
2007	872,812	143,762	64,945	208,319	20,721	38,005	75,000	55,269	178,162	88,629
2008	928,224	168,913	62,728	199,715	20,593	30,646	80,081	41,123	214,610	109,815

Source: TSB Northern Province (2009)

In terms of maize production, central province is the largest province; it produced 717,444 tons of maize in 2009/10. Second and third ranked were Southern and Eastern provinces: 582,984 and 540.533 tons respectively. These three provinces share 66% of the total production in the country. Looking at the yield of maize in each province, Central province was the highest at 3.0 tons/ha, followed by Lusaka province at 2.8 tons/ha. In Eastern provinces, although planted area was the largest among the provinces, production remained low, resulting in a limited yield level at 1.9 tons/ha.

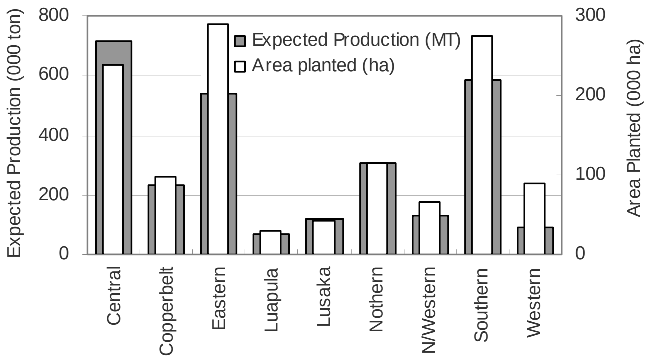


Figure 1.1.4 Maize Production Status in Each Province (2009/10)

Source: Central Statistic Office (2009/10).

Table 1.1.8 Maize Production by Province (2009/10)

Province	Area planted (ha)	Expected Production (MT)	Yield (MT/ha)	Quantity of basal fert used (MT)	Quantity of Top dressing used (MT)
Central	237,386	717,444	3.02	28,830	29,643
Copperbelt	97,849	233,223	2.38	8,260	8,954
Eastern	289,334	540,553	1.87	15,247	15,868
Luapula	30,373	69,363	2.28	2,900	2,827
Lusaka	43,441	121,740	2.80	5,476	5,570
Nothern	114,607	308,078	2.69	12,358	12,275
N/Western	66,562	130,860	1.97	3,754	3,857
Southern	274,184	582,984	2.13	16,271	16,453
Western	88,532	91,238	1.03	1,352	1,278
Total	1,242,268	2,795,483	2.25	94,448	96,724

Source: CSO Data for planted area of 2009/10

1.1.3 Staple Food Consumption Per Capita

Zambian population generally enjoys high level of food consumption per capita. As shown in Figure 1.1.5, maize consumption per capita marked more than 150 kg/capita back to the 19960s. Although it declined to a level around 125kg/capita since the 1990s, maize consumption still is at a considerable level—it can be supported by the fact that Zambia is almost a net exporting country during the 2000s. Instead of the decline in maize consumption, the consumption of cassava kept increasing since the mid 1970s and greatly increased during the late 1880s from around 50kg/capita to more than 75kg/capita. Combining those two tendencies, the total consumption of maize and cassava remained approximately 200kg/capita for more than four decades. Considering the standard calories of both crops at around 365kcal/100g, a total 200kg/capita/year of food consumption is equivalent to 2,000kcal/capita/day.

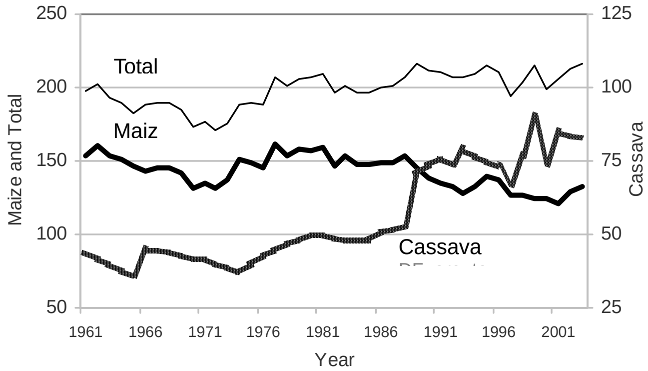


Figure 1.1.5 Maize Production Status in Each Province (2008)

Source: TSB Northern Province (2009). Table shows the estimated yield (tons/ha)

This condition can be roughly interpreted in the following way: now that Zambians have already achieved the first goal of self sufficiency in calorie consumption, next stage is to pursue more balanced dietary life in which nutritional balance is more concerned.

1.2 Government Policy in the Agriculture Sector

1.2.1 Fertilizer Support Program (FSP)

1) Background and Objectives

Fertilizer Support Program (FSP) was initiated by MACO in 2002/03 agricultural year. It plays a significant role in the agricultural sector coupled with the marketing activity by the Food Reserve Agency (FRA). Every year, 115,000 up to 210,000 farmers benefit from this program, which accounts for 6.1% to 11.1% of the total number of households, 1.8% to 3.3% of the rural population, and 9.3% to 17.1% of the total number of rural households in Zambia[1]. In fact, the annual budgets for FSP and FRA share nearly half, 48.8% composing of 39.7% for FSP and 9.1% for FRP in 2009, of MACO's annual budget[2]. The objectives of the program are summarized as follows:

- To increase private sector participation in the supply of agricultural inputs to smallholder farmers thereby reducing government involvement;
- To ensure timely, effective and adequate supply of agricultural inputs in the country;
- To improve access of smallholder farmers to agricultural inputs (fertilizer and hybrid maize seeds)
- To ensure competitiveness and transparency in the distribution of inputs, thereby breaking monopolies;
- To serve as a risk-sharing mechanism for smallholder farmers to cover part of the costs for improving agricultural productivity;
- To expand markets for private sector input suppliers/ dealers and increase their involvement in the distribution of agricultural inputs in rural areas, thereby reducing direct role of the government; and
- To facilitate the process of farmers' organization, dissemination of knowledge and creation of other rural institutions that will contribute to the development of the agricultural sector.

Food Security Pack

" Food Security Pack" is a package of agricultural inputs: fertilizer, maize seeds, and rhyme, which is distributed to smallholder farmers or "vulnerable but viable" farmers who may not be able to cultivate more than one lima (0.25 ha). The Food Security Pack is facilitated by the Department of Community Development (DCD) under the Ministry of Social Services. In practice, distribution of the Food Security Pack is operated by the "Program against Malnutrition (PAM)," a local NGO, under a partnership with the DCD. PAM started early 1990s and still on-going. Essentially, two ministries, MACO and the MSS, are running similar programs focusing on the distribution of agricultural inputs. Primarily, PAM focus on smaller scale farmers, while the FSP's package is designed for the farmers who grow maize in one hector. On the other hand, MACO staff, including CEOs, is deeply involved in PAM so that the agriculture-oriented program can be technically supported.

It should be emphasized that the program is aiming to encourage the private sector in agricultural-inputs supply and is focused on smallholder farmers, that is, the government is not willing to dominate the sub-sector of input supply.

[1] Based on the total number of households (1,884,741) and rural population (6,458,729) in 2000 (National Census of 2000). Number of rural households is estimated based on the portion of rural population (65%).

[2] Based on "Budget speeches 2006-09" referred to by "Participatory Review of the Ministry of Agriculture and Cooperatives (MACO) Performance in assuming its Leadership role in promoting Agriculture as the Engine of Growth and Poverty Alleviation in Zambia, Report on Phase One (Draft) (April 2009).

2) Beneficiaries

Not all the smallholder farmers can receive the full range of benefit from the program; certain criteria are applied to the selection of beneficiaries. First, beneficiaries have to be a member registered cooperative or a farmers' organization so that the organization can select the potential beneficiaries based on the criteria. To be eligible, a person:

- Is small scale farmer and actively involved in farming within the cooperative's coverage area;
- Has the capacity to grow one to five hectares of maize;
- Has the capacity to pay obligated amount (25% in 2008/09) of the cost of inputs;
- Does not concurrently benefit from the Food Security Pack (see the box); and
- Is not a defaulter from the Food Reserve Agency and/or any other agricultural credit program whether belonging to an eligible cooperative or not.

3) Procedure

Specific procedure or a condition of payment may change each year. For the cropping season 2008/2009, the procedure, which is also shown in Figure 1.2.1, was formulated as follows:

a) Selection of cooperative or farmers groups

District Agricultural Committee (DAC), in collaboration with the local leadership (MPs, DCs, NGOs, village headmen etc.), pre-selects the cooperatives and farmers organizations. Then, the Program Coordination Officer (PCO) makes a final verification and approves the beneficial organizations. For the selection, following criteria are applied:

- Have written by-laws to manage their funds and have appropriate accountability mechanism;
- Have an executive committee structure and operate a bank account;
- Demonstrate the need and ability to use the inputs well;
- Duly registered by the Register of Cooperative Societies or Register of Societies;
- Have no outstanding loans from the past seasons from FRA or any other lending institution
- Located in an agricultural area and engaged in agricultural activities; and
- Demonstrate knowledge in cooperative and agribusiness management.

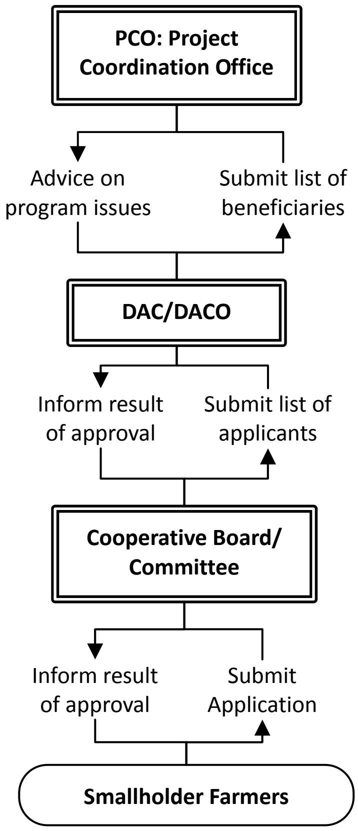


Figure 1.2.1 Application and Appraisal Process of FSP

b) Application

After cooperative or farmers' organization are selected, the cooperative board or committees of farmers' organization together with CEO hold a meeting for farmers to explain rules and modalities of the program. Farmers are required to fill up the application form, which will be endorsed by the CEO. List of applicants is then prepared by the board or the committee and submitted to the DACO through the CEO.

c) Appraisal

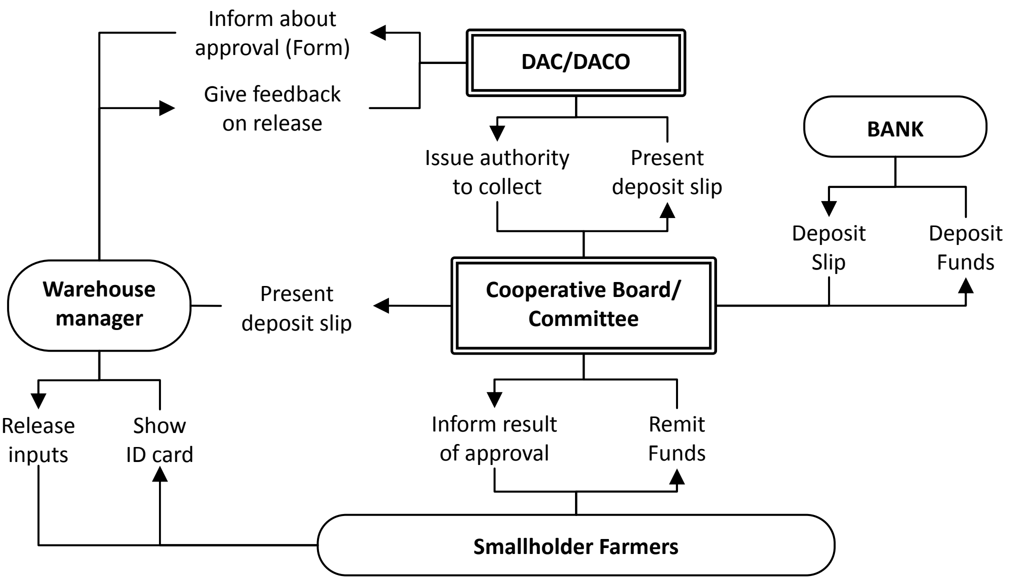
At the district level, District Agriculture Committee (DAC), which was originally created under the Agricultural Sector Investment Program (ASIP)[3], appraises cooperatives, farmers' organization, and beneficial farmers based on the criteria mentioned above. In so doing, block extension officers, representative from Zambia police, and senior district representative from FRA are also invited. In the appraisal process, it is checked if inputs are rationally allocated, total sum of inputs does not exceed the district allocation, and the entire process is in line with the guideline. DACs are responsible for all the process and are accountable to Provincial Agricultural Coordinators Officer (PACO) and the PCO. Then, the PCO creates a database of all the approved applicants and check the whole process. The members of DACs are as follows:

- District Agricultural Coordinator (DACO)
- District Marketing and Cooperatives Officer (DMCO)
- Senior Agricultural Officer (SAO)
- District Planner from council
- Representative from the Office of the President
- Representative from the District Cooperative Union
- Primary Cooperatives Members (one from each block), and
- Representative from Zambia National Farmers Union (ZNFU).

d) Distribution

DACO informs the cooperative board or committee so that they can inform the result to the member farmers. Then, as shown in Figure 1.2.2, board or committee:

- Collect the required amount of money from the approved applicants,
- Collect deposit slips from DACO,
- Deposit the money in a special account approved by PCO,
- Submit evidence (bank slip) to DACO that funds are remitted,
- Present bank slip to warehouse manager, and
- Inform all the approved applicants about the distribution arrangement.



[3] Agricultural Sector Investment Program (ASIP) was initiated by the World Bank as one of the sector approaches focusing on infrastructure development in the agriculture sector for the period of 1998 to 2001.

Figure 1.2.2 Distribution Process of Fertilizer Support Program (FSP)

Source: Fertilizer Support Programme (FSP), Implementation Manual 2008/2009 Agricultural Season, MACO.

If DAC approved the applications, DAC issues an authority to collect input and inform it to warehouse manager so that individual farmers can collect the inputs upon the presence of their identification card at the satellite depot.

4) Achievement

Since the beginning of the program, amount of fertilizer delivered has been kept around 50,000 metric tones or more. The farmers' contribution rate was originally 50% of the input cost; however, it was once increased to 60% in 2006/07 and again to 75% in 2008/09. As the number of beneficiaries remains as high as 200,000, it suggest that this program is gaining its significance year by year, implying some inconsistency with the primary objective of the program: "reducing government involvement" in the supply of agricultural inputs.

Table 1.2.1 Estimated Achievement of Fertilizer Support Program (FSP)

Year	No. of Beneficiaries Estimated	Amount of Fertilizer Delivered (Mt*)	Amount of Maize Seeds Delivered (Mt)	Subsidy Rate
2002/03	120,000	48,000	2,400	50%
2003/04	150,000	60,000	3,000	50%
2004/05	115,000	46,000	2,500	50%
2005/06	125,000	50,000	2,500	50%
2006/07	210,000	84,000	4,200	60%
2007/08	125,000	50,000	2,550	60%
2008/09	200,000	80,000	N/A	75%

Source: Fertilizer Support Programme (FSP), Implementation Manual 2008/2009 Agricultural Season, MACO.
Note: "Beneficiaries" are defined as "smallholder farmers" in the source. *: Metric tones.

5) Allocation for the Year 2008/09

As of the cropping year 2008/2009, 200,000 bags of fertilizer coupled with necessary seeds of maize were planned to be distributed, of which, 14% and 5% were reserved for Northern and Luapula provinces. The largest portions were for Central (17%), Eastern (18%) and Southern (18%). Provided that each beneficiary is a head of household, the number of targeted beneficiaries is equivalent to 11% of the total number of households in 2000, ranging from 3% in Western province to 19% in Central province.

Table 1.2.2 Input Allocation of FSP in Each Province for the year 2008/09

Province	Targeted Beneficiaries/Packs		Beneficiaries Per Total No. of H/H	Total Fertilizer Allocation (Mt)	Total Seed Allocation (Mt)
Central	34,296	17%	19%	13,718	686
Copper belt	25,040	13%	9%	10,016	501
Eastern	36,960	18%	15%	14,784	739
Luapula	9,560	5%	6%	3,824	191
Lusaka	14,400	7%	5%	5,760	288
Northern	28,344	14%	11%	11,338	567
N/Western	10,160	5%	9%	4,064	203
Southern	36,216	18%	18%	14,486	724
Western	5,024	3%	3%	2,010	100
Total	200,000	100%	11%	80,000	4,000

Source: Fertilizer Support Programme (FSP), Implementation Manual 2008/2009 Agricultural Season, MACO.
Total number of household is for the year 2000 (CSO).
Note: Due to the rounding, the total may not be the same as the sum of each number in the column.

In the study area, on the other hand, districts of Kawambwe (33%) and Mansa (31%) in Luapula and Isoka (14%), Kasama (14%), Mbala (20%) and Mpika (13%) are given higher priority as shown below. In terms of the ratio of the targeted beneficiaries per total number of households in each district, Kawambwa (15%) and Milenge (11%) are given higher priority in Luapula province, while Isoka (20%), Mbala (18%), and Nakonde (16%) enjoy a relative importance among all the districts in Northern province.

Table 1.2.3 Input Allocation of FSP in Each District for the year 2008/09

Province/ District	Targeted Beneficiaries/Packs		Beneficiaries Per Total No. of H/H	Total Fertilizer Allocation (Mt)	Total Seed Allocation (Mt)
Luapula					
Chienge	616	6%	3%	246	12
Kawambwe	3,200	33%	15%	1,280	64
Mansa	3,000	31%	8%	1,200	60
Milenge	616	6%	11%	246	12
Mwense	616	6%	3%	246	12
Nchelenge	312	3%	1%	125	6
Samfya	1,200	13%	3%	480	24
Total	9,560	100%	6%	3,824	191
Northern					
Chilubi	272	1%	2%	108	5
Chinsali	2,240	8%	9%	896	45
Isoka	3,920	14%	20%	1,568	78
Kaputa	480	2%	3%	192	10
Kasama	4,000	14%	11%	1,600	80
Luwingu	1,320	5%	8%	528	26
Mbala	5,600	20%	18%	2,240	112
Mpika	3,792	13%	13%	1,517	76
Mporokoso	1,360	5%	9%	544	27
Mpulungu	800	3%	6%	320	16
Mungwi	2,160	8%	9%	864	43
Nakonde	2,400	8%	16%	960	48
Total	28,344	100%	11%	11,338	567

Source: Fertilizer Support Programme (FSP), Implementation Manual 2008/2009 Agricultural Season, MACO.
Total number of household is for the year 2000 (CSO).
Note: Due to the rounding, the total may not be the same as the sum of each number in the column.

According to the TSB Northern province, it is anticipated that the number of bags per a unit of package will be reduced from 8 bags/ha/unit to 4 bags/0.5ha/unit in next agricultural season so that more farmers can benefit out of same amount of budget. Also, even the smallholder farmers who have smaller size of farmland, less than a hector, and used to form a group to share the fertilizer in the past can be the beneficiaries of the program.

1.3 Past and On-going Project in Agriculture Development

1.3.1 Agriculture Support Program (ASP)

Supported by Swedish International Development Cooperation Agency (SIDA), Agriculture Support Program (ASP) had been carried out in 2003-2008. The program was operated in a total of 242 camps in 22 districts of four provinces: Central, Southern, Eastern and Northern provinces. To improve food and nutritional security and to increase income through agriculture-related business, the program was implemented with a total of four components: i) entrepreneurship building, ii) agriculture development, iii) infrastructure development, and iv) service delivery and outreach improvement.

The ASP promoted farming as a business rather than a mere means of sustenance, whereby a total of 44,000 smallholder farmers are trained. To provide a series of technical trainings, infrastructure development, and resource mobilization, management unit and facilitation units were constituted. In the five-year operation, SEK 330,263,149, or US$ 43,326,269 (at 7.6227SEK/US$ as of July 22, 2009) had been spent, of which 49% was spent for the administration and management including mobilization of management unit and facilitation teams.

One of the unique features of the program was found in the management and funding system. Management unit at the central (Lusaka) provided technical, financial, and logistical support directly to the facilitation teams on the ground which was composed of district coordinators, CEOs, and so-called “own facilitators” hired with the program budget. Through those facilitation teams, the above listed supports were provided to the form of interest groups rather than individual farmers.

Table 1.3.1 Outline of Agriculture Support Program (ASP)

Item	Description		
Name	Agriculture Support Program (ASP)		
Organization	Zambia: MACO/ Donor: SIDA		
Period	2003-2008	Budget	US$ 45 million
Target Area	A total of 242 camps in 20 districts in Central, Southern, Eastern and Northern provinces (In Northern, Mpika and Kasama are included)		
Objectives	1) Improve food and nutritional security 2) Increase income through sale of mainly agricultural and agricultural related products and services		

Source: Agriculture Support Programme, 2003-2008, End of Programme Report Draft

1.3.2 Agricultural Development Support Project (ADSP)

The Agricultural Development Support Project (ADSP) aims to improve smallholders' access to markets and the competitiveness of their agricultural commodities. Adopting a value chain approach, the project focuses on high potential agricultural areas so that all levels of the chains are operating efficiently and increasing value added. To this end the project is promoting the development of a network of well functioning and competitive value chains and supporting the improvement of the public sector's capacity.

The project components include i) support to farmers and agribusiness enterprises, ii) institutional development, and iii) project management and coordination. The first component includes supply chain credit facility that is to provide credit to agro-enterprises, traders and commercial farmers; matching grant, providing financial resources for innovating business on a matching basis; and development of rural road network. Pilot project of rural road development is being carried out in a total of three districts in Southern and Eastern provinces.

Institutional development component is focused on MACO’s core functions such as data and policy analysis, monitoring and evaluation, market information and capacity and seed certification and control. The target groups include Department of Policy and Planning, Agricultural Marketing Information Center (AMIC), Seed Control and Certification Institute (SCCI), and Zambia Agricultural Research Centre (ZARI).

For the project implimentation, the African Development Bank (AfDB) agreed to coordinate through its proposed Smallholder Agricultural Production and Marketing Support Project (SAPMSP); The World Bank finances to road construction, value chain strengthening, and a line of credit, while AfDB is supposed to address capacity building of farmer groups, provision of extension services and support to rural seed industry and livestock production.

Table 1.3.2 Outline of Agricultural Development Support Project (ADSP)

Item	Description		
Name	Agriculture Development Support Project (ADSP)		
Organization	Zambia: MACO/ Donor: The World Bank		
Period	2006-2012	Budget	US$ 40 million (US$37.2M Granted)
Target Area	Whole Country (High potential area of agriculture)		

Objectives	improve smallholders' access to markets and the competitiveness of their agricultural commodities

Source: Project Appraisal Document (The World Bank 2006)/ The World Bank's website

1.3.3 Food Crop Diversification Support Project for Enhancement of Food Security (FoDiS)

Food Crop Diversification Support Project for Enhancement of Food Security (FoDiS) is a technical cooperation project funded by JICA. Through capacity development of Zambia Agricultural Research Institute (ZARI), it aims to diversify food crops in drought-prone areas that include Luapula, Southern, and Eastern provinces. By diversifying the crop production with cassava, sweet potato etc., it is expected to mitigate the risk in maize production that is largely influenced by climate change.

The project is composed of four components: i) strengthening the propagation and distribution system for improved varieties of cassava and sweet potato; ii) identifying and production of drought-tolerant crops other than cassava and sweet potato; iii) accelerating the existing agricultural extension activities for the increased production of target crops; and iv) promoting the technologies on food processing, preservation, and other use of the food crops.

FoDiS is focusing on the improvement of research and extension functions of MACO in the drought prone area. To this end, officers and researchers in ZARI are being trained on the matter of propagation of the target crops, while the extension officers at the district level are involved in the extension process of those improved varieties to the target farmers. One of the target provinces of the project, namely Luapula province, is also included in the JICA Study.

Table 1.3.3 Outline of Food Crop Diversification Support Project for Enhancement of Food Security (FoDiS)

Item	Description		
Name	Food Crop Diversification Support Project for Enhancement of Food Security in Zambia (FoDiS)		
Organization	Zambia: ZARI of MACO/ Donor: JICA		
Period	On going	Budget	N/A
Target Area	ZARI's central and regional offices in Northwestern, Luapula, Southern, Eastern provinces		
Objectives	Diversify food crops in draught-prone areas in Zambia for mitigating too much dependence on maize		

Source: Project outline (written in Japanese, FoDIS 2009)

1.3.4 Participatory Village Development in Isolated Areas (PaViDIA)

Participatory Village Development in Isolated Areas (PaViDIA) is a technical cooperation project funded by JICA. It has been implemented since 2002 and completed in 2009 right after the Study was started. PaViDIA's project objective was to reduce poverty by improving food security and by stimulating local economy in the isolated area. To this end, it employed a participatory approach named "Participatory Approach to Sustainable Village Development (PASViD), by which ownership of villagers can be nurtured.

The project implemented a number of micro projects. The micro project was composed of three components: i) provision of seed money for agricultural oriented income generation activities, ii) infrastructure development, iii) trainings on income generation activities. For the implementation of micro projects, seed money was provided at US$ 100 per household for a group of villagers.

To support the implementation process, MACO's existing organization structure was fully utilized; CEOs were the ones who actually help villagers prepare their proposals, formulate plans and implement the micro projects. By the end of 2008, a total of 62,640 villagers of 10,440 households in 87 villages in isolated area had been benefited by the project.

Some of the target districts of the project, such as Mpokorokoso and Luwingu, were within the Study are. Also, provincial operation units, abbreviated by "POR," were established in Luapula and Northern provinces. Although irrigation development was not the main component of PaViDIA, target area was overlapping and it applied a similar extension mechanism to the Study, the Study's irrigation development can be a supplemental activity to the area where micro projects were implemented.

Table 1.3.4 Outline of Participatory Village Development in Isolated Areas (PaViDIA)

Item	Description		
Name	Participatory Village Development in Isolated Areas (PaViDIA)		
Organization	Zambia: MACO/ Donor: JICA		
Period	Phase I: 2002-2007 Phase II: 2007-2009	Budget	US$ 6.2 million
Target Area	Villages located in isolated areas in the whole country		
Objectives	Reduce poverty through food security and by invigorating local economy of the village communities in isolated areas		

Source: PaViDIA Implementation Guidelines (MACO-JICA 2007)/ PaViDIA website/
Pre-evaluation report, Japanese version (JICA 2002)

1.3.5 Program for Luapula Agricultural and Rural Development (PLAD)

Program for Luapula Agricultural and Rural Development (PLARD) addresses the sub-sector of agricultural production, fisheries and aquaculture, and agribusinesses. To ensure increased income and food security in Luapula province, it has four components: i) sustainable fisheries development; ii) agriculture development, iii) agribusiness development and iv) policy, regulation and institutions.

The direct beneficiaries of the program include the fishing communities and the "progressive" and "intermediate" producers and entrepreneurs. Then, poorer segments of the rural and urban communities are defined as indirect beneficiaries. PLARD places an emphasis on the planning stage so as to identify comparative advantages of the province at macro and micro level. The program also employs the sustainable livelihood approach (SLA), by which all the necessary capitals, such as human, social, natural, financial and physical capitals, can be harmonized for the sustainable development.

Also employed is the value chain analysis, by which potential and constraints in each segment of the value chain can be clearly understood and addressed. In its agriculture sub-sector, PLARD addresses the enhancement of access to seeds and planting materials, appropriate technology, and business development services as well as soil fertility improvement. As for the sustainable integrated production systems development, furthermore, integrated wetland production system is being developed as pilot basis, which specifically seeks for the better use of *dambo* area.

Luapula province, the target province of this program, is completely included in the study area of the JICA study. In addition, development of improved farming system in wetland may include the use of smallholder irrigation activities.

Table 1.3.5 Outline of Programe for Luapula Agricultural and Rural Development (PLARD)

Item	Description		
Name	Program for Luapula Agricultural and Rural Development (PLARD)		
Organization	Zambia: MFNP/ Donor: Ministry of Foreign Affaires of Finland		
Period	2006-2010	Budget	US$10.3 million (US$10.0M granted)
Target Area	Luapula province		
Objectives	Develop an efficient, competitive and sustainable agricultural and rural sector, which ensures increased income and food security for the people of Luapula province		

Source: PLARD Program Document (2007)

1.4 Lessons Learnt from Past Experiences

1.4.1 Factors Limiting the Mobilization of CEOs

Outreach is always a big challenge for many agricultural projects or program that internalizes the technology dissemination or service delivery to the remote areas. First of all, number of staff is chronically limited. Although, one CEO is registered in each camp in theory, in actuality, not all the camps are equipped with CEOs. According to some officers in Northern province, only 80% of camps are staffed with CEOs. Although number of CEOs is recently increasing, in those cases, extension network from the central to farmers is unfortunately disconnected, that is, no matter how useful the technical packages are, they may not be delivered to the users.

Donors are/were aware of that rationale and devised countermeasures. For example, due to the vacant in some of the target camps, the ASP had hired a total of 62 "own facilitator." These temporary staff reportedly helped complement the deficit and disseminated necessary technologies in stead of CEOs. It might be an only countermeasure to tackle on the issues in the target villages but it might not help improve the substantial inadequacy of the extension system in the country; what will happen after the completion of the program?

Second, mobilization of the CEOs was found as a significant constraint to the agricultural extension system in Zambia. As one CEO has to cover a wide range of area, 20km squire for an example of Northern province, they absolutely need any means of transportation. Therefore, to begin with, a number of programs/project had to provide a means of transportation not only for the supervisors at the provincial level but also to some CEOs concerned. In the case of the ASP, motorcycles were provided to CEOs in the target camps and on average 20 litters per CEO per month had been supplied; mobilization of the tail end officers was such a big challenge.

Third, it was also mentioned that the qualification of officers was not always in line with what the project/program was aiming to address. In general, a majority of CEOs are the studied general agriculture in agricultural college (diploma) or any agricultural courses (certificate) and thus they usually built their capacity on more practical aspect of farming technologies. Therefore, when introducing improved farming technologies or like, it would best suite to their background and thus higher performance can be expected. However, if dealing with more theoretical arrangements such as "farming as business" or non-farming issues such as processing and marketing, more time has to be secured.

In short, there are a number of negative factors against the mobilization of CEOs. Donors are therefore required to come up with some countermeasures to cope with those factors. In this regard, it is desirable to propose any alternative that can be functional with Zambian resources even after the withdrawal of the donors' assistances. Possible solution might be collaboration with other stakeholders. PLARD, for example, emphasized the importance of collaboration with non-public institutions.

1.4.2 A Direct Funding to CEOs

As mentioned above, fuel cost is a critical factor that has a decisive influence to the extent of the extension service. The government has many times faced a difficulty in delivering the necessary cost for the full mobilization of CEOs on the ground. In addition to the lack of total funding, some CEOs claim that they are not always paid as expected because DACO, their supervisor at the district level, does not acknowledge the importance of CESs' activities or does not put higher priority on them. As a result, very limited funding, if not at all, is often disbursed to cover the cost of CEOs' mobilization.

In this context, an ad hoc funding mechanism was attempted by the ASP in its target area where some target districts of this study are also included. To supplement the mobilization cost of CEOs, the ASP provided a set of funding directly to the CEOs in the target area. To be direct, the ASP established a completely different funding mechanism in parallel with the government's recurrent funding mechanism. First, a project office was established at the central and then all the necessary budgets were disbursed directly to the CEOs of the target camps. It should be noted that DACO or SAO, supervisor of CEOs, was bypassed in this mechanism so that necessary budget can be actually delivered to the CEOs.

It was probably successful in delivering necessary funding, usually 20 to 30 litters a month, surely to the target CEOs, while it might have disturbed the regular interaction between DACO/SAO and CEOs. In this mechanism, DACO did not have much authority to administrate the CEOs. The problematic issue was that DACO and SAO did not have enough funding or did not receive any funding from the ASP for the fuel and thus faced some difficulties in supervising the CEOs. It might have been an ambitious attempt but did not have a concrete exit strategy; the government funding system was not harnessed through this attempt.

Nevertheless, mobilization of CEOs and BEOs is a vital factor in promoting a new technology such as smallholder irrigation and it can be a primary constraint since the coverage area of one CEO is relatively large: 20km squire. Considering the fact that the majority of the CEOs in the study area do not have motorcycle, or sometimes bicycle either, unless they received from PaViDIA or the ASP, another extension mechanism should be additionally incorporated. Possible approach may include the distribution of bicycle and/or spare parts rather than just distributing fuel to those who already have motorcycles.

1.4.3 Provision of "Handouts" Alone (a Case of Livestock)

Based on the team's observation and experience, livestock rearing does not seem to be as popular in the Study area as other neighboring countries. When asking about the possibility of making compost, a lot of farmers responded that they did not have any cattle, swine or goat to obtain manure. In such area, livestock rearing is sometimes promoted by donors and NGOs. In a case of World Vision, pigs were provided to each household in Mayanga village in Mbala district, Northern province. However, it turned out that a large number of villagers just abandoned the activity in stead of grazing and multiplying them. Reportedly, major reasons include:

- i) Sensitizing was not enough so that some villagers thought that was just a "present;"
- ii) Villagers were not ready as they did not have any stall to keep;
- iii) Pigs messed up their or neighbors' field crops;
- iv) Pigs were stolen, and
- v) Villagers were not familiar with the procedure of raising pigs.

Farmers in the Study area may not have enough knowledge, experience and necessary establishments for livestock rearing. Therefore, provision of domestic animals may not guarantee the improvement of their livelihood in a long run, or more simply, it may not be sustainable. To be sustainable, therefore, more close and continuous support is necessary from the very beginning of the program: provision of technical assistance, explanatory workshop to the program, selection of farmers who are willing to participate, and also technical and, if necessary financial assistance for the establishment of surrounding facilities. Adverse influence of "hand out" is also addressed by the ASP; it would influence the attitude of farmers and thus make it difficult for the introduction of self-help concept for the next occasion.

1.5 Agriculture in the Study Area

1.5.1 Salient Features in Agriculture in the Study Area

The Study area is largely categorized in the agro-ecological zone III, where maize, cassava, and finger millet dominate with abundant annual rainfall of more than 1,200mm. Although this area is blessed with a plenty of water resource, the area is widely covered with acrisols, which is not very appropriate for agricultural production.

According to the FAO[4], acrisols is “extremely nutrient deficient and acid.” As it is often with high level of exchangeable aluminum which fixes phosphorus in the soil, availability of phosphorus is generally low. In addition, this soil type is fairly susceptible to erosion unless sustainable measures are taken. Thus, in the Study area, soil fertility issues always underlay the agricultural practices.

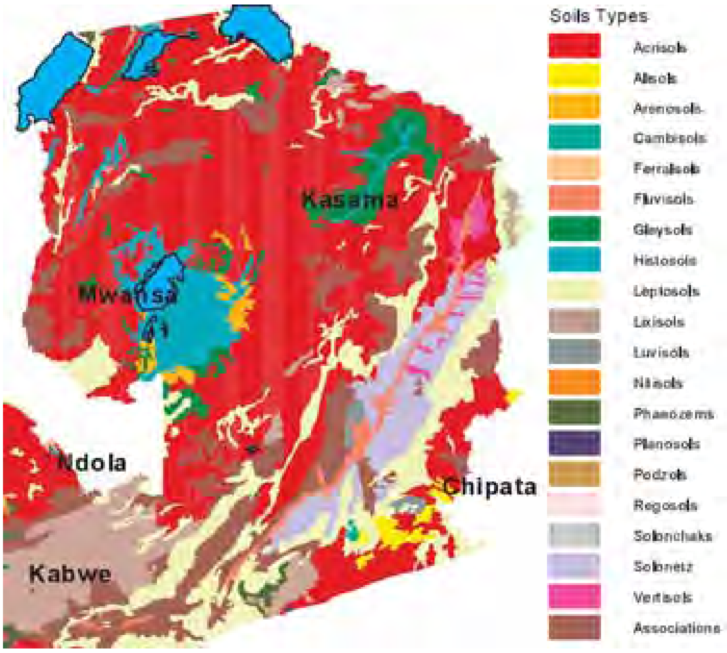


Figure 1.5.1 Soil Types of the Study Area

Source: Soil Survey Unit of Mount Makulu, ZARI (2003)

Majority of the farmers in the area depend on rainfed agriculture, whereby, maize, cassava, beans, and finger millet are cultivated. For example, more than half of the interviewed farmers in the baseline survey answered cassava (52% of the respondents), maize (54%) and beans (56%) are parts of their income source. Farming practices are generally primitive; farmers usually depend on hand hoe for the cultivation. For those who cannot buy enough amount of chemical fertilizer for hybrid maize, cassava comes to the second option as it is relatively tolerant to draught condition.

1.5.2 Agricultural Practice

Majority of the farmers practices rainfed cropping of maize in the rainy season. They usually start planting maize in mid of November and, after exposing the cob under the sun for a certain period of time, harvest it from May in the following year. Some farmers also practice irrigated farming in small scale during the dry season. However, common irrigation method is limited to bucket irrigation. Note that even when farmers get irrigation water by gravity to his/her farm plot, they often scoop water from the furrow (canal) because they usually apply relatively large ridge for dry-season crops and gravity irrigation at the on-farm level may not be functional.

Furthermore, although vegetables are given high appreciation in terms of profitability, there are a case reported that the price of tomato in the dry season became lower than that of rain season. Possible reason behind is a relatively large number of tomato growers in the region; although scale of each farmer’s plot is minimal, there are a considerable number of farmers who can grow tomato around *dambo* area by applying a bucket irrigation. Another reason suggested is related to the cost of agricultural inputs in the rainy season; vegetable production in the rainy season is quite susceptible to

[4] http://www.fao.org/ag/agl/agll/prosoil/acri.htm

disease due to high humidity and then, more agricultural inputs may be required.

Yet, irrigated agriculture is not a major farming practice and, even if it is available, on-farm irrigation method is still inefficient –bucket irrigation. Now, what characterize the area is Chitemene shifting cultivation and Fungikila ridge as explained below.

1) "*Chitemene*" Shifting Cultivation

"*Chitemene*" is known as a form of shifting cultivation, or slash and burn agricultural system, widely practiced in northern Zambia. In this traditional system especially common for Bemba group, crops are planted in a plot after a heap of branches is burned. The land is used for a limited period of time, typically three to four cropping seasons, and the plot is abandoned for succession, reportedly for several years to some decades. *Chitemene* shifting cultivation is unique from the perspective that the actual planting plot is not same as, or far smaller than, the area for lopping; it is said that lopping area is five to eight times as much as the planted area (Stromgaard, 1984[5]). *Chitemene* farmers chop and collect branches from wider range of area so that s/he can enjoy the benefit from the concentrated organic matter to be incorporated into the plot as a form of ash.

In addition, Chitemene may be an indigenous wisdom that the forerunners had developed. As ash has an effect to neutralize the acidity in the soil, it should be suited to the acid soil that covers the most part of the Study area.

Branches are gathered in a center of the plot; they will be burned before the planting season.

According to some observations and interviews in the Study area, Chitemene usually starts right after the rainy season. In and around June, farmers cut branches and shrubs in a place near to the expected farm plot and leave them for drying. Then, by the time they are burned in October-November, those materials are carried and piled up in the center of the field. Note that many mentioned that cutting branches is "man's work" and gathering those branches is "women's work."

After burning, cultivation starts with finger millet and cassava for one instance. In this example, the farmer cultivates groundnuts after finger millet, while cassava remains in the same plot for about two years. After beans are cultivated, one cycle of Chitemene cultivation ends. Every year, those farmers open new land for Chitemene and thus maintain six to seven places at the same time. Chitemene has been a sustainable agricultural practice in many parts of the area where population density is low and forest is still dense. However, urbanized area is no longer suitable for this kind of exploitative arrangement and farmers in those area already gave up doing Chitemene notwithstanding they still prefer Chitemene shifting agriculture for its better production. Today, the government is discouraging farmers to continue Chitemene but there are still a lot of Chitemene area in Northern and Lupapula provinces.

[5] Stromgaard, P. (1984). Field studies of land use under chitemene shifting cultivation, Zambia. Geografisk Tidsskrift 84, 78-85. Copenhagen. Available online at http://img.kb.dk/tidsskriftdk/pdf/gto/gto_0084-PDF/gto_0084_97460.pdf

2) *"Fundikila"*

"*Fundikila*," means "covering" in the local language. It is commonly practiced among the ethnic groups of Mambwe in Mbala, Lungu in Mpurungu, and Namanga in Nakonde and Isoka. This is applied mostly when reclaiming a new farmland. Right after the rainy season, specifically during March to April, a virgin land covered with tall grasses, such as elephant grass, is ploughed and soils are piled up. In some cases it is created as a straight ridge and in other cases in a round shape especially at the north part of the Study area. In so doing, grasses are put under the heap of soil so that they can be decomposed by the time rain season cultivation starts. As the biomass of tall grasses is massive and each cake of soils dug out by hoe is cohesive supported with the root complex, the ridge or heap naturally becomes large. Here is an example of round type *Fundikila*:

"Fundikila," a huge and mound-shape ridge for the decomposition of biomass (50-60cm in height)

On the big heap, farmers usually plant sweet potato, groundnuts and/or beans. Sometimes, these crops are planted altogether in the mound, reminding us of the "three sisters" farming system, which had been practiced by the Native American throughout North America.

Inside of "Fundikila," before covered by soil

Then, at the beginning of the rainy season, November to December, mounds are pulled down and new ridges are formed with that soil, or sometimes just leveled. Note that, the shape of new ridge is no longer round but straight, and the size is also not so big anymore, that is, the *Fundikila* is only applied for the first year of the reclamation as a part of composting process. By this time of the process, biomasses mixed into the *Fundikila* have been, supposedly, decomposed and the soil's fertility and physical structure are to be improved. For the new ridges, finger millet or maize is commonly planted and common type of farming system will continue for three to five years until the soil fertility becomes considerably low.

There are some variations of this farming practice. First, cassava is also planted for the first stage. In this case, farmers cannot fully pull down the mound as cassava's growing period is longer. Thus, farmers plant a cassava plant to the periphery of the mound so that they can pull down other part of the mound when time has come. Afterward, other crops like maize are planted in the space.

3) Mixed System of Extensive and Intensive Agriculture

One of unique characteristics that well illustrate agriculture in the Study area is a mixture of extensive and intensive agriculture. It was always a case in other countries that extensive and intensive farming practices are clearly located away from each other. For instance, irrigation agriculture, one of intensive farming practices, is widely developed in a particular area where condition allows, while rainfed farming practice may be found in upland area with disadvantaged condition—those areas are often separated from each other or clearly divided.

Yet, in the Study area, those intensive and extensive farming practices are located more closely to each other with mosaic-like arrangement. The point is that extensive practice, like *Chitemene* shifting cultivation, is still a major farming practice even in such area where natural condition generally allows intensive farming practice. As a result, *Chitemene* shifting cultivation (left picture) can be sporadically found along a canal (right picture).

A typical *Chitemene* shifting cultivation, wherein maize, cassava, and finger millet are mixed.

A personal irrigation furrow (canal) running right next to the *Chitemene* plot.

Possible reason why irrigated agriculture did not become as common as in other countries notwithstanding the relatively rich water resources in the area is that it was not "necessary." Due to an abundant rain fall, farmers were most likely able to produce their subsistence with their traditional farming system. Secondly, it might have been a drastic change for them to abandon their traditional farming style. Benefit of *Chitemene* shifting cultivation, for example, is to uphold soil fertility by changing their farm plots—staying at a same piece of farm plot means loosing this benefit. In this context, water was not the biggest single bottleneck. Rather, soil fertility is another critical factor that characterizes the agriculture in the area.

To be sure, social situation is gradually changing; in general, lifestyle is being more modernized and cash mattes more in their daily life. For example, although primary education is for free, it cost ZMK 250,000/student per semester in secondary school. To gain more profit for cash, extensive farming practice is no longer the best solution. Now, once necessity is recognized, there should be much incentive for farmers to shift from dynamic and extensive farming style to static and intensive farming style—stallholder irrigation development has a good rationale in today's society in the Study area.

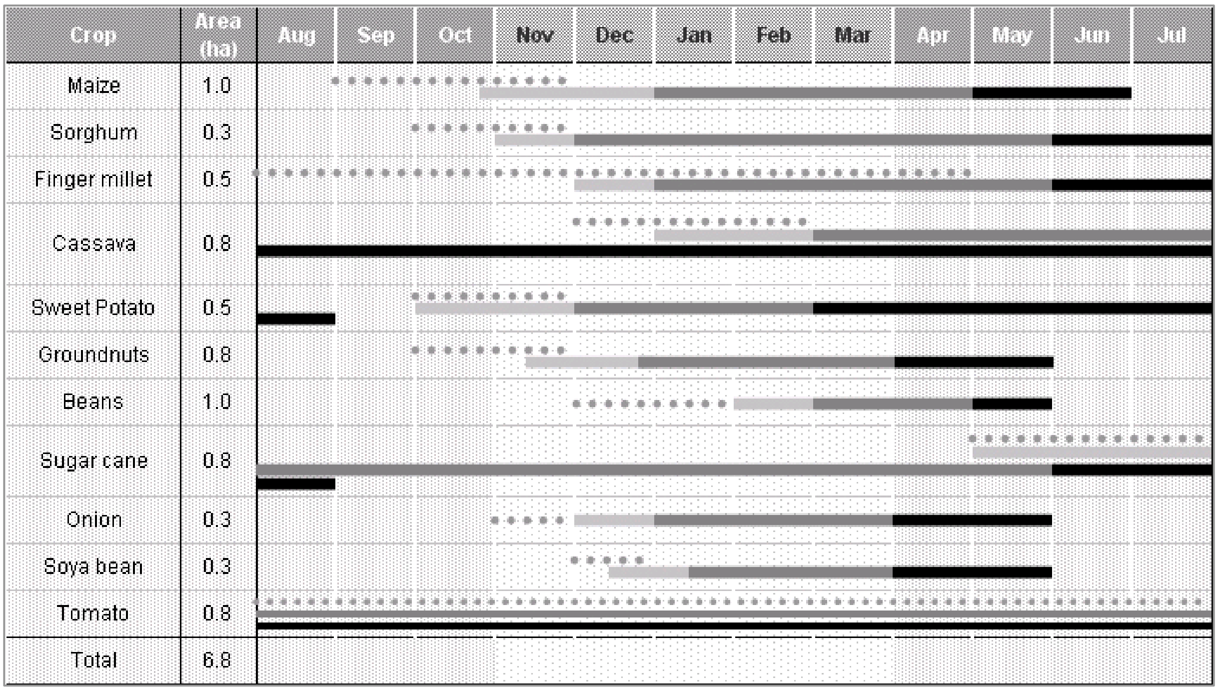
1.5.3 Crop Calendar

Cropping pattern varies farmer by farmer and district by district but here is an example of a crop calendar derived from a group interview to some farmers who represented Molwani village in Kasama district, Northern province. As shown in Table 1.5.1, most of crops are grown in rainy season during November to March. Land preparation of maize, for example, starts in early September and maize is planted during November to December when the first rain of the rainy season can be expected. Maize takes four months or more to harvest. Usually, grains are left on the field for a certain period of time after it matured so that they can become dry enough to harvest.

Sorghum and finger millet have similar seasonal characteristic; cultivated during the rainy season and harvested after the rainy season but have longer period of time for the growth. Cassava and sugarcane, on the other hand, have a longer growing period, which even go beyond a year. As of cassava cultivation, for example, it starts in the middle of the rainy season, that is, farmers prepare land for cassava after they finished planting maize. Then, cassava is grown for a year or so.

Although the Table suggests that harvest can start as early as August, or 7 months after planting, main harvest usually start after a year or around, based on some supplemental interviews. The unique characteristic of cassava is its long harvesting period, lasting for a year. Farmers harvest as much as they need anytime in a year, and this is why statistical information is rarely available. Thus, cassava is given a credit of food security crop for its longer harvesting period coupled with its relative tolerance to low humidity.

Table 1.5.1 Crop Calendar in Molwani Village in Kasama, Northern Province



● ● ● ● Land Prepration, Planting, Growing, Harvesting

Source: JICA Study Team (Baseline Survey)

Note: Tomato can be cultivated anytime in a year.

As the longer period of land preparation suggest, finger millet can also be cultivated in a wired range of period

In a general perception, maize, sorghum, finger millet as well as cassava are well observed under *Chitemene* shifting cultivation or in upland area, while sugarcane, sweet potato, and vegetables are often seen in a periphery of *dambo* area. In addition, crop calendars in different villages derived from the baseline survey are shown with another format as follows:

Table 1.5.2 Crop Calendar in Chipapa Village in Mungwi, Northern Province

Crop	Area (ha)	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul
Maize	0.50												
Beans	0.25												
Ground nuts	0.25												
Soya bean	0.25												
Finger millet	0.50												
Sweet potato	0.25												
Cassava	0.75												
Total	2.75												

Land Preparation Planting Harvesting

Source: JICA Study Team (Baseline Survey)

Table 1.5.3 Crop Calendar in Kalemba Chiti Village in Mungwi, Northern Province

Crop	Area (ha)	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul
Maize	0.25												
Finger millet	0.25												
Beans	0.25												
Groundnuts	0.25												
Cassava	0.75												
Cow peas	0.06												
Total	1.81												

Land Preparation Planting Harvesting

Source: JICA Study Team (Baseline Survey)

Table 1.5.4 Crop Calendar in Molwani Village in Kasama, Northern Province

Crop	Area (ha)	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul
Maize	1.00												
Groundnuts	0.75												
Beans	1.00												
Cassava	0.75												
Finger millet	0.50												
Sugar cane	0.75												
Onion	0.25												
Sorghum	0.25												
Sweet Potato	0.50												
Soya bean	0.25												
Tomato	0.75												
Total	6.75												

Land Preparation Planting Harvesting

Source: JICA Study Team (Baseline Survey)

Table 1.5.5 Crop Calendar in Saise Village in Mbala, Northern Province

Crop	Area (ha)	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul
Maize	0.38												
Beans	0.50												
Finger Millet	0.25												
Cassava	0.50												
Soya bean	0.25												
Sunflower	0.25												
Ground nuts	0.13												
Total	2.25												

Land Preparation Planting Harvesting

Source: JICA Study Team (Baseline Survey)

Table 1.5.6 Crop Calendar in Mayanga Village in Mbala, Northern Province

Crop	Area (ha)	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul
Maize	1.00				15	20							
Finger Millet	0.25												
Groundnuts	0.25												
Beans	0.38												
Cassava	0.50												
Soya beans	0.50					15	15						
Sunflower	0.50					15	15						
Sweet Potato	0.25												
Rape	0.13												
Total	3.75												

Land Preparation Planting Harvesting

Source: JICA Study Team (Baseline Survey)

1.5.4 Area under Cultivation per Household

Table 1.5.7 shows a result for a case study on the share of households that cultivate particular crops among the villagers as well as average sizes of planted area per household, which are derived from the baseline survey in six villages in the Study area. Based on the case study, the most popular crop that the largest number of households cultivates is cassava; of a total 182 households interviewed in the six villages, 169 households, 93% of the interviewee, grow cassava. Similarly, beans, sweet potato, and groundnuts are popular; 79%, 73% and 70% of the respondents are engaged in these crops respectively.

Notwithstanding the fact that maize field can be observed widely in the Study area, both of local and hybrid maize are actually not as popular as above mentioned crops; 48% and 41% respectively. In this result, availability of fertilizer may play an important role. According to some supplemental interviews, those who cannot obtain enough amount of fertilizer do not seem to start cultivating hybrid maize. Given the high cost of chemical fertilizer these days, majority of smallholder farmers may not able to obtain fertilizers.

It is however noteworthy that 87 households, nearly half of the respondents, grow local maize. It is more than what was observed in the area; local maize does not seem to be common. This high ratio may be biased by the terminology of “local,” that is, recycled hybrid maize might also be included because high percentage of households was found applying chemical fertilizer to the “local” maize.

As of the average size of planted areas of each crop per household that actually cultivates designated crops, the biggest one is maize; it reaches to 0.65 ha/household. And the second biggest is cassava at 0.50ha/household. Although these crops have the biggest land area per household, they are actually quite limited in the size. The group of most popular crops has, in tern, far smaller land area under cultivation. Beans, sweet potato, and groundnuts are cultivated about a quarter hector per household. These limited land area imply how hard it is to expand their farmland without farm power mechanization.

Table 1.5.7 Area under Cultivation per Household (Summary)

Crop	No. of HH cultivating	Percentage	Area Planted (ha)	Average area per HH (ha/HH)
Local Maize	87	48%	37	0.43
Hybrid Maize	74	41%	48	0.65
Cassava	169	93%	85	0.50
Beans	143	79%	38	0.27
Sweet Potato	133	73%	38	0.28
Groundnuts	127	70%	35	0.27

Source: JICA Study Team (Baseline Survey)

Note: “HH” stands for “household(s)”/ Number of households and area planted are of the aggregation of six villages. Number of household is for those who cultivate the designated crops. Percentage is for those who cultivate the designated crop among a total of 182 households in the six villages who are interviewed.

Table 1.5.8 Area under Cultivation per Household by Village

Village name	Local Maize			Hybrid Maize			Cassava		
	Average land area per HH	Number of HH	Total Area Per Village	Average land area per HH	Number of HH	Total Area Per Village	Average land area per HH	Number of HH	Total Area Per Village
Lunda	0.38	8	3.0	0.43	12	5.1	0.43	30	12.8
Molwani	0.40	6	2.4	0.70	22	15.4	0.50	27	13.5
Kalemba Chiti	0.33	16	5.2	0.45	4	1.8	0.68	30	20.3
Chipapa	0.38	18	6.8	0.60	8	4.8	0.45	29	13.1
Saise	0.58	19	10.9	0.78	13	10.1	0.40	27	10.8
Mayanga	0.45	20	9.0	0.73	15	10.9	0.55	26	14.3
Total/Average	**0.43**	87	37.3	**0.65**	74	48.1	**0.50**	169	84.7

Village name	Beans			Sweet Potato			Ground nuts		
	Average land area per HH	Number of HH	Total Area Per Village	Average land area per HH	Number of HH	Total Area Per Village	Average land area per HH	Number of HH	Total Area Per Village
Lunda	0.40	19	7.6	0.13	14	1.8	0.28	24	6.6
Molwani	0.20	19	3.8	0.23	26	5.9	0.33	25	8.1
Kalemba Chiti	0.28	27	7.4	0.38	23	8.6	0.35	28	9.8
Chipapa	0.23	28	6.3	0.33	26	8.5	0.20	27	5.4
Saise	0.30	24	7.2	0.15	19	2.9	0.20	9	1.8
Mayanga	0.23	26	5.9	0.40	25	10.0	0.20	14	2.8
Total/Average	**0.27**	143	38.2	**0.28**	133	37.5	**0.27**	127	34.5

Source: JICA Study Team (Baseline Survey)/ Unit: hector

1.5.5 Crop Production and its Yield

Along with the national trend, maize production is the main form of agriculture in the Study area. As shown in Figure 1.5.2, planted area of maize in two provinces reached 144,981 ha (114,607 ha in Northern and 30,373 ha in Luapula) in the agricultural year 2009/10, which accounts for 29.9% of the total area planted in the two provinces in the same year (484,126 ha). The second major crop was cassava (120,335 ha), which is followed by groundnuts (70,856 ha) and mixed beans (59,080 ha).

It should be noted that cassava is one of the major crops in the two provinces, and actually seen widely in the area. The significance of cassava was also captured in the baseline survey as summarized in above Table 1.5.7and Table 1.5.8. However, as its growing period exceeds more than a year and also it is harvested anytime throughout the year, actual production of cassava is rarely available even in the CSO statistics. Fortunately, the CSO data of 2009/10 provides cassava production data based on the assumption that cassava can be harvested 11.7 ton/ha. Therefore, production of cassava in Figure 1.5.2 could be overestimated.

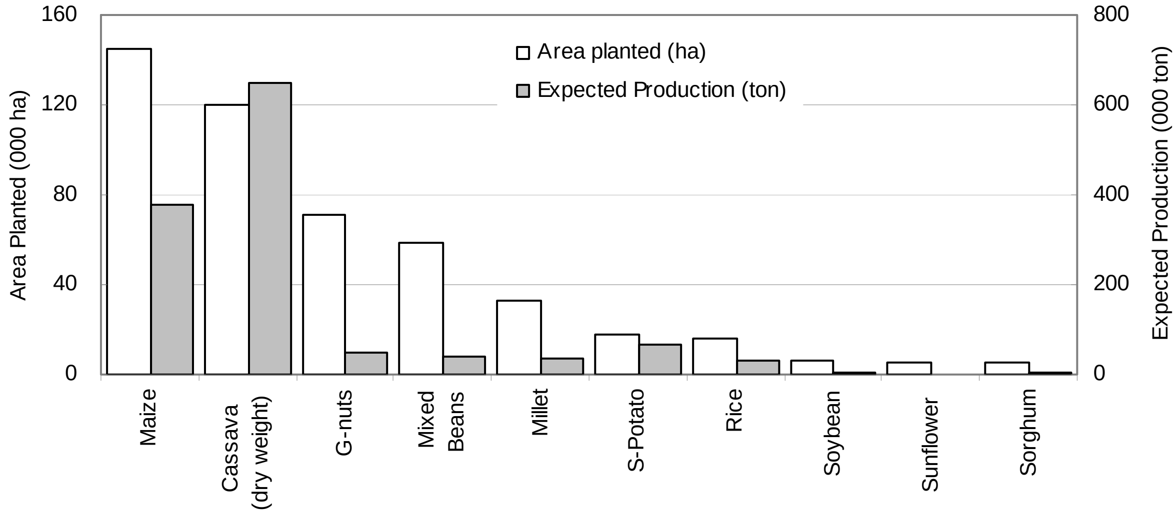


Figure 1.5.2 Production of Different Crops in the Study Area (Luapula and Northern Provinces)

Source: CSO crop data for 2009/10 cropping season
Production of cassava is converted into the dry weight.

Detailed data of the total production in Luapula and Northern provinces are shown below:

Table 1.5.9 Production of Different Crops in the Study Area

Cop	Area planted (ha)	Expected Production (ton)	Yield (ton/ha)
Maize	144,981	377,441	2.6
Cassava (dry weight)	120,335	647,602	5.4
G-nuts	70,856	48,712	0.7
Mixed Beans	59,080	37,972	0.6
Millet	33,268	36,202	1.1
S-Potato	18,046	66,104	3.7
Rice	16,352	30,538	1.9
Soybean	6,024	5,348	0.9
Sunflower	5,258	2,131	0.4
Sorghum	4,925	3,839	0.8
Others	5,002	5,361	1.1
Total	484,126	1,261,250	2.6

Source: CSO crop data for 2009/10 cropping season for Northern and Luapula Provinces.

Furthermore, detailed data in the production of different crops in Luapula and Northern provinces are shown below by district:

Table 1.5.10 Crop Production in Luapula and Northern Provinces in 2009/10

Area Planted (2009/10)

District	Cassava	Bambara nuts	Burley Tobacco	Cowpeas	Ground nuts	Irish Potatoes	Maize	Millet	Mixed Beans	Paprika	Popcorn	Rice	Seed Cotton	Sorghum	Soya beans	Sun flower	Sweet Potatoes	Virginia Tobacco
Chilubi	4,381	64	-	1	798	-	608	60	58	-	-	273	-	18	8	4	71	-
Chinsali	7,755	223	-	83	6,334	-	7,442	6,088	3,768	5	-	4,378	-	74	747	49	2,002	-
Isoka	4,490	185	943	26	3,325	21	15,469	2,078	3,423	-	-	713	-	105	498	431	2,023	-
Kaputa	9,282	9	-	-	1,272	-	2,961	-	18	-	-	2,460	-	3	5	-	75	-
Kasama	5,311	856	-	-	7,591	-	8,750	2,394	5,043	-	-	134	-	25	813	10	2,017	-
Luwingu	5,455	25	19	-	5,287	-	4,435	2,040	8,015	8	-	10	-	69	59	176	281	-
Mbala	6,856	34	41	6	6,643	8	29,414	4,038	12,917	19	18	-	-	1,845	1,062	3,207	512	-
Mpika	2,314	14	-	-	4,287	13	12,926	3,679	3,636	-	26	28	-	246	393	506	3,042	-
Mporokoso	5,804	47	-	-	5,695	-	8,270	3,437	8,114	-	-	12	-	15	375	96	536	-
Mpulungu	1,369	33	-	-	894	-	5,418	366	2,460	-	-	964	-	189	27	7	213	-
Mungwi	9,687	392	2	28	6,215	-	6,937	4,442	3,203	-	-	5,687	-	189	1,209	205	1,266	-
Nakonde	1,714	-	9	120	1,273	19	11,976	2,894	3,138	27	-	650	12	251	616	523	1,342	3
Chienge	9,935	46	-	-	2,394	-	5,408	-	605	-	-	746	-	-	13	1	822	-
Kawambwa	8,574	14	-	27	3,132	-	8,554	804	827	-	-	63	-	2	1	36	282	-
Mansa	12,850	164	-	14	6,439	1	7,407	798	2,799	2	-	75	-	7	114	5	1,696	-
Milenge	2,634	6	-	-	1,062	-	1,319	144	258	-	-	17	-	1,883	12	-	73	-
Mwense	5,872	687	-	-	4,116	-	2,632	3	150	2	-	3	-	2	28	-	336	-
Nchelenge	7,461	188	7	-	2,167	-	3,668	1	552	3	-	48	-	-	10	-	436	-
Samfya	8,591	471	-	30	1,933	2	1,385	-	96	-	-	91	-	1	35	-	1,020	-
Ground Total	120,335	3,459	1,020	336	70,856	62	144,981	33,268	59,080	65	44	16,352	12	4,925	6,024	5,258	18,046	3

Production (2009/10)

District	Cassava (Dry	B-nuts	Burley Tobacco	Cowpea	G-nuts	I-Potato	Maize	Millet	Mixed Beans	Paprika	Popcorn	Rice	Seed Cotton	Sorghum	Soybean	Sunflower	S-Potato	Virginia Tobacco
Chilubi	22,912	41	-	0	459	-	1,884	37	13	-	-	299	-	23	3	4	196	-
Chinsali	37,102	317	-	126	5,263	-	27,620	6,420	2,898	2	-	13,456	-	90	680	24	7,804	-
Isoka	29,066	87	673	5	1,969	16	37,750	2,267	1,523	-	-	1,098	-	195	285	160	3,324	-
Kaputa	37,873	8	-	-	875	-	5,512	-	7	-	-	4,145	-	4	2	-	457	-
Kasama	29,008	1,886	-	-	6,764	-	27,378	3,360	3,878	-	-	299	-	47	685	7	10,250	-
Luwingu	32,962	32	11	-	3,544	-	15,495	2,180	4,502	3	-	22	-	46	43	76	653	-
Mbala	41,210	18	9	3	3,086	26	66,641	2,256	8,385	6	47	-	-	1,110	969	1,036	1,400	-
Mpika	18,988	22	-	-	4,243	21	43,026	5,617	3,073	-	74	22	-	274	375	449	13,719	-
Mporokoso	31,801	20	-	-	2,655	-	13,488	3,002	4,939	-	-	16	-	21	394	28	2,724	-
Mpulungu	10,126	11	-	-	396	-	16,063	222	1,918	-	-	902	-	267	12	3	122	-
Mungwi	50,772	223	1	33	4,771	-	21,915	5,585	2,419	-	-	7,689	-	152	1,165	73	3,760	-
Nakonde	11,300	-	3	37	840	24	31,306	3,553	2,434	5	-	706	4	189	564	256	4,714	1
Chienge	43,594	59	-	-	1,660	-	7,280	-	254	-	-	1,306	-	-	22	1	2,454	-
Kawambwa	42,532	8	-	5	1,821	-	27,069	960	384	-	-	111	-	3	1	14	637	-
Mansa	76,397	62	-	22	5,088	1	18,398	606	1,043	-	-	118	-	3	83	1	7,918	-
Milenge	11,560	9	-	-	758	-	3,070	135	124	-	-	41	-	1,414	2	-	207	-
Mwense	39,390	604	-	-	2,485	-	4,444	2	34	1	-	5	-	0	17	-	948	-
Nchelenge	37,742	141	9	-	981	-	6,218	1	123	1	-	100	-	-	16	-	1,315	-
Samfya	43,266	625	-	20	1,055	3	2,884	-	23	-	-	204	-	1	29	-	3,503	-
Total	647,602	**4,172**	**706**	**250**	**48,712**	**90**	**377,441**	**36,202**	**37,972**	**17**	**121**	**30,538**	**4**	**3,839**	**5,348**	**2,131**	**66,104**	**1**

Source: CSO crop data for 2009/10 cropping season

Looking at the maize plantation and production, furthermore, Northern province is superior to Luapula province as shown in Figure 1.5.3. Among all the districts in the two provinces, Mbala district has the largest planted area and production: 66,641 tons from the planted area of 29,414 ha in the year 2009/10. Those which follow are Mpika (43,026 tons in 12,926 ha), Isoka (37,750 tons in 15,469 ha), and Nakonde (31,306 tons in 11,976 ha). Top six districts in the production of maize are all in Northern province, which are located relatively hilly area in eastern side of the province.

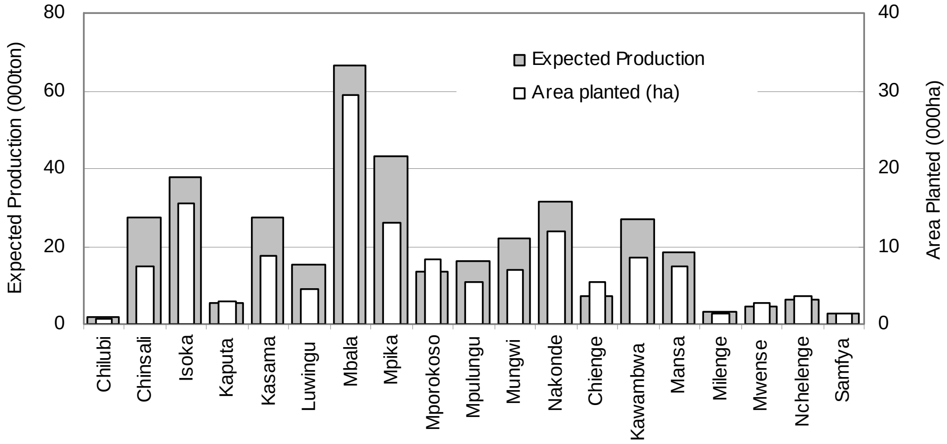


Figure 1.5.3 Maize Production and Area Planted by District in the Study Area

Source: CSO crop data for 2009/10 cropping season

Production level of maize corresponds to the amount of fertilizer inputs. As shown in Figure 1.5.4, the more fertilizer is provided by the FSP/FISP, the greater the production level is. For example, Mbala, the largest production district of maize, received the largest amount of fertilizer in 2009/10 at 2,790 tons, while Chilubi district that demonstrates the least production actually received the least amount of fertilizer (155 ton). It can be explained by the distribution policy of FSP/FISP, in which fertilizer is allocated in accordance with the size of the district. Accordingly the result suggests that the maize production in the Study area depends largely on the allocation of chemical fertilizer by FSP/FISP. The high cost of fertilizer in the market may further encourage this tendency as the farmers may not always able to purchase the fertilizer in the market.

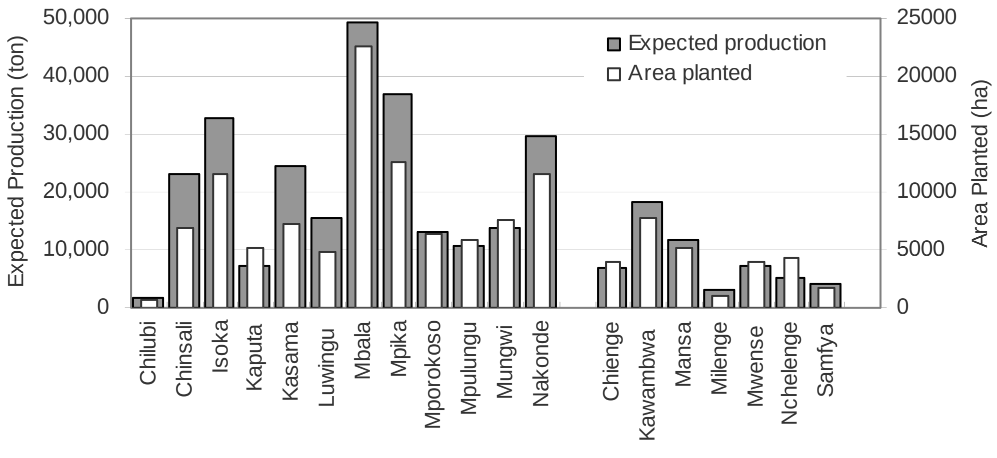


Figure 1.5.4 Maize Production and Distribution of Fertilizer by District in the Study Area

Source: CSO crop data for 2009/10 cropping season

The yield of maize varies among the districts from 1.3 tons/ha in Nchelenge up to 3.7 tons/ha in

Chinsali district as summarized in Figure 1.5.5. On average, the yield in Northern at 2.7 tons/ha is higher than that of Luapula at 2.3 tons/ha. Production was well correlated with the amount of fertilizer distributed as aforementioned. However, comparing the yield level to the FISP's fertilizer distribution, they do not necessarily correspond to each other; a large volume of fertilizer distribution does not guarantee high yield. It implies that the Study area is characterized by more extensive farming practice. In such area where production is large but yield level is low, it is assumed farmer apply a limited amount of fertilizer per unit of land but apply to a larger extent of land.

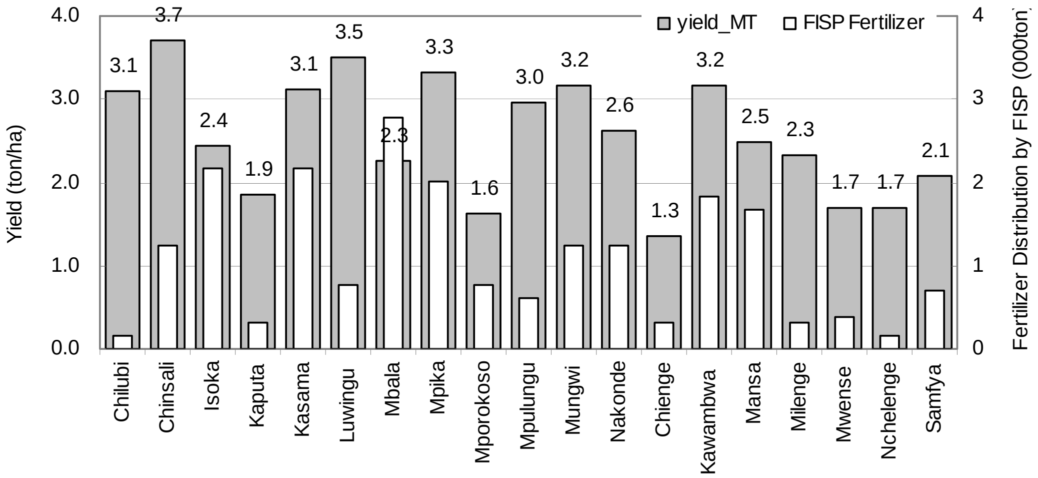


Figure 1.5.5 Yield of Maize and Distribution of Fertilizer by District in the Study Area

Source: CSO crop data for 2009/10 cropping season

Note: estimated from the expected production and the area harvested

1.5.6 Production of Major Staple Foods by Geographical Location

Production level of maize per capita varies within the Study area. As geospatial data in Figure 3.5.9 shows, there is a tendency that eastern side of the Study area has relatively higher production of maize per capita. For instance, Isoka district, located at the eastern end of the Study area, shows the highest – more than 300kg/capita, while Mansa, Mwense and Nchelenge, the western end of the Study area, indicate the lowest – below 100kg/capita. This result generally corresponds with the topography of the Study area: higher in eastern side and lower in western side. It is likely that maize is planted intensively under *Chitemene* shifting cultivation on hilly upland in the eastern side. With the help from the natural fertility from virgin soil or neutralized soil, farmers can enjoy higher productivity of maize in such area.

Being a staple food, cassava production per capita is significant in both provinces, although data is quite limited. Though the aforementioned source, CSO 2008/09, does not show correct picture in cassava production, there is an available data by CSO for cassava in 2005/06 season which looks reflecting the real situation. The data shows that the per capita production of cassava in 2005/06 agricultural season was 314kg/capita in Northern province and 405kg/capita in Luapula province, which is far larger than the national average of 92kg/capita in the same year.

When looking into the cassava production by geographical location, production level of cassava per capita shows completely opposite tendency against that of maize. As the geospatial data in Figure 3.5.10 shows, it is the highest at Mwense, the far west side of the Study area. The highest district, 400-425kg/capita, and the second highest group, 300-400kg/capita, are concentrated in Luapula province where there area big low land area along Luapula river. One possible scenario can be, not necessarily proved though, that farmers in those districts can have a great deal of access to the market in DRC, where the population prefer cassava as staple food, legally and illegally and thus farmers in Luapula are motivated enough to produce cassava in stead of maize.

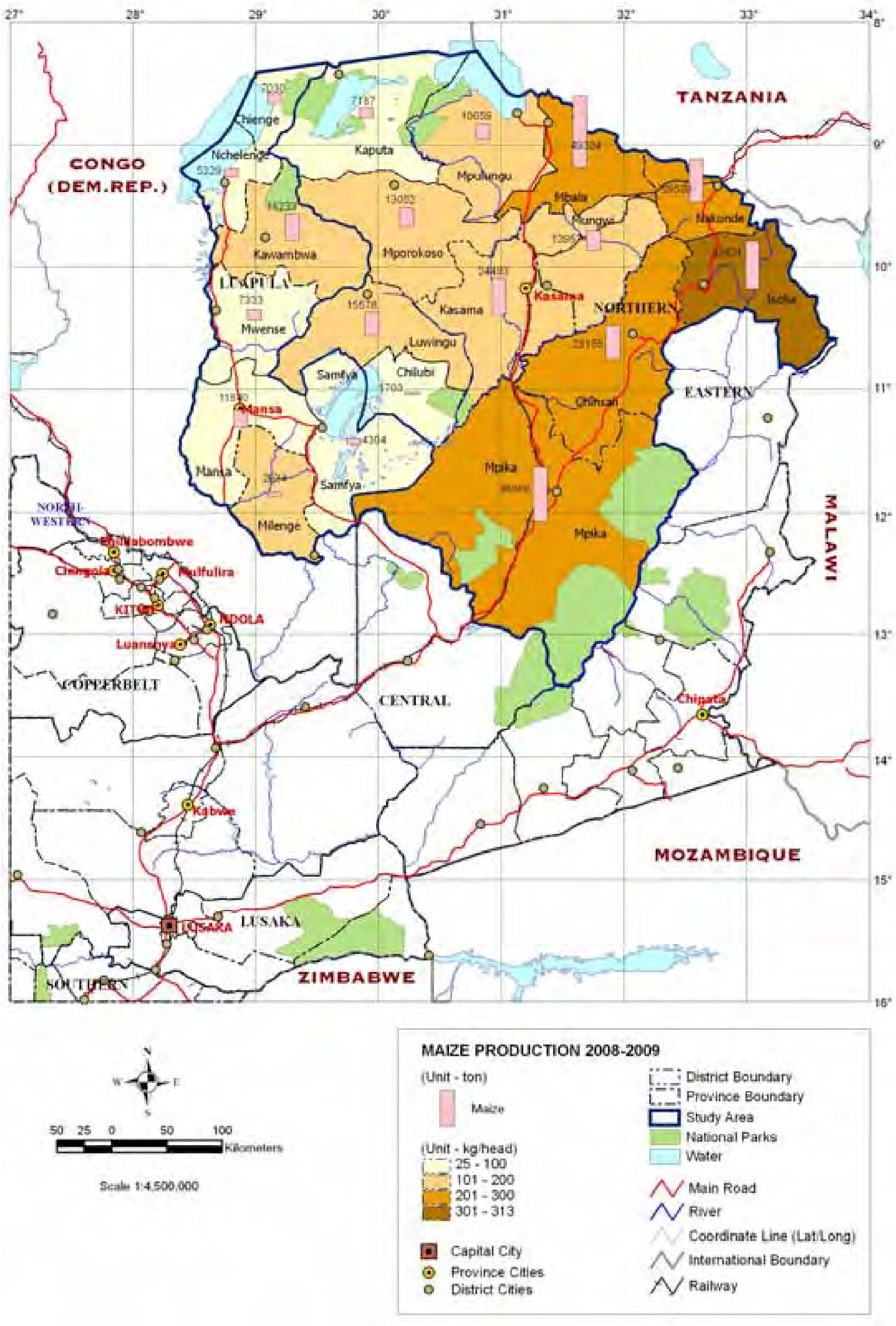


Figure 1.5.6 Maize Production Per Capita by District (2008/09)

Source: Production/ CSO crop data (2008/09), Population/ calculated based on CSO population data

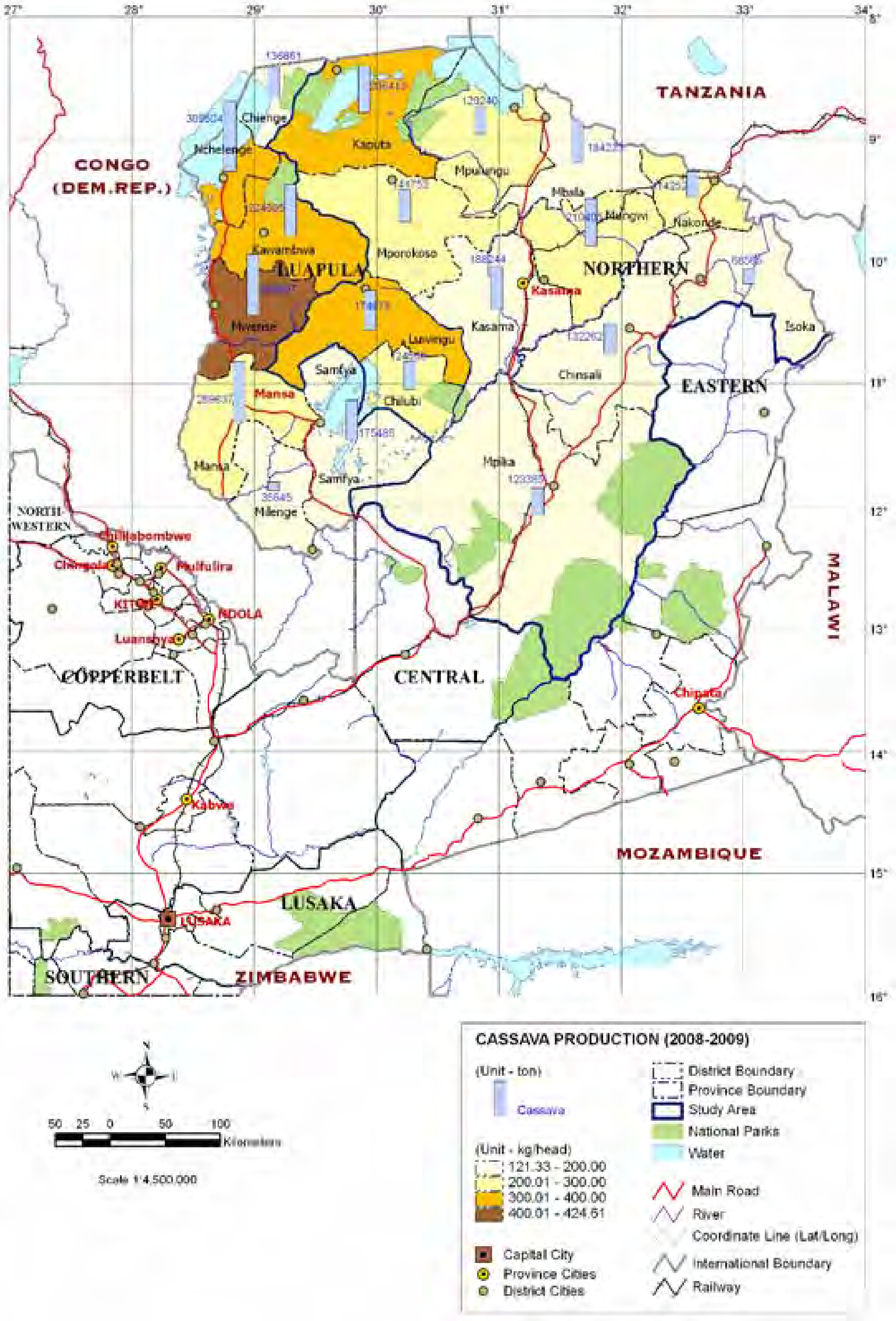


Figure 1.5.7 Cassava Production Per Capita by District (2005/06)

Source: Production/ CSO crop data (2008/09), Population/ calculated based on CSO population data

1.5.7 Balance in Crop Production and Consumption by District

Figure 1.5.8 shows the per capita production of cereal crops by district and province, which includes maize, sorghum, millet, and rice. On average, people in Northern province produces 226 kg/capita, while ones in Luapula province face a deficit; it reached only 72 kg/capita. As for the districts, Mbala, Isoka, and Nakonde marked more than 300 kg/capita, suggesting that they have enough surpluses to export to other regions including the neighboring countries..

On the other hand, Chilubi and Kaputa district in Northern province and most of districts in Luapula province except Kawambwa and Milenge encounter the shortage; they go under 100 kg/capita that is equal to approximately 1,000kcal/ day per capita[6]. As discussed, there are big differences in per capita cereal production among the districts.

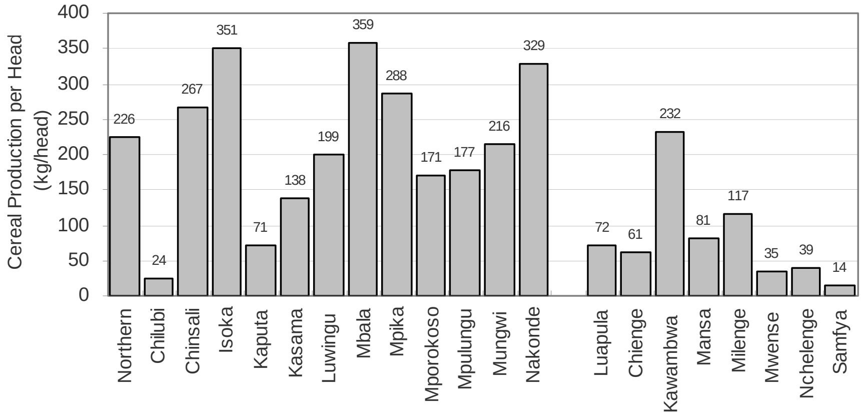


Figure 1.5.8 Cereal Production Per Capita in the Study Area (2009/10)

Source: Production/ CSO crop data for 2009/10 cropping season;
Population 2009/ Estimated based on the national census of 2000

Table 1.5.11 Cereal Production Per Capita in the Study Area (2009/10)

District	Cereal Production 2009/10 (ton)					
	Maize	Sorghum	Millet	Rice	Cereal Total	kg /head
Northern Province						
Chilubi	1,884	23	37	299	2,243	23.6
Chinsali	27,620	90	6,420	13,456	47,586	266.7
Isoka	37,750	195	2,267	1,098	41,310	351.1
Kaputa	5,512	4	0	4,145	9,660	71.4
Kasama	27,378	47	3,360	299	31,083	138.2
Luwingu	15,495	46	2,180	22	17,743	199.1
Mbala	66,641	1,110	2,256	0	70,007	358.6
Mpika	43,026	274	5,617	22	48,939	287.6
Mporokoso	13,488	21	3,002	16	16,527	171.3
Mpulungu	16,063	267	222	902	17,454	176.8
Mungwi	21,915	152	5,585	7,689	35,341	216.0
Nakonde	31,306	189	3,553	706	35,754	328.6
Total	308,078	2,418	34,498	28,653	373,647	225.5
Luapula Province						
Chienge	7,280	0	0	1,306	8,586	61.1
Kawanbwa	27,069	3	960	111	28,143	231.8
Mansa	18,398	3	606	118	19,126	80.8
Milenge	3,070	1,414	135	41	4,659	116.7
Mwense	4,444	0	2	5	4,452	34.9
Nchelenge	6,218	0	1	100	6,318	38.9
Samfya	2,884	1	0	204	3,090	14.3
Total	69,363	1,421	1,704	1,885	74,373	72.2
Study Area Total	377,441	3,839	36,202	30,538	448,020	167
Share	84%	1%	8%	7%	100%	

Source: Production/ CSO crop data for 2009/10 cropping season;
Population 2009/ Estimated based on the national census of 2000

[6] As maize shares 83% of the total cereal production, energy contents of maize was applied for the estimation. According to USDA, Agricultural Research Service, Nutrient Data Laboratory, energy content of maize (corn) is estimated at 365kcal/100g.

A large number of rural populations in the area consume starch as a form of cassava, sweet potato, and some Irish potato. Based on CSO agricultural production data of 2009/10, per capita production of starch crops at dry weight (20% of fresh weight) averaged 219 kg/capita in Northern province and 289 kg/capita in Luapula province. By district, Luwingu, and Kawambwa demonstrate relatively good; more than 350 kg/capita (Figure 1.5.9). Note that the production of cassava is estimated based on 11.7ton/ha by the CSO and thus it could be overestimated.

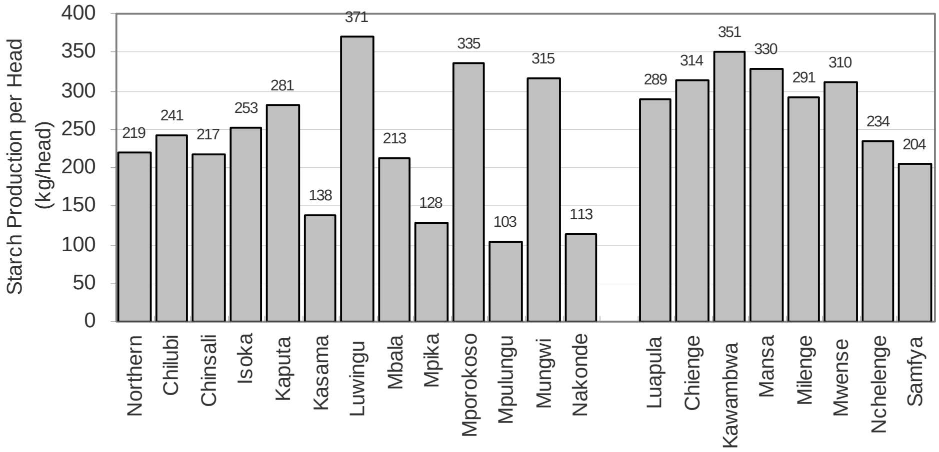


Figure 1.5.9 Starch Production Per Capita in the Study Area (2009/10)

Source: Production/ CSO crop data for 2008/09 cropping season;
Population 2009/ Estimated based on the national census of 2000
Weight is converted from to dry weight based on the water content of sweet potato (80%).

Table 1.5.12 Starch Production Per Capita in the Study Area (2009/10)

District	Starch Production 2009/10 (ton)				
	S-Potato	Cassava	I-Potato	Starch Total	kg /head
Northern Province					
Chilubi	196	114,561	0	114,757	241
Chinsali	7,804	185,512	0	193,316	217
Isoka	3,324	145,332	16	148,672	253
Kaputa	457	189,366	0	189,823	281
Kasama	10,250	145,040	0	155,290	138
Luwingu	653	164,811	0	165,464	371
Mbala	1,400	206,052	26	207,478	213
Mpika	13,719	94,940	21	108,680	128
Mporokoso	2,724	159,007	0	161,731	335
Mpulungu	122	50,629	0	50,751	103
Mungwi	3,760	253,860	0	257,619	315
Nakonde	4,714	56,498	24	61,236	113
Total	49,122	1,765,608	87	1,814,817	219
Luapula Province					
Chienge	2,454	217,971	0	220,425	314
Kawanbwa	637	212,660	0	213,297	351
Mansa	7,918	381,985	1	389,904	330
Milenge	207	57,799	0	58,005	291
Mwense	948	196,948	0	197,896	310
Nchelenge	1,315	188,708	0	190,023	234
Samfya	3,503	216,331	3	219,837	204
Total	16,982	1,472,402	4	1,489,387	289
Study Area Total	66,104	3,238,010	90	3,304,204	246.0
Share	2%	98%	0%	100%	

Source: Production/ CSO crop data for 2009/10 cropping season;
Population 2009/ Estimated based on the national census of 2000

To obtain rough idea of energy consumption status in the area, Figure 1.5.10 illustrates the total production of cereals and starch per capita per annum. Although it is a simple combination of crop weights in different categories, it implies that the level of crop production in the area is quite satisfactory. On average, the production per capita reached 445 kg/capita in Northern and 362 kg/capita in Luapula provinces. Among all the districts, six districts exceeded 500 kg/capita: Isoka (604 kg/capita), Kawambwa (583 kg/capita), Mbala (571 kg/capita), Luwingu (570 kg/capita), Mungwi (531 kg/capita), and Mporokoso (507 kg/capita). The minimum production per capita was found in Samfya (219 kg/capita), followed by Chilubi (265 kg/capita)—but they are still at a satisfactory level.

Although there was a significant difference in the production of cereal crops alone (Figure 1.5.8), the difference in a total production of cereal and starch is much moderate. For instance, while the maximum production per capita in cereal was 26 times as much as the one in minimum district, the difference between maximum and minimum in the total production is 2.8 times, suggesting that each district has different dieting pattern.

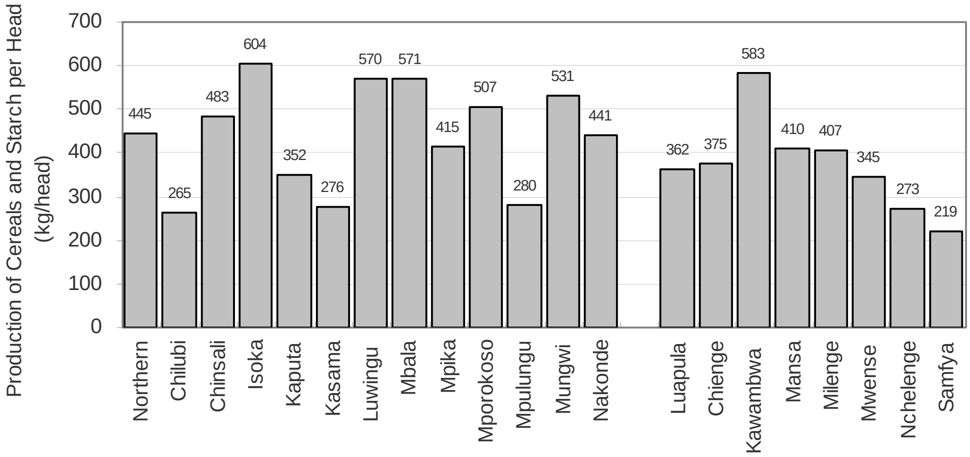


Figure 1.5.10 Production of Cereals and Starch Per Capita in the Study Area(2009/10)

Source: Production/ CSO crop data for 2009/10;
Population 2009/ Estimated based on the national census of 2000
Note: Weight is converted to dry weight based on the water content of sweet potato (80%).

When summing up the production of maize and cassava per capita, the total production far surpasses the minimum requirement of the population in the Study area in terms of the total calories. It can be interpreted that farmers in the Study area is no longer in such situation as to pursue self sufficiency of staple food. Rather, they are in the stage to diversify their diet to improve their nutritious balance – enough rationality to start vegetable production under irrigated agriculture.

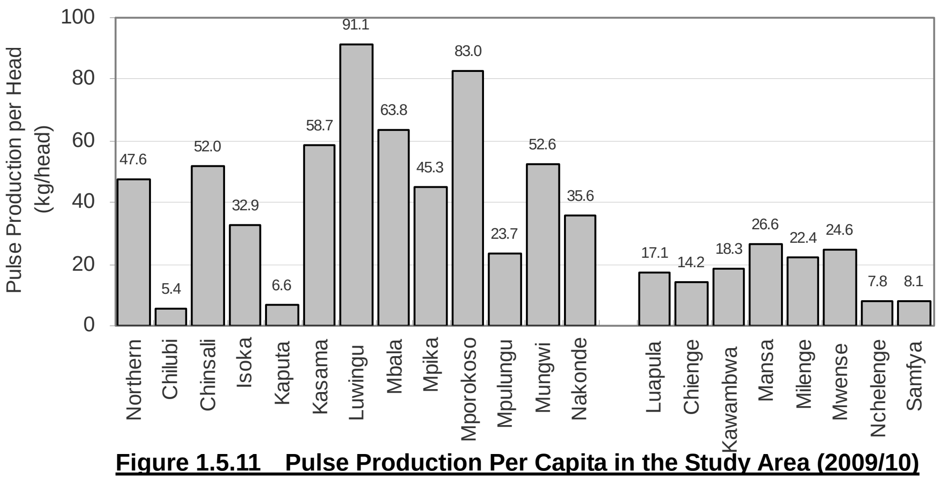


Figure 1.5.11 Pulse Production Per Capita in the Study Area (2009/10)

Source: Production/ CSO crop data for 2009/10 cropping season;
Population 2009/ Estimated based on the national census of 2000

Moreover, groundnuts and mixed beans are major crops of pulse crops in the area. Different from that of cereal crops, Luwingu and Mporokoso are outstanding in per capita production of the pulses. According to an officer who had been a CEO in Luwingu district, the large production of pulses is associated with the allocation of fertilizer under the FSP/FISP. As shown in Figure 1.5.11, Luwingu is allocated a fewer amount of fertilizer from FSP/FISP and thus farmers in this area try to make up for the shortfall by cultivating pulses, which is believed to improve soil fertility at some point.

As discussed, a series of production per capita data make it clear the differences among the districts in the levels of production per capita. Thus, by taking surplus and deficit into consideration, general marketing strategy can be identified.

Table 1.5.13 Pulse Production Per Capita in the Study Area (2009/10)

District	Pulse Production 2009/10 (ton)						
	G-Nuts	Soybean	Mixed Beans	B-Nuts	Cowpea	Pulse Total	kg/head
Northern Pro.							
Chilubi	459	3	13	41	0	516	5.4
Chinsali	5,263	680	2,898	317	126	9,284	52.0
Isoka	1,969	285	1,523	87	5	3,868	32.9
Kaputa	875	2	7	8	0	891	6.6
Kasama	6,764	685	3,878	1,886	0	13,214	58.7
Luwingu	3,544	43	4,502	32	0	8,121	91.1
Mbala	3,086	969	8,385	18	3	12,461	63.8
Mpika	4,243	375	3,073	22	0	7,713	45.3
Mporokoso	2,655	394	4,939	20	0	8,008	83.0
Mpulungu	396	12	1,918	11	0	2,337	23.7
Mungwi	4,771	1,165	2,419	223	33	8,610	52.6
Nakonde	840	564	2,434	0	37	3,876	35.6
Total	34,864	5,178	35,988	2,664	204	78,898	47.6
Luapula Pro.							
Chienge	1,660	22	254	59	0	1,995	14.2
Kawanbwa	1,821	1	384	8	5	2,218	18.3
Mansa	5,088	83	1,043	62	22	6,298	26.6
Milenge	758	2	124	9	0	894	22.4
Mwense	2,485	17	34	604	0	3,140	24.6
Nchelenge	981	16	123	141	0	1,261	7.8
Samfya	1,055	29	23	625	20	1,752	8.1
Total	13,848	170	1,984	1,508	47	17,557	17.1
Ground Total	48,712	5,348	37,972	4,172	250	96,455	35.9
Share	51%	6%	39%	4%	0%	100%	

Source: Production/ CSO crop data for 2009/10 cropping season;

Population 2009/ Estimated based on the national census of 2000

Note: There are some lacks of data for some districts depending on the types of crops

As discussed, a series of production per capita data make it clear the differences among the districts in the levels of production per capita. Thus, by taking surplus and deficit into consideration, general marketing strategy can be identified.

1.5.8 Balance in Crop Production and Consumption by Time

The production of maize has changed significantly especially in the 2000s. As is shown in Figure 1.5.12, the production had been stagnant until 2002, and started increasing. The production in Northern province shows constant increase while Luapula province has not been as much. One of the possible contributors of this increase can be an increase in planted area as shown in Figure 3.5.14. The area planted maize had increased from 54,618 ha in 1999/00 to 114,607 ha 2009/10 in Northern province and 12,440 ha to 30,373 ha in Luapula province. Accordingly, the production had increased from 87,553 tons in 1999/00 to 308,078 tons in 2009/10 in Northern province and 40,282 tons to 69,363 tons in Luapula province. As the planted area had increased to 210% and 244% in Northern and Luapula provinces, the production had increased to 352% and 172% respectively.

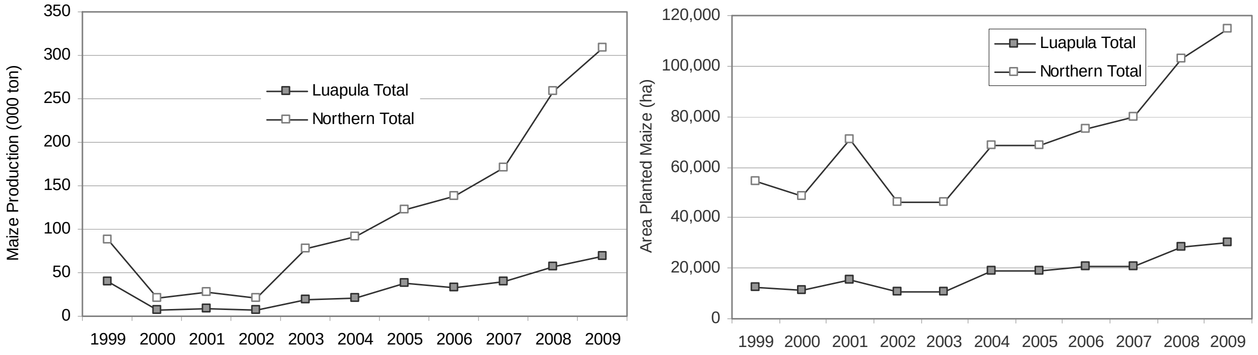


Figure 1.5.12 Area Planted and Production of Maize by Time in the Study Area (1999-2009)

Source: Production/ CSO crop data (1999/00-2009/00)

Note: Because data for 2002 and 2004 are unavailable, dummy data were applied for drawing the graph.

Table 1.5.14 Maize Production by District (1999-2009)

District	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Chienge	1,643	855	1,355	909	2,156		3,375	2,644		7,030	7,280
Kawambwa	5,207	1,835	3,197	1,043	4,715		7,646	10,000		18,233	27,069
Mansa	6,691	863	907	524	2,813		4,028	7,821		11,840	18,398
Milenge	4,296	405	521	1,356	1,286		6,126	2,380		2,934	3,070
Mwense	11,277	459	978	513	2,716		2,226	1,637		7,333	4,444
Nchelenge	7,652	1,606	1,075	1,602	3,155		7,300	3,804		5,329	6,218
Samfya	3,516	553	104	160	2,102		7,072	3,939		4,304	2,884
Luapula	40,282	6,576	8,137	6,107	18,943	20,462	37,773	32,225	40,008	57,004	69,363
Chilubi	500	101	205	747	810		1,347	552		1,703	1,884
Chinsali	5,353	824	1,201	315	4,671		8,385	12,156		23,155	27,620
Isoka	13,367	2,236	2,574	1,358	12,443		14,064	14,453		32,621	37,750
Kaputa	4,251	1,595	1,725	2,925	2,287		4,665	1,767		7,187	5,512
Kasama	8,641	3,084	2,941	2,617	7,864		11,176	12,148		24,493	27,378
Luwingu	3,409	589	686	1,214	5,202		4,542	10,811		15,578	15,495
Mbala	16,191	2,791	4,791	2,897	18,614		24,163	34,889		49,324	66,641
Mpika	10,722	1,713	3,855	1,767	6,861		17,607	16,256		36,969	43,026
Mporokoso	7,582	998	1,434	855	2,998		7,259	10,821		13,052	13,488
mpulungu	7,553	4,156	1,945	938	4,271		12,893	7,310		10,659	16,063
Mungwi	5,340	1,854	1,736	1,601	5,171		7,366	7,926		13,957	21,915
Nakonde	4,644	970	3,803	3,727	5,608		9,773	8,968		29,539	31,306
Northern	87,553	20,911	26,896	20,961	76,800	91,878	123,240	138,057	171,232	258,236	308,078

Source: Production/ CSO crop data (1999/00-2009/10)

Note: Due to a lack of data, dummy data were applied to the year 2004 and 2007 (average of two years before and after the subject year)

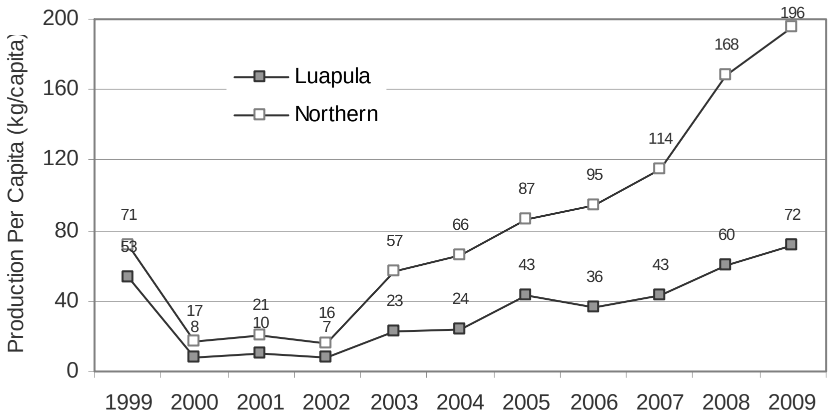


Figure 1.5.13 Per Capita Production of Maize by Time in the Study Area (1999-2009)

Source: Production/ CSO crop data (1999/00-2009/10)

Population Estimated based on the national census of 2000 and population growth rate during the 90s.

Table 1.5.15 Maize Production Per Capita in the Study Area (1998-2008)

Year	Luapula			Northern		
	Population	Production	Per capita	Population	Production	Per capita
1999	756,442	40,282	53	1,227,996	87,553	71
2000	775,353	6,576	8	1,258,696	20,911	17
2001	794,737	8,137	10	1,290,163	26,896	21
2002	814,605	6,107	7	1,322,417	20,961	16
2003	834,970	18,943	23	1,355,478	76,800	57
2004	855,845	20,462	24	1,389,365	91,878	66
2005	877,241	37,773	43	1,424,099	123,240	87
2006	899,172	32,225	36	1,459,701	138,057	95
2007	921,651	40,008	43	1,496,194	171,232	114
2008	944,692	57,004	60	1,533,599	258,236	168
2009	968,310	69,363	72	1,571,939	308,078	196

Source: Production/ CSO crop data (1999/00-2009/10)
Population Estimated based on the national census of 2000 and population growth rate during the 90s.

1.5.9 Yield of Major Crops Based on the Baseline Survey

Yields of major crops are specifically studied through a baseline survey in five villages in Northern province. Those villages include Molwani in Kasama, Kalemba Chiti and Chipapa in Mungwi, and Saise and Mayanga in Mbala. Based on a series of interviews to 30 farmers in each village, typical yields in poor, bumper, and usual harvest years are outlined. As shown in Table 1.5.16, on average of five villages, yield of local maize is from 0.81 tons/ha in poor harvest year to 2.55 tons/ha in bumper harvest year. Farmers can usually expect as much as 1.58 tons/ha from local maize.

On the other hand, looking at the average of five villages, hybrid maize shows a bit different view; in general higher yield can be expected in each of poor (1.12 tons/ha), bumper (2.70 tons/ha), and usual (1.79 tons/ha) harvest year. However, the minimum yield of hybrid maize in bumper year (1.24 tons/ha) is even lower than that of local maize. One may think that difference between local and hybrid maize is not significant. In fact, there are some respondents who apply chemical fertilizer at a considerable level. This practice might contribute to keeping the minimum yield at a certain level.

Table 1.5.16 Yield of Poor, Bumper and Usual Harvest Years

Crop	Item	Usual Harvest Year	Bumper Harvest Year	Poor Harvest Year
Local Maize	Min	0.88	1.61	0.36
	Max	2.52	3.51	1.20
	Ave	1.58	2.55	0.81
Hybrid Maize	Min	0.98	1.22	0.57
	Max	2.68	3.60	2.29
	Ave	1.79	2.70	1.12
Cassava	Min	1.85	2.49	1.34
	Max	3.15	5.66	2.92
	Ave	2.68	3.81	1.92
Finger Millet	Min	0.64	0.80	0.52
	Max	1.91	2.49	1.53
	Ave	1.09	1.35	0.87
Beans	Min	0.45	0.67	0.20
	Max	1.02	0.96	0.42
	Ave	0.57	0.78	0.28
Groundnuts	Min	0.40	1.02	0.24
	Max	0.89	1.68	0.62
	Ave	0.69	1.30	0.39

Source: JICA Study Team (2009). Based on the Baseline Survey carried out in five villages (Molwani, Kalemba Chiti, Chipapa, Saise, Mayanga)
Note: Poor, bumper and average years are subjectively selected by the interviewees. “Min” and “Max” are the minimum and maximum figures among the five villages, while “ave” is an average of five villages estimated by the total area and the total production of the five villages.

Table 1.5.17 Yield of Poor, Bumper and Usual Harvest Years in Five Villages

Crop	Village name	Usual Harvest Year			Bumper Harvest Year			Poor Harvest Year		
		Area (ha)	Produce (ton)	Yield (ton/ha)	Area (ha)	Produce (ton)	Yield (ton/ha)	Area (ha)	Produce (ton)	Yield (ton/ha)
Local Maize	Molwani	0.43	1.07	2.52	0.73	2.54	3.51	0.30	0.35	1.18
	Kalemba Chiti	0.43	0.43	1.00	0.40	0.69	1.74	0.38	0.21	0.56
	Chipapa	0.45	0.93	2.08	0.60	1.59	2.66	0.43	0.51	1.20
	Saise	0.60	0.53	0.88	0.75	1.21	1.61	0.68	0.24	0.36
	Mayanga	0.48	0.80	1.69	0.53	1.60	3.05	0.43	0.48	1.12
	Total/ Ave	2.38	3.76	**1.58**	3.00	7.64	**2.55**	2.20	1.79	**0.81**
Hybrid Maize	Molwani	0.75	1.71	2.28	1.03	3.69	3.60	0.65	0.73	1.12
	Kalemba Chiti	0.43	0.42	0.98	0.68	0.83	1.22	0.40	0.23	0.57
	Chipapa	0.68	0.95	1.41	0.73	1.53	2.11	0.60	0.49	0.81
	Saise	1.15	1.56	1.36	1.03	2.55	2.49	0.83	0.56	0.68
	Mayanga	0.83	2.21	2.68	0.85	3.01	3.54	0.65	1.49	2.29
	Total/ Ave	3.83	6.85	**1.79**	4.30	11.61	**2.70**	3.13	3.49	**1.12**
Cassava	Molwani	0.45	1.42	3.15	0.53	2.97	5.66	0.33	0.95	2.92
	Kalemba Chiti	0.55	1.25	2.26	0.60	1.96	3.27	0.48	0.86	1.80
	Chipapa	0.40	1.18	2.96	0.58	1.95	3.40	0.43	0.75	1.76
	Saise	0.45	0.83	1.85	0.50	1.24	2.49	0.38	0.50	1.34
	Mayanga	0.58	1.81	3.15	0.68	2.81	4.16	0.58	1.12	1.95
	Total/ Ave	2.43	6.49	**2.68**	2.88	10.94	**3.81**	2.18	4.18	**1.92**
Finger Millet	Molwani	0.43	0.45	1.05	0.58	0.61	1.05	0.35	0.33	0.94
	Kalemba Chiti	0.48	0.30	0.64	0.55	0.44	0.80	0.38	0.20	0.52
	Chipapa	0.30	0.32	1.06	0.33	0.49	1.50	0.30	0.20	0.67
	Saise	0.33	0.31	0.97	0.33	0.42	1.29	0.28	0.19	0.70
	Mayanga	0.35	0.67	1.91	0.40	1.00	2.49	0.33	0.50	1.53
	Total/ Ave	1.88	2.05	**1.09**	2.18	2.95	**1.35**	1.63	1.41	**0.87**
Beans	Molwani	0.23	0.12	0.51	0.25	0.23	0.92	0.23	0.06	0.28
	Kalemba Chiti	0.30	0.14	0.46	0.35	0.23	0.67	0.33	0.09	0.28
	Chipapa	0.35	0.21	0.61	0.35	0.34	0.96	0.33	0.14	0.42
	Saise	0.15	0.15	1.02	0.45	0.31	0.68	0.38	0.08	0.20
	Mayanga	0.28	0.12	0.45	0.28	0.20	0.73	0.25	0.05	0.20
	Total/ Ave	1.30	0.74	**0.57**	1.68	1.31	**0.78**	1.50	0.42	**0.28**
Groundnuts	Molwani	0.30	0.24	0.80	0.38	0.63	1.68	0.28	0.17	0.62
	Kalemba Chiti	0.38	0.15	0.40	0.40	0.41	1.02	0.33	0.08	0.25
	Chipapa	0.28	0.25	0.89	0.28	0.36	1.31	0.30	0.15	0.49
	Saise	0.18	0.12	0.66	0.18	0.22	1.23	0.25	0.06	0.24
	Mayanga	0.20	0.16	0.79	0.20	0.24	1.18	0.18	0.07	0.38
	Total/ Ave	1.33	0.91	**0.69**	1.43	1.85	**1.30**	1.33	0.52	**0.39**

Source: JICA Study Team (2009). Based on the Baseline Survey carried out in five villages
Note: Poor, bumper and average years are subjectively selected by the interviewees. "Min" and "Max" are the minimum and maximum figures among the five villages, while "ave" is an average of five villages estimated by the total area and the total production of the five villages.

As for Cassava, 1.92 tons/ha to 3.81 tons/ha had been harvested, in which 2.68 tons/ha was the usual yield. At the minimum of poor harvest year, 1.33 tons/ha was recorded in a village and 5.78 tons/ha was realized as the maximum of bumper year. Those yield data on maize, cassava, finger millet, beans and groundnuts shows a large deviation from poor harvest year to bumper harvest year, implying an unstable agricultural production in the area; agriculture in this area is associated with a certain level of uncertainty.

1.5.10 Farm Block and its Land Allocation

Ministry of Agriculture and Cooperative (MACO) allocates farmland to farmers as an "agriculture block," or "farm block." Agriculture block is a piece of land area composing of a number of farm plots, size of which varies from a few to some hundreds hectors. In general, when MACO consider a vast range of area suited to agricultural production, it asks the traditional chief who governs the land for transferring his land to MACO; this is the beginning of the land allocation. Upon signing on a letter of consent, the land title is officially transferred to MACO and the chief can no longer claim his ownership of the land. After a unit of area is transferred, MACO carries out a topographic survey to set the boundary of the area and to subdivide the area into a number of farm plots to be allocated. In most cases, MACO constructs at least road network to be accessible. And, in some cases, it also develops bridges, electricity and irrigation schemes as well as does some soil analysis so that the area can be functional enough as an “agriculture block.”

After the reclamation of the land, the land is allocated to the farmers who are willing to receive. In the case of Lukulu North project in Mungwi district in Northern province that was started in 1979 (see the box in this section), the land was allocated through a procedure as described: First, a total of around 10,000 ha of land was allocated only to 74 farmers, meaning that the whole area was divided into 74 farm plots. The size of each plot varied from minimum of 3.7 ha to the maximum of 457 ha, averaging 135 ha. At that time, the number of beneficiaries was not so big maybe because, according to some provincial officers of MACO, not so many farmers were aware of the program and/or the value of agricultural land was not given much credit at that time due to relatively small population density in the area. However, as time passes, the demand for agricultural land has increased. By today, the number of beneficiaries increased to more than 150 farmers.

Note that while the number of beneficiaries increased, the total area of the land remained the same. In fact, the land initially allocated was not fully utilized. Thus, some parts of farm plots were repossessed by MACO and was reallocated to other farmers who newly applied. The average size of subdivided plots now is 67 ha or less. Actually, the whole process of i) assessing the utilization status of land, ii) repossessing the unutilized land, iii) subdividing the repossessed land, and iv) reallocating the land is still on going. Thus, the number of beneficially is still increasing and the average size of plot per farmer is to decrease. As far as unutilized land remains, MACO keeps on going accepting the application from the new farmers.

To be an owner of a farm plot in the agriculture block, farmers have to submit some documentation and be interviewed by MACO. Applicants are required to explain their plans of farming in the agriculture block and to prove the validities of the plans by submitting the documentation. For instance, a farmer may request the farm plot as big as he or she wants, saying 100 ha. However, to be eligible, the person has to prove that s/he can manage and fully utilize all the land requested. The person needs to have enough capital to buy agricultural inputs, hire labors and transport the harvests. To prove it, it is required to get CEO’s endorsement that the applicant is actually engaged in agriculture and possesses assets s/he mentioned. Bank statement or a letter from the bank manager explaining the saving status and/or loan status is also required. On top of those, the applicant is subjected to go to court and declare all the documents are correct.

In many cases, the land size is reduced through the assessment by MACO. In some cases, farmers do not have concrete idea how big it is the size of one hector and overstates their plan. In case a farmer virtually has no capital, he or she is exempted from the submission of bank statement or a like. The applicant just needs to explain how s/he intends to manage the farm plot—“I would make charcoal and sell it to raise the necessary capital for starting agricultural production in the plot,” for example. Even without apparent capital, farmers most likely are given as large as 5 to 30 ha.

Lukulu North Irrigation Project

Lukulu North project was initiated in 1979 and welcomed the first group of settlers in 1983. The area, totaling around 10,000 ha, is divided into two zones: a total of 2,700 ha of irrigation zone and a total of 7,300 ha of dry land zone. In the irrigated zone, the average size of the plots is relatively smaller, while the one in the dry zone is bigger. Big plots are usually devoted as a rangeland or ranch. At the same time, there are some cases that individual farmers developed some personal furrows (canals) in the dry zone tapping from small streams. Today, MACO officers including the ones in TSB Northern province also have their farm plot in the project area, however, no officer was included in the initial group of settlers.

1.5.11 Soil Condition

A total of 10 soil samples were collected and analyzed from four villages where pilot activities are being carried out. As shown in Table 3.5.1, samples were collected in a total of four villages: Kalupa village in Mungwi and Lukulu North (project name), Molwani, and Mulenga Mulaka in Kasama district. In principle, two samples were collected in each of the village except Molwani where four samples were collected as there was more diversity in the appearance of the soil surface.

Table 1.5.18 Location of the Samples Collected

Sample Code	Location	District
A	Kalupa Upper	Mungwi
B	Kalupa Lower	Mungwi
C	Lukulu North Upper	Kasama
D	Lukulu North Lower	Ditto
E	Molwani Upper (1)	Ditto
F	Molwani Upper (2)	Ditto
G	Molwani Middle	Ditto
H	Molwani Lower	Ditto
I	Mulenga Mulaka Upper	Ditto
J	Mulenga Mulaka Lower	Ditto

Based on the analysis, most of the soil samples were concluded low in their fertility. The most apparent feature of the soils can be found in their pH: an average of 10 samples is pH 4.2, ranging from 3.9 to 4.7, all of which are far below than recommended range for crop production (6.0-6.5). The traditional farming system of Chitemene shifting cultivation may have been developed to cope with this acidic soil; farmers may have found empirically that ash can neutralize the soil acidity. Fortunately, maize, the dominant crop in the area, is of the most tolerant crops against low pH. Other crops relatively suited to lower pH are chili pepper, soybeans, rice, wheat, sorghum. Crops categorized in the least tolerant group include cabbage, tomato, and spinach; all of them are popular in the area, claiming the necessity of appropriate soil management.

Table 1.5.19 Inventory of the Soil Properties of 10 Samples in the Study Area (1/3)

Sample	Water Content	pH (1:2.5) H2O	EC (1:5)	Effective Phosphoric acid (mg/100g dry soil)	Phosphoric acid Absorption coefficient	Exchangeable Potassium (mg/100g dry soil)	Exchangeable Lime (mg/100g dry soil)
	%	6.0〜6.5	<0.2	>20	>200	>15	>200
A	0.87	**4.7**	0.07	**30**	393	**11.5**	**86**
B	0.74	**4.3**	0.10	**31**	388	**8.0**	**69**
C	0.80	**4.5**	0.03	12	330	**8.8**	**44**
D	0.80	**4.2**	0.05	16	328	**11.8**	**22**
E	1.00	**4.1**	0.06	14	380	**11.1**	**38**
F	1.47	**3.9**	0.20	12	455	19.1	**55**
G	0.90	**4.0**	0.06	16	258	**8.4**	**32**
H	0.34	**4.1**	0.05	10	**192**	**6.9**	**7**
I	0.27	**4.1**	0.06	8	**111**	**5.2**	**24**
J	0.37	**4.5**	0.02	12	204	**4.2**	**9**
Ave.	0.76	4.2	0.07	16	304	9.5	39
Min.	0.27	3.9	0.02	8	111	4.2	7
Max.	1.47	4.7	0.20	31	455	19.1	86

Source: JICA Study Team (2009)

Also, all the exchangeable ions, potassium, lime, and magnesium, appeared to be low compare to the standard recommended in Japan. For instance, an average value of exchangeable potassium was 9.5 as compared to the standard at “more than 15.” Of all the samples, only one sample from Molwani surpassed the standard. In such sols, application of potassium is highly recommended. For instance, chicken droppings are recommended as a material for making organic fertilizer. Exchangeable lime is also quite low; an average value resulted in 39 as compared to the standard at "more than 200."

Low values in exchangeable irons are likely to be caused by low Cation Exchange Capacity (CEC). CEC is known as a measure of nutrient retention capacity of the soil. Therefore, low CEC value usually leads to lower fertility of the soil. Looking at the CEC of the samples, as expected, it is generally low. An average of 10 samples was 4.3 mg/100g dry soil, although it is supposed to be more than 20. The minimum value was even lower than 2.0 in Molwani and Mulenga Mulaka.

Table 1.5.20 Inventory of the Soil Properties of 10 Samples in the Study Area (2/3)

Sample	Exchangeable Magnesium (mg/100g dry soil)	CEC (mg/100g dry soil)	Basic Saturation (%)	Magnesium/ Potassium Ratio	Lime/ Magnesium Ratio	Free iron oxide (%)
	>25	>20	60〜80	>2	<6	
A	**10.8**	**4.8**	79.4	2.2	5.7	0.21
B	**8.3**	**5.5**	**55.7**	2.4	5.9	0.25
C	**7.7**	**4.4**	**48.6**	2.1	4.1	0.33
D	**6.8**	**3.7**	**37.0**	**1.3**	2.3	0.31
E	**10.5**	**5.4**	**39.8**	2.2	2.6	0.14
F	**15.9**	**7.9**	**39.9**	2.0	2.5	0.12
G	**8.2**	**5.2**	**33.8**	2.3	2.8	0.09
H	**3.0**	**1.9**	**28.7**	**1.0**	1.7	0.03
I	**6.1**	**1.9**	66.6	2.8	2.9	0.10
J	**3.2**	**2.1**	**27.2**	**1.8**	2.0	0.15
Ave.	8.0	4.3	45.7	2.0	3.2	0.17
Min.	3.0	1.9	27.2	1.0	1.7	0.03
Max.	15.9	7.9	79.4	2.8	5.9	0.33

Source: JICA Study Team (2009)

Other notable elements of the soil include fusible boron; an average 0.09 is far less than the standard (0.5-1.0). Low value in fusible boron often causes damage on the top of leaves making the color blackish. Crops prone to low fusible boron include eggplant, tomato, bell pepper, and sunflower, while grass plants (poaceous) is relatively sustainable against low fusible boron. Therefore, maize, sorghum and finger millet are relatively suited in that condition.

Table 1.5.21 Inventory of the Soil Properties of 10 Samples in the Study Area (3/3)

Sample	Ammonium Nitrogen (mg/100g dry soil)	Nitrate Nitrogen (mg/100g Dry soil)	Humic Substance (%)	Exchangeable Manganese (ppm)	Fusible boron (ppm)	Zinc (ppm)	Copper (ppm)
			>3	>3	0.5〜1.0	8〜40	1〜3
A	2.2	1.8	3.93	**1.52**	**0.12**	**0.09**	**0.20**
B	1.3	2.4	5.43	5.25	**0.19**	**0.35**	**0.10**
C	1.3	0.7	3.29	27.78	**0.08**	**0.39**	**0.10**
D	1.9	0.8	3.41	21.82	**0.09**	**0.93**	**0.09**
E	1.5	2.5	5.28	**1.82**	**0.20**	**0.59**	**0.10**
F	5.7	6.1	7.68	4.04	**0.10**	**0.68**	**0.05**
G	1.5	1.8	5.61	**1.82**	**0.10**	**0.53**	**0.05**
H	2.1	0.8	3.31	**0.40**	**0.01**	**0.62**	**0.08**
I	1.3	2.2	**2.65**	7.07	**0.01**	**0.26**	**0.07**
J	1.3	1.2	3.41	**0.81**	**0.01**	**0.79**	**0.06**
Ave.	2.0	2.0	4.40	7.23	0.09	0.52	0.09
Min.	1.3	0.7	2.65	0.40	0.01	0.09	0.05
Max.	5.7	6.1	7.68	27.78	0.20	0.93	0.20

Source: JICA Study Team (2009)

As briefly discussed above, chemical characteristics of the soil in the sampled area are generally not supportive to crop production. A number of important elements showed lower value as compared to the recommended values in Japan. It is therefore understandable why this area is a granary of maize; comparatively, maize is tolerant to such environment where acidity is high and fusible boron is low. However, this result strongly suggests that, if cultivating other vegetable crops, any measurement has to be taken to cope with those negative factors of the soil condition.

1.6 Farming Economy (Part I: In-depth Interviews to Farmers)

Agricultural productivity may vary in accordance with the availability and quality of resources necessary for agricultural practices. For instance, same extent of farmland may produce different amount of harvests depending on the internal and external factors, including soil fertility, availability of irrigation, amount, timing, and type of agricultural inputs, weather condition, and situation of farming power mechanization, as well as the skills of farm management in general. To be sure, it is recommendable to grasp the actual status of farm economy so that suitable farming system can be identified. Now, here are some case studies of farm economy for some specific crops identified in the study area. Note that it does not necessarily represent all the farming systems in the area but should be treated as examples.

Table 1.6.1 Summary of Farming Economy Per Lima and Hector

Crop	Gross Income (ZMK/ha)	Expenditure (ZMK/ha)	Net Income (ZMK/ha)
Maize (Hybrid)	5,200,000	3,586,000	1,614,000
Beans	3,840,000	1,176,000	2,664,000
Groundnuts	2,400,000	1,470,000	930,000
Tomato (rain season)	27,000,000	3,780,000	23,220,000
Tomato (dry season)	10,500,000	3,780,000	6,720,000

Note: sources of each crop is mentioned under the table of each crop
DMCO: District Marketing Cooperative Officer, M/T: Meeting and Training, GAP: Group Action Plan

(1) Maize

Table 1.6.2 Farm Economy of Maize Production

Item	Per Lima		Per Hector		Remark
A. Expenditure					
1. Production					
Plowing	50,000	K	200,000	K	
Seeds	65,000	K	260,000	K	
Planting	20,000	K	80,000	K	
Weeding	20,000	K	80,000	K	
Fertilizer	480,000	K	1,920,000	K	
Application of fertilizer	20,000	K	80,000	K	
Miscellaneous	64,000	K	256,000	K	
Sub total	719,000	K	2,876,000	**K**	
2. Harvesting					
Temperally storage	7,500	K	30,000	K	
Harvesting	20,000	K	80,000	K	
Maize shelling	20,000	K	80,000	K	
Empty grain bags	30,000	K	120,000	K	
Sub total	77,500	K	310,000	**K**	
3. Marketing					
Transportation	100,000	K	400,000	K	
Sub total	100,000	K	400,000	**K**	
Total	**896,500**	**K**	**3,586,000**	**K**	
B. Income					
Gross income	1,300,000	K	5,200,000	K	@65,000K/50kg bag multiplied by 20 bags
C. Profit					
B-A	403,500	K	1,614,000	K	

Source: District Agriculture Coordinator's Office of Kasama (Estimation for Chilongo Camp)
Note: Family labor is not considered as cost in this estimation

Table 1.6.3 Farm Economy of Beans Production

Item	Per Lima		Per Hector		Remark
A. Expenditure					
1. Production					
Plowing	50,000	K	200,000	K	
Seed	30,000	K	120,000	K	2x1500
Planting	40,000	K	160,000	K	10 galons
Sub total	**120,000**	**K**	**480,000**	**K**	
2. Harvesting					
Empty grain bags	16,000	K	64,000	K	
Harvesting	96,000	K	384,000	K	1,000kg
Sorting	38,000	K	152,000	K	500kg
Sub total	**150,000**	**K**	**600,000**	**K**	
3. Marketing					
Transport	24,000	K	96,000	K	3,000k/50kg bag by 8 bags
Sub total	**24,000**	**K**	**96,000**	**K**	
Total	**294,000**	**K**	**1,176,000**	**K**	
B. Income					
Gross income	**960,000**	K	**3,840,000**	K	@120,000K/50kg bag by 8 bags
C. Profit					
B-A	**666,000**	K	**2,664,000**	K	

Source: District Agriculture Coordinator's Office of Kasama (Estimation for Chilongo Camp)
Note: Family labor is not considered as cost in this estimation

Table 1.6.4 Farm Economy of Groundnuts Production

Item	Per Lima		Per Hector		Remark
A. Expenditure					
1. Production					
Seed	60,000	K	240,000	K	
Cultivation	50,000	K	200,000	K	
Planting	20,000	K	80,000	K	
Weeding	20,000	K	80,000	K	
Miscellaneous	35,000	K	140,000	K	
Sub total	**185,000**	**K**	**740,000**	**K**	
2. Harvesting					
Harvesting	50,000	K	200,000	K	
Temporal storage	15,000	K	60,000	K	
Empty grain bags	7,500	K	30,000	K	
Shelling	60,000	K	240,000	K	
Sub total	**132,500**	**K**	**530,000**	**K**	
3. Marketing					
Transportation	50,000	K	200,000	K	
Sub total	**50,000**	**K**	**200,000**	**K**	
Total	**367,500**	**K**	**1,470,000**	**K**	
B. Income					
Gross income	**600,000**	K	**2,400,000**	K	@120,000K/50kg bag by 5 bags
C. Profit					
B-A	**232,500**	K	**930,000**	K	

Source: District Agriculture Coordinator's Office of Kasama (Estimation for Chilongo Camp)
Note: Family labor is not considered as cost in this estimation

Table 1.6.5 Farm Economy of Tomato Production (Rain and Dry Seasons)

Item	Rain Season (1ha)		Dry Season (1ha)		Remark
A. Expenditure					
1. Production					
Seed	30,000	K	30,000	K	Estimated cost is same between dry and rainy season
Fertilizer	840,000	K	840,000	K	
Manure	270,000	K	270,000	K	
Chemical DM 45	210,000	K	210,000	K	
Doom	315,000	K	315,000	K	
Dicophol	315,000	K	315,000	K	
Sub total	**1,980,000**	**K**	**1,980,000**	**K**	
2. Marketing					
Transportation	1,500,000	K	1,500,000	K	
Sub total	**1,500,000**	**K**	**1,500,000**	**K**	
3. Others					
Miscellaneous	300,000	K	300,000	K	
Sub total	**300,000**	**K**	**300,000**	**K**	
Total	**3,780,000**	**K**	**3,780,000**	**K**	
B. Income					
Rainy Season	**27,000,000**	K			@1,800K/kg by 15,000kg
Dry Season			**10,500,000**	K	@700K/kg by 15,000kg
C. Profit					
B-A	**23,220,000**	K	**6,720,000**	K	

Source: MACO Northern Province
Note: Labor is not considered as cost in this estimation (labor cost for vegetable is usually significant)

(2) Rice

Chambeshi river basin in and around Munbwi and Isoka districts is well known as a high production area of paddy rice. Farmers in this area, therefore, practice a very different farming system from other area in the province; focusing on rice production. According to Mr. Hoah Mubanga Chikwanda, the village headman of Mununga village, Mungwi District, farmers in this area depend only on rainfed and rarely apply fertilizer or any agricultural inputs. Notwithstanding the extensive farming system, they can expect a net profit of around 90,000 ZMK/lima with farm-gate price or 120,000 ZMK/lima at market price. The major practices in rice production in the area can be summarized into land preparation, harvesting and marketing. For the land preparation, paddy field is ploughed once right after the harvest of previous season: May to August depending on the soil condition and the availability of labor. It is far easier for farmers to plough at that time because soil is soft as it still contains a certain level of moisture in it. It is common in the area to use ox plough but if farmers do not have oxen, they can also ask for plough at approximately 25,000 ZMK/lima. When sowing in December, field is ploughed again by cross cutting the direction drawn at the first plough so that seeds can be covered by soil. After the sowing, Mr. Hoah, and probably most of others too, does not do particular for water control, weeding, or pest management. What he does next is harvesting. For harvesting, he hires labors at 10,000 ZMK/lima, taking about two days to harvest one limas of rice by one person. In addition, costs for carrying at 5,000ZMK /lima, slashing at 60,000ZMK /heap and carrying sacks at 2,000 ZMK/bag (50kg) are required.

For marketing, he sells to middlemen at the farm-gate price of 60,000ZMK/bag (50kg). So-called “50kg bag” actually contains 15 tins of 1 gallon (5 little) tin and “110kg bag” does 50 tins. Selling price at the farm-gate may change from 60,000 ZMK/bag (50kg) during June to July up to 80,000 ZMK/bag (50kg). Note that, buyers visit the area up until the end of August when all the produces would be supposedly sold out. There is another case of marketing. Some villagers sell their produces at Chambeshi Market in Kasama town. They take truck at 20,000 ZMK/bag (110kg) to carry. Before they sell at 15,000 ZMK/5 litter, they mill the rice at 17,000 ZMK/bag (110kg). According to Mr. Michck Misonda, Mulema village, Mungwi District, quantity of rice becomes about half after milling, suggesting the milling rate close to 50%. Farm economy of rice production is summarized in Table 1.6.6.

In Chambeshi region, a lot of white sacks filled with paddy can be observed along the road. In the peak harvest season, buyers set a camp where they collect paddy from farmers and put them into large white sacks, which is called “110kg sack,” which can contain paddy as much as 50 tins of 1 gallon tin. After they collect a quite good amount of paddy, they take a ride to Kasama. In this area, transporters are available at two to four trucks a day. In addition, some producers already started taking their produce to Chambeshi market in Kasama town so that they can expect higher selling price. In the case of Mulema village in Munguwi district,

Table 1.6.6 Farm Economy of Rice Production

Item	Unit Price		Quantity		Total		Remark
Farm Size: 16 lima (4ha)							
A. Expenditure							
1. Production							
First plough*	25,000	K/lima	16	Lima	200,000	K	August for three weeks
Seeds					0	K	Recycling (variety: SUPER). 15 litter/lima
Sowing					0	K	December by himself (no cost)
Second plough*	15,000	K/lima	16	Lima	120,000	K	December for two weeks
Fertilizer	0	K/bag (10kg)	0	bag	0	K	Not applied
Pesticide	0	K/littler	0	litter	0	K	Not applied
Sub total					**320,000**	**K**	(80,000K/ha)
2. Harvesting							From the mid of June
Harvesting	10,000	K/lima	16	Lima	160,000	K	
Gathering	5,000	K/lima	16	Lima	80,000	K	
Slashing & packing	60,000	K/heap	2	heaps	120,000	K	2 heaps in 16 limas
Sacks	2,000	K/sack	32	sacks	64,000	K	
Carrying sacks	2,000	K/bag (50kg)	32	bags	64,000	K	
Sub total					**488,000**	**K**	(122,000K/ha)
3. Marketing (to Kasama)							
Transportation	20,000	K/bag (110kg)	8	bags	160,000	K	
Milling	17,000	K/bag (110kg)	8	bags	136,000	K	
Sub total					**160,000**	**K**	(40,000K/ha)
B. Income							
1. Selling at the farm-gate							
Peak	60,000	K/bag (50kg)	16	bags	960,000	K	June to July
Off peak	80,000	K/bag (50kg)	16	bags	1,280,000	K	August
					2,240,000	K	(560,000K/ha)
2. Selling at Kasama Market							
Selling at Kasama (milled)	15,000	K/tin (5L)	250	tins	**3,744,000**	K	12 tins times 32 bags** divided by 2*** (936,000K/ha)
C. Profit							

Item	Unit Price	Quantity	Total		Remark
Selling at farm-gage			**1,432,000**	K	B1-A1,2
Selling at Kasama			**2,776,000**	K	B2-A1,2,3
D. Unit Profit (K/lima)					
Selling at farm-gage			**89,500**	K	C divided by 16 limas
Selling at Kasama			**173,500**	K	C divided by 16 limas
E. Unit Profit (K/ha)					
Selling at farm-gage			**358,000**	K	
Selling at Kasama			**694,000**	K	

Source: Mr. Hoah Mubanga Chikwanda, Mununga village (headman), Mungwi District, Northern province for the information on production and selling at farmgate.
Mr. Michck Misonda, Mulema village, Mungwi District, Northern province for the marketing information at Kasama Chambeshi market.

Note: Family labor is not considered as cost in this estimation

* Although he uses his own oxen, the cost was estimated based on an assumption when he hires anyone to plough.

** 50tins/110kg sack, and 12tins/50kg sack

*** Milling rate is said about 50% (need to be confirmed)

(3) Onion

According to Mr. Derick Chisulo, a farmer in Mwambezi village, Mbala District, Northern province, onion is one of the most preferable crops for his family. Each of his family members, his father, mother, and brother, maintains one to two limas of farmland for onion and earning considerable amount of incomes. With irrigation, he produces onion during the dry season, May to July. Although it is still possible, weather condition during August is not preferable in this region. In his 1.5 limas of land (0.375 ha), he can expect as much as 60 bags of 90kg bag, equivalent to 14,400 kg/ha. He sell his produce mostly at Kitwe district in Copper Belt province, approximately 900 km away from his village. Based on a rough estimation, he can anticipate as much as 18 million ZMK from his 1.5 limas of land. However, it seems a bit too much as a profit of single plot. One of the possible contributors is the way of marketing he practice; he brings produce by himself and can expect twice as much unit price as the one in Mbala town. An average selling price of 200,000ZMK/bag (90kg) in Mbala skyrockets to 400,000ZMK/bag in Copper Belt Province, where a lot of demand exists. Another possible contributor is the fact that he sell by himself. Generally, it is well known that middleman can obtain considerable level of margin and thus farmers can expect only a limited profit from his produce. In his case, he can keep everything he sold; that is why unit profit can be beyond our expectation. Now, based only on this case study, it can be said that onion production in this type of condition can be very profitable.

Table 1.6.7 Farm Economy of Onion Production

Item	Unit Price		Quantity		Total		Remark
Farm Size: Nursery; 60m2 (3m by 20m), Main plot; 1.5 lima (0.375 ha)							
A. Expenditure							
1. Production							
(Nursery)							
Seeds	30,000	K/bag (100g)	9	bags	135,000	K	1 bag/2 plot by 18 plots
Fertilizer	40,000	K/bag (10kg)	1	bag	40,000	K	D compound
Fungicide	75,000	K/littler	5	litter	375,000	K	Apply every week (1L/week by 5 times) V-rat and Karate
(main plot)							
Transplanting	5,000	K/person	20	people	100,000	K	Provide foods
Fertilizer	280,000	K/bag (50kg)	1.5	bag	420,000	K	D compound as basal dressing
Fertilizer	250,000	K/bag (50kg)	1.5	bag	375,000	K	Urea as top dressing
Pesticide			3	litter	240,000	K	
Sub total					**1,685,000**	**K**	
2. Harvesting							
Harvesting	1,000	K/raw	*250*	row	250,000	K	15m by 1m (row). 5 people
Gathering	2,500	K/bag	60	bags	150,000	K	
Sub total					**400,000**	**K**	
3. Marketing (to Kitwe in Copper belt)							
Transportation	60,000	K/bag	60	bags	3,600,000	K	Mbala to Copper belt (Kitwe)
Storage	5,000	K/bag	60	bags	300,000	K	One time only fee
Sub total					**3,900,000**	**K**	
B. Income							
Case 1	400,000	K/bag (90kg)	60	bags	24,000,000	K	Selling at Kituwe in Copper Belt
Case 2	200,000	K/bag (90kg)	60	bags	12,000,000	K	Selling at Mbala
C. Profit							
Case 1: Selling at Kituwe in Copper Belt (B1-A1,2,3)					**18,015,000**	K	= 12,010,000K/lima
Case 2: Selling at Mbala (B2-A1,2)					**9,915,000**	K	=6,616,000K/lima

Source: Mr. Derick Chisulo, Mwambezi village, Mbala District, Northern province
* Family labor is not considered as cost in this estimation
** The number of rows in 1.5 lima was calculated by the Study Team
(2,500 m2/lima * 1.5 lima=3,750m2. 3,750m2/(15m*1m)/row=250 rows)
*** For marketing to Mbala, the interviewee carries his produce by bicycle (walking about 2hours and 30 minutes)

1.7 Farming Economy (Part II: Officers' Estimation)

There is another set of data on production cost and expected profit of major crops. This series of data was computed by the TSB officers in five districts: Kasama, Mbala, Mungwi, Muporokoso, Luwingu, Kawambwa. As shown in Table 1.8.1, the most profitable crop among green maize, onion, rape, cabbage, and tomato is cabbage at ZMK 7.7 million/lima. Although rape is regarded as least profitable among the five crops, it can still generate considerable profit of ZMK 2.3 million/lima. Gross incomes in those data were calculated based on the projected price during the dry season: the lowest price throughout the year for most of crops, except green maize. The simple average of those five crops is ZMK 4,757,172/lima. For the details of each computation, refer to the following tables.

Table 1.7.1 Production Cost and Profit of Major Crops

Crop	Items	ZMK per lima: Production Cost	ZMK per lima: Gross Income	ZMK per lima: Net Profit	Basic Data: Production per lima		Price: Average	Price: Lowest	Price: Highest
Green Maize	Kasama	615,000	8,250,000	7,635,000	11,000	cobs	750	500	1,000
	Mbala	1,069,500	8,250,000	7,180,500	11,000	cobs	750	500	1,000
	Mungwi	915,000	6,000,000	5,085,000	8,000	cobs	750	500	1,000
	Muporokoso	1,022,500	2,700,000	1,677,500	3,600	cobs	750	500	1,000
	Luwingu	1,235,000	8,250,000	7,015,000	11,000	cobs	750	500	1,000
	Kawambwa	1,365,000	11,000,000	9,635,000	11,000	cobs	1,000	800	1,500
	Average	1,037,000	7,408,333	6,371,333	9,267		792	550	1,083
Onion	Kasama	1,600,000	6,000,000	4,400,000	600	bag(5kg)	12,500	10,000	15,000
	Mbala	1,094,000	6,000,000	4,906,000	40	bag	225,000	150,000	300,000
	Mungwi	1,780,000	4,160,000	2,380,000	52	bag(50kg)	90,000	80,000	100,000
	Muporokoso	730,000	2,700,000	1,970,000	180	bag(5kg)	17,500	15,000	20,000
	Luwingu	1,550,000	6,000,000	4,450,000	400	bag(5kg)	20,000	15,000	25,000
	Kawambwa	1,300,000	5,555,667	4,255,667	33,334	bulbs	250	167	500
	Average	**1,342,333**	**5,069,278**	**3,726,944**	5,768		60,875	45,028	76,750
Rape	Kasama	1,820,000	3,900,000	2,080,000	2,600	kg	2,000	1,500	2,500
	Mbala	860,500	3,000,000	2,139,500	30	bag(100kg)	125,000	100,000	150,000
	Mungwi	1,730,000	5,000,000	3,270,000	500	bag(5kg)	12,500	10,000	15,000
	Muporokoso	700,000	1,500,000	800,000	50	bag(25kg)	32,500	30,000	35,000
	Luwingu	1,685,000	3,750,000	2,065,000	150	bag(50kg)	35,000	25,000	40,000
	Kawambwa	2,690,000	6,251,000	3,561,000	12,502	Bundle	500	500	1,000
	Average	**1,580,917**	**3,900,167**	**2,319,250**	2,639		34,583	27,833	40,583
Cabbage	Kasama	2,270,000	10,000,000	7,730,000	10,000	head	1,750	1,000	2,500
	Mbala	1,859,000	10,000,000	8,141,000	10,000	head	1,500	1,000	2,000
	Mungwi	1,214,000	5,000,000	3,786,000	10,000	head	750	500	1,000
	Muporokoso	700,000	10,000,000	9,300,000	10,000	head	1,250	1,000	1,500
	Luwingu	1,435,000	12,000,000	10,565,000	10,000	head	2,100	1,200	3,000
	Kawambwa	2,690,000	9,260,000	6,570,000	9,260	head	1,500	1,000	2,000
	Average	**1,694,667**	**9,376,667**	**7,682,000**	9,877		1,475	950	2,000
Tomato	Kasama	3,150,000	15,000,000	11,850,000	600	box	57,500	25,000	90,000
	Mbala	7,789,000	15,000,000	7,211,000	300	box	75,000	50,000	100,000
	Mungwi	2,968,000	4,000,000	1,032,000	200	box	50,000	20,000	80,000
	Muporokoso	990,000	1,200,000	210,000	60	box	25,000	20,000	30,000
	Luwingu	2,015,000	3,000,000	985,000	120	box	47,500	25,000	70,000
	Kawambwa	4,270,000	5,100,000	830,000	170	box	35,000	30,000	40,000
	Average	**3,530,333**	**7,216,667**	**3,686,333**	242		48,333	28,333	68,333

Source: Questionnaire Interview to District TSB Officers in five districts (Kasama, Mbala, Mungwi, Mporokoso, Luwingu, and Kawambwa). Computation is based on lowest price except green maize. The price of green maize in the dry season is supposedly the highest, but to be safe, average price is applied.

1.8 Challenges and Opportunities in the Agriculture Sector

1.8.1 High Cost of Input (Fertilizer) – A Challenge

The cost of fertilizer stands as a primary constraint for smallholder farmers. It is significant for the farmers who produce hybrid maize that inherently requires an intensive application of chemical fertilizer. It is a common observation that farmers in the study area cultivate as much land for maize as they can purchase the fertilizer for. In Zambia, spending on the importation of chemical fertilizer continued to increase during 1999 to 2004. As shown in Figure 1.8.1, the spending in 1999 accounted as much as ZMK 80 billion, or US$33million, and it became ZMK 393 billion, or US$ 82 million, by 2004.

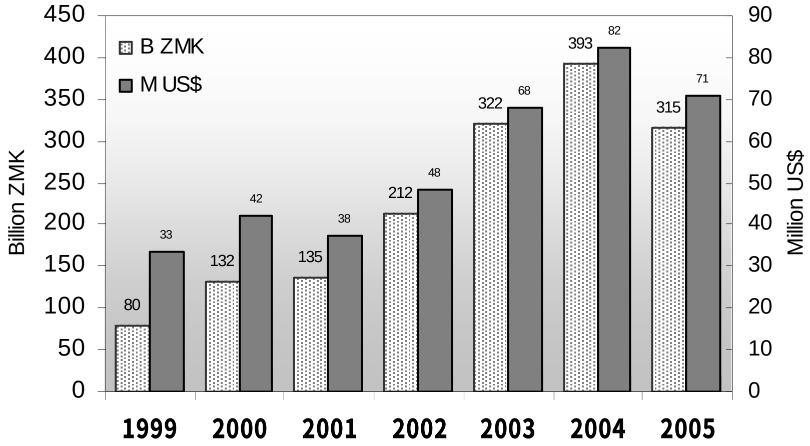


Figure 1.8.1 Spending on the Importation of Chemical Fertilizer

Source: Value; Central Statistic Office (2009)/ Exchange rate; USDA.

Note: CIF (Cost, Insurance, and Freight) value.

This trend can be partly explained by the increase in the amount of chemical fertilizer. As seen in Figure 1.8.2, imported quantity of urea had increased constantly from 2002 to 2004 and it once decreased in 2005-06, as corresponding to Figure 1.8.1 above. Although data on spending on the importation after 2005 is not available, it must have increased as the quantity of imported urea has shown rapid increase in 2007. This consequence generally suggests that the spending on importation is a big burden for Zambia as a country. Still, imported quantity of urea is accounted for around 160 kg/ha, which is less than recommended amount for maize under FSP: 200kg/ha of urea in addition to 200kg/ha of D compound. Considering the use of urea for other crops, urea does not seem to be enough for maize production.

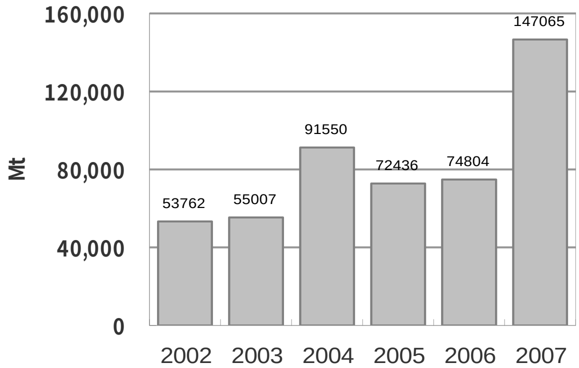


Figure 1.8.2 Urea Imported (tons)

Source: FAOSTAT (2009).

In addition, market price of chemical fertilizer is another critical factor which influences agricultural condition of the country. In general, market price of chemical fertilizer has skyrocketed in the past several years. As shown in Figure 1.8.3 (left), price of D-compound, with a composition of N:P:K=10:20:10, increased from ZMK 18,000/50kg in 2001 to ZMK 150,000/50kg in 2009; it became more than 13 times during eight years. Furthermore, looking at the inflation adjusted price of the same commodity that is equivalent to the 2001 value (right), price actually remained almost the same from

2001 until 2006. Then, it was doubled in 2007 and also tripled since 2008. This sudden and big increase may stem from the significant increase in the world oil price.

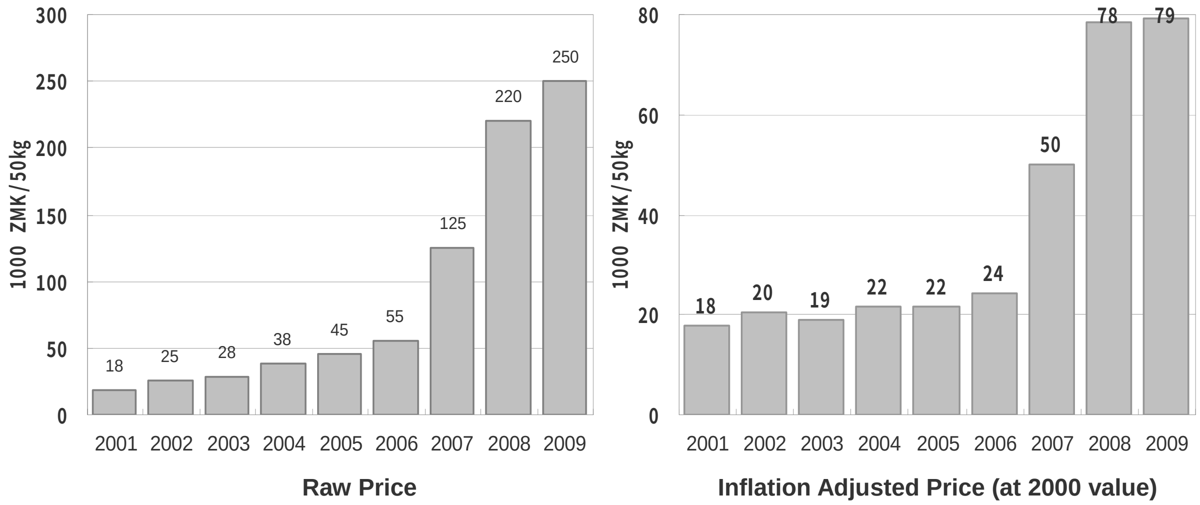


Figure 1.8.3 Market Price of Chemical Fertilizer (D-compound) in Kasama

Source: Agricultural commodity shop in Kasama town. Price of D-compound (N:P:K=10:20:10).

As stated above, Zambian farmers are now facing the most difficult time they have ever experienced. For example, on commercial bases, fertilizer cost shared only 14.5% of the gross income of maize production per hector. However, it became to be as much as 38.5% of the gross income with the current price of fertilizer in 2009. For those who can benefit from the FSP, however, the condition is far different. The share under FSP was only 5.8% in 2006 and it remained less than 10% (9.6%) by 2009 under heavily subsidized condition. However, expected beneficiaries of FSP account for only 11% of total rural households in Zambia, notwithstanding nearly 40% of MACO's budget is infused into this program.

Table 1.8.1 Ratio of Fertilizer Cost against Gross Income of Maize per Hector

Item		2006		2009	
		Commercial	FSP (60%)	Commercial	FSP (75%)
Fertilizer					
Unit price	ZMK/bag	55,000	22,000	250,000	62,500
Quantity	Bags (50kg)	8	8	8	8
Total	ZMK	440,000	176,000	2,000,000	500,000
Income					
Unit price	ZMK/bag	38,000		65,000	
Quantity	Bags (50kg)	80		80	
Total	ZMK	3,040,000		5,200,000	
Ratio (Fertilizer/Income)		14.5%	5.8%	38.5%	9.6%

Source:
Fertilizer Price: Interview at a commodity shop in Kasama (2009). Quantity of fertilizer: recommended by FSP.
Selling price of maize: FRA buying price in each year
Percentage of the subsidies in FSP: FSP Implementation Manual (2008/09).

As noted, high cost of fertilizer can be one of the significant hindrances against smallholder irrigation development. In fact, some farmers in Lunda village in Kasama district mentioned that they gave up irrigation itself due to the high cost of fertilizer. They used to "borrow" irrigation canal from other villagers by paying a fee. However, as they could not buy enough amount of fertilizer and thus could not make an enough use of irrigation, they had to give up doing irrigated agriculture itself. This case suggests that irrigation development per se does not automatically guarantee improved agriculture.

Chemical fertilizer would not spare what is valued if they produce conventional food crops only with irrigation. Irrigated agriculture should therefore focus on high valued cash crops which can compensate the high price of chemical fertilizer, or otherwise they would rather stay with rain-fed agriculture. Marketing opportunities should always be examined in this regard.

1.8.2 Aspects Conducive to Marketing – A opportunity

1) Urbanized Areas accessible from the Study Area

Marketing is a challengeable aspect of agriculture as an economic activity especially in such areas where population density is low and thus market place is relatively far. In the Study area, a number of farmers are often observed who are pushing their bicycles, carrying a large piece of their produces along the main road to the market. It takes hours from their farm to the market and another hours going back home. It surely is a big burden for them, although it is still a preferable situation compare to such farmers who can not even access to the big market.

Although the study area seems to stand little chance of agricultural marketing, there are a couple of best practices: inter-district or inter-provincial marketing. While Zambia in general is low in the population density, population is actually concentrated in some particular area such as small and medium towns along the rail road and some big cities like Lusaka and Copperbelt. In such urbanized area, there is a huge demand for food. One may think that the study area is too far from those areas, there are actually a number of small cases that smallholder farmers carry their produces to other district or other province like Copper Belt, by hiring transportation by themselves. There are two cases:

Case One: Shipping from Mbala Northern Province to Copper belt

According to Mr. Derick Chisulo, a farmer in Mbala District, Northern province, onion is one of the most preferable crops for his family, earning considerable amount of incomes. With irrigation, he produces onion during the dry season, May to July. In his 1.5 limas of land (0.375 ha), he can expect as much as 60 bags of 90kg bag, equivalent to 14,400 kg/ha. He sells his produce mostly at Kitwe district in Copper Belt province, approximately 900 km away from his village. Based on a rough estimation, as far as he describes, he can anticipate as much as ZMK 18 million from his 1.5 limas of land.

One of the possible contributors is the way of marketing he practice; he brings produce by himself and can expect twice as much unit price as the one in Mbala town. An average selling price of ZMK 200,000 per bag (90kg) in Mbala skyrockets to ZMK 400,000 per bag in Copper Belt, where a lot of demand exists. Even after deducting transportation cost, income is far better than selling in town. Another possible contributor is the fact that he sells by himself. Generally, it is well known that middlemen can obtain considerable level of margin and thus farmers can expect only a limited profit from his produce. In his case, he can keep everything he sold; that is why unit profit can be beyond our expectation.

Case two: Shipping from Chambeshi region (Mungwi district) to Kasama market

Chambeshi river basin in Mungwi and Isoka districts is well known as a big production area of paddy rice. Different from many other places in the study area, farmers in this area focus very much on rice production. Without applying any fertilizers, they can expect a net profit of around ZMK 90,000 per lima with farm-gate price or ZMK 120,000 per lima at market price. In the area, middlemen still play a major role in marketing. Middlemen set up a temporary “camp,” where they buy and collect paddy from a number of farmers until they fill up enough amounts of bags to transport.

> On the other hand, some villagers bring their produces to Chambeshi Market in Kasama town. Fortunately, in this particular area, transporters are active. During the harvesting season, they shuttle the truck two to four times a day between the area and Kasama. Then some farmers make a great use of this opportunity by paying a fee at ZMK 20,000 per bag (large). By doing so, farmers can expect higher selling price: ZMK 60,000 per bag (middle) with paddy that include 15 tins. Even after deducting the cost of transportation, by carrying by themselves, farmers can gain as much as ZMK 84,000 per lima of more profit, that is to say a household that cultivated 4 limas (1 ha) can benefit ZMK 330,000 by marketing by themselves.

Both cases clearly illustrate the marketing potential in the urbanized area in the nearby district or in the other provinces. What should be noted is that some smallholder farmers are already transporting their produces to those areas and gaining a good amount of profit; those areas are actually accessible today. The key factor in those areas is the means of transportation. In both cases, there are service providers of transportation from the production area to the market. It implies that by connecting producers to those transporters, marketing opportunity can be capitalized.

2) Nearby Schools and Hospitals

Long distance transportations would not be an option for all the farmers. Some, or most, of farmers may not afford hiring transportation even if they can expect higher profit from that arrangement. Some may face a lack of fund and the other may not be confident. For those farmers, nearby markets are the only options. In addition to ordinal markets in the communities, there are some potential customers: boarding schools and district hospitals. During the Study, there were a few smallholder farmers who responded that they are selling their produces to the nearby schools or hospitals. As those institutions maintain a good number of clients, there should be a certain demand of food. Although the number of those institutions per district is limited, once farmers are linked, they can expect stable market. Specifically, boarding school at secondary and tertiary, regardless of governmental and private, is the type of school that provides food for student.

However, it should be noted that a procedure is required for farmers to deal with the government entities, not private institutions. In general, to sell their produces to the governmental institutions like schools and hospitals, farmers are required to obtain a registration paper from the government, particularly from the tender board committee of the office of the permanent secretary in each province. By registered as a food supplier, farmers are then able to sell their produce. In many cases, however, farmers do not know this procedure and miss their opportunity to sell their produce.

Another constraint reported is that, for some reason like a lack of funding, it sometimes takes months to get paid from those institutions. A farmer once experienced that he waited nearly eight months of time to get paid. As noted, to be a potential market destination, some issues have to be solved. To this end, extension workers including CEOs and BEOs can help link farmers to those potential institutions, support farmers to be registered, and ensure farmers about the attendant risk. The potential in the long run is however preferable. Since 2003, the government is running a free primary education, raising the enrollment rate in primary school nationwide. It can be a general perception that higher enrollment rate in primary school naturally leads to the higher enrollment rate of secondary and tertiary schools, which have the boarding facilities. Therefore, expected demand from the schools in the future can be positive.

CHAPTER 2 AGRICULTURAL EXTENSION SYSTEM

2.1 Overview of the Agricultural Extension System

The government plays a significant role in the agricultural extension sector in Zambia. Overall, technologies such as new varieties of crops are developed in the national and provincial research centers and then delivered to the farmers through governmental network. For example, a new cassava variety developed by ZARI in Lusaka is now being promoted in several provinces. In the study area, a set of new varieties of beans which show higher production performances were developed by Misanfu Agricultural Research Center in Kasama and are being promoted throughout the province.

For those extension activities, Camp Extension Officers (CEOs) are the main and direct entity that delivers the recommended agricultural technology to the clientele farmers and also facilitates farmers organizations at the camp level. CEOs are usually stationed at camp level so as to take care of their assigned camp all the time. As shown in Figure 2.2.2, CEOs are administratively supervised by DACO and SAO and technically supported by the officers in each technical branch of the district or the province. For the smallholder irrigation development, for example, CEOs need to enlist the technical cooperation from TSB officers, specialists. However, it is only once a quarter that all the BEOs and CEOs get together and have a plenary meeting with technical officers, implying a very limited number of opportunity wherein they can share what they are doing and learn what the other are doing.

2.2 Governmental Extension System

2.2.1 Institutional Setting in Agriculture Development

MACO is the responsible agency in the agriculture sector of Zambia. As of the fiscal year 2008, MACO maintains a total of 11,412 positions, although not all are fulfilled. In the organization, there are five technical departments: agriculture, agribusiness, cooperatives, fisheries, and veterinary and livestock development. In addition, agricultural research institute and seed control and certification institute play a pivotal role in the sub sector of agricultural research. In the department of agriculture, or DOA, there are three major branches: agricultural advisory service branch, crops production branch, and Technical Services Branch (TSB). In fact, crop production branch, or sometimes referred to as “crop husbandry branch,” was once dissolved during the period of Structure Adjustment Program (SAP) in the 1990s. However, it reestablished as the said branch in 2009 as a part of reconstruction policy of MACO. Current structure of the DOA is shown in Figure 2.2.1.

At the provincial level, organizational structure reflects the one in the headquarters. As shown in Figure 2.2.2, all the related departments are under the authority of Provincial Agriculture Coordinator (PACO), who is designated by the Permanent Secretary (PS) of the ministry. As for the provincial DOA, Principal Agricultural Officer (PAO) takes charge and, under PAO, there are also three branches as in the headquarters. Although crop production branch is restructured also at the province level, staffing yet to be completed and thus a limited number of staff, if not at all, is available by today. At the district level, the same structure is replicated. In stead of PACO and PAO, there are District Agriculture Coordinator (DACO) and Senior Agriculture Officer (SAO). For most of practical coordination, provincial technical officers under each branch coordinate closely with SAO and district officers under the branch rather than coordinating through DACO.

Below the district level, there are special units defined specifically by MACO for its extension operation: block and camp. Block is in general composed of several camps: on average, five blocks are under district. For those units, Block Extension Officer (BEO) and CEO are respectively assigned. Thus, CEOs are the tail-end agents of MACO who deliver agricultural technologies to clientele farmers in the villages and then deliver the needs and feedback from the farmers.

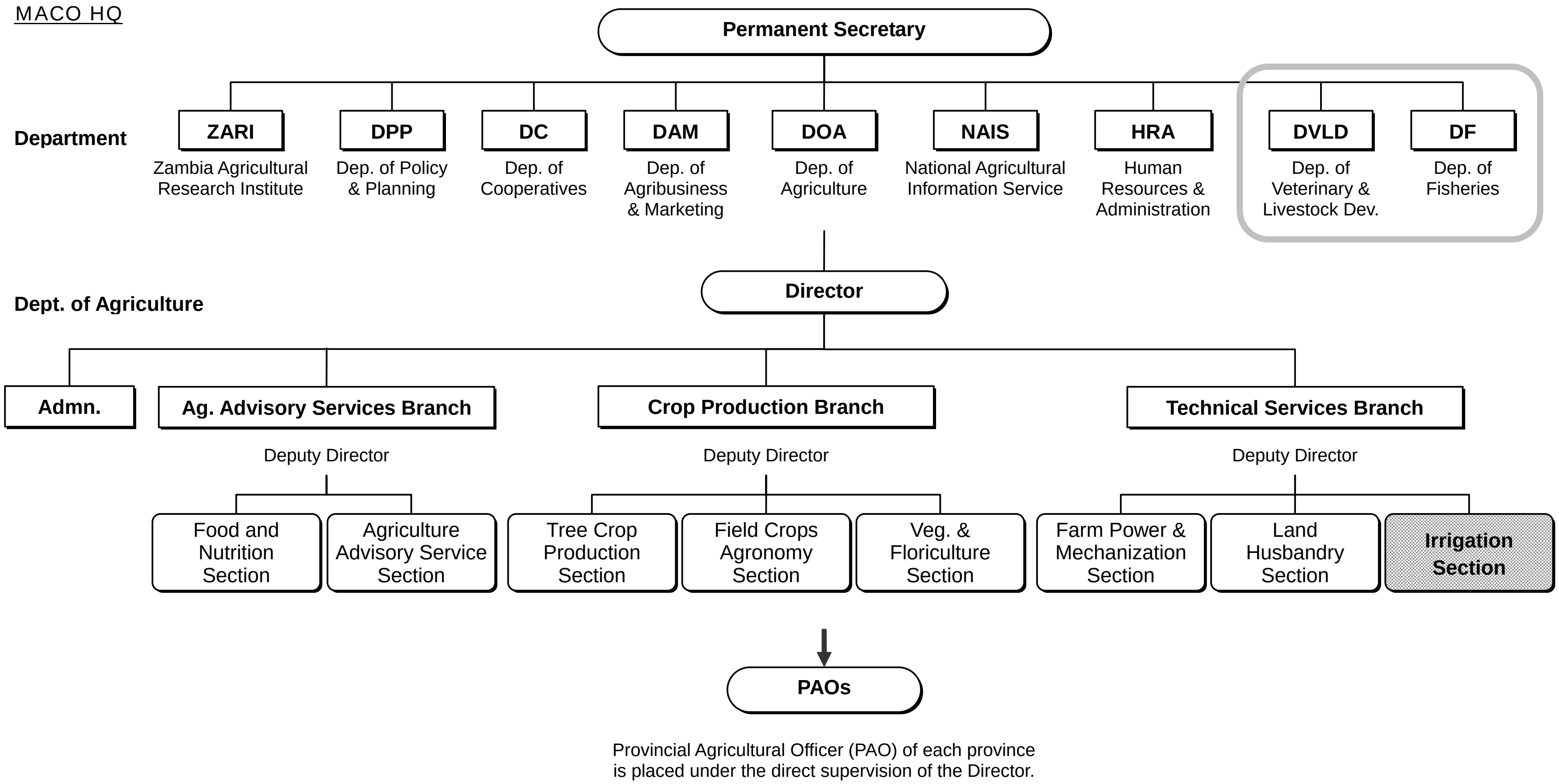
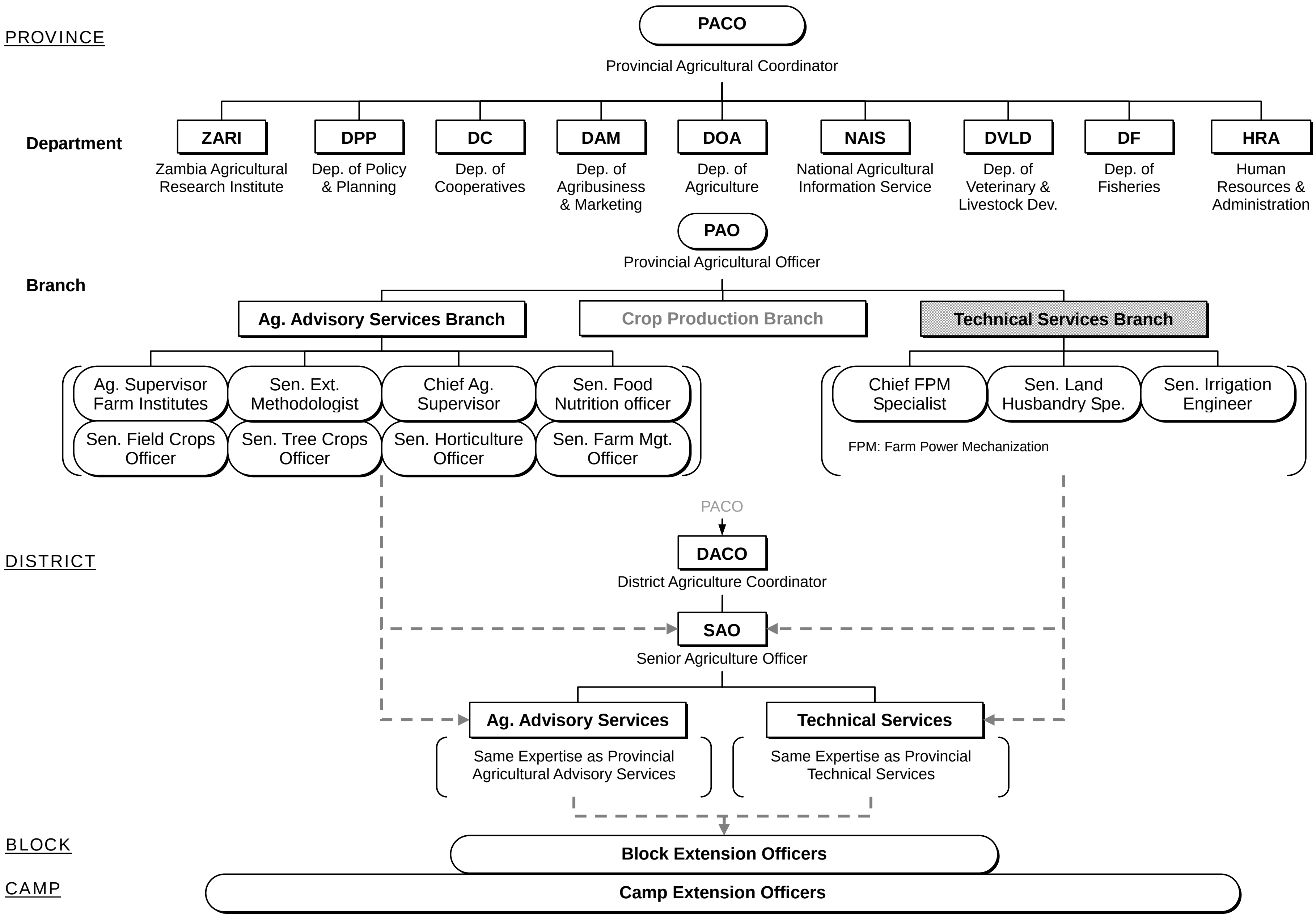


Figure 2.2.1 Organizational Structure of DOA


PROVINCE
PACO
Provincial Agricultural Coordinator
Department
ZARI
Zambia Agricultural Research Institute
DPP
Dep. of Policy & Planning
DC
Dep. of Cooperatives
DAM
Dep. of Agribusiness & Marketing
DOA
Dep. of Agriculture
NAIS
National Agricultural Information Service
DVLD
Dep. of Veterinary & Livestock Dev.
DF
Dep. of Fisheries
HRA
Human Resources & Administration
PAO
Provincial Agricultural Officer
Branch
Ag. Advisory Services Branch
Crop Production Branch
Technical Services Branch
Ag. Supervisor Farm Institutes
Sen. Ext. Methodologist
Chief Ag. Supervisor
Sen. Food Nutrition officer
Sen. Field Crops Officer
Sen. Tree Crops Officer
Sen. Horticulture Officer
Sen. Farm Mgt. Officer
Chief FPM Specialist
Sen. Land Husbandry Spe.
Sen. Irrigation Engineer
FPM: Farm Power Mechanization
DISTRICT
PACO
DACO
District Agriculture Coordinator
SAO
Senior Agriculture Officer
Ag. Advisory Services
Technical Services
Same Expertise as Provincial Agricultural Advisory Services
Same Expertise as Provincial Technical Services
BLOCK
Block Extension Officers
CAMP
Camp Extension Officers

2.2.2 The Extensionist

(1) Camp Extension Officers

As described in the previous section of the report, Camp Extension Officers (CEOs) are the main and direct entity that delivers the recommended agricultural technology to the clientele farmers and facilitates cooperatives and/or farmers organizations at the camp level. They are stationed at the camp level equipped with the government housings and take care of the farmers in the camp under the supervision of administratively by the Senior Agricultural Officer (SAO) and technically by the officers in agricultural advisory services or technology services branches at the district.

Today, up to __*(to be filled)*_ positions of CEOs are secured throughout the country. However, a lot of vacancies can be found all over the place. In Northern province, for example, the total number of CEO positions, including block officers, reaches to as many as 250, averaging 20.8 CEOs per district. However, the actual number of officers in 2009 is said around half of that position. The reason behind can be partly explained by the history of structural adjustment of the ministry as well as the trend of donors' activity in the past 20 years. Zambia's agricultural extension system had been influenced by such external factors. Given the Structural Adjustment Program (SAP), for instance, the government drastically shifted the way how it should be; a large number of government officers had to leave through the so-called "voluntary separation" program and virtually no staff had been newly employed for nearly 10 years. As a result, MACO officials became fewer and older, and Crop Husbandry Branch, one of three branches under the Department of Agriculture, was disorganized in 1996. Thus, the number of CEOs had been reduced in line with this policy change. Fortunately for them, MACO decided to restart employing new staff in the early 2009 and the Crop Husbandry Branch was also re-organized at that time. Now, it is expected that the vacancy of the CEO positions can be filled up in the near future.

(2) Technology Service Branch Officers

On irrigation development, officers in Technology Service Branches (TSBs) at national, provincial and district levels are responsible. In many cases, they are engaged in specific irrigation projects of their responsible areas and work on surveying, designing, and supervising the construction. On the other hand, they also work directly for and closely with the farmers in the area. Upon the request from the specific group of farmers or individual farmers, TSB officers, especially the ones at (the?) provincial and district level, visit the clients' farmland and provide technical advices concerning irrigation. In most of cases, farmers invite them for the construction of small scale irrigation scheme. To be functional, TSB officers are asked to carry out a topographic survey from the potential water source to the expected command area. Using dumpy level, TSB officers draw an appropriate canal alignment and peg along the alignment. Consultation about the on-farm irrigation is also a subject for the expected service on the ground.

According to the provincial and district TSB officers in Northern province, they used to provide these services for free as the government was able to manage the funding with an sufficient support from the donors. However, as many donors completed their project/program based support in and around 1995, these arrangements became difficult, or frankly, impossible. Other than project-based activities, TSB officers were no longer able to dispatch themselves to the clients' farmland due to the lack of funding for transportation. Since then, therefore, TSB officers started, officially, asking clientele farmers to bear the necessary cost for the transportation. In addition, farmers are requested to cover the full amount of meal allowance to the officers at the government rate of 50,000ZMK/person a day. Note that it was not a personal arrangement of individual TSB officers but an official conduct supervised by the senior engineers; MACO even issued receipts when requested. Although it is not fully systematized, this type of arrangement still remains as part of TSB officers' daily work; when it is difficult to manage the fuel cost, TSB officers ask farmers for the fuel cost.

2.2.3 Funding

The funding system for the operation cost of CEOs, mainly transportation cost, was given some amendment in early 2009. In the past, the budget for the CEOs' activities was treated as a part of budget for whole district. In this system, DACO had a full authority and responsibility in the allocation of the district budget. Therefore, if s/he recognizes the necessity to allocate a certain amount of budget for CEOs, CEOs might be able to receive budget entitled to his/her activity of the month. However, if CEOs' activities are not given higher priority among the other items, or if there are other necessary expenditure in the district, such as special arrangement of a meeting, CEOs might not be able to receive what they anticipate. After the amendment in 2009, the budget for CEO's activity is earmarked as their "activity-based budget." Therefore, now, CEOs are supposed to enjoy their full entitlements they bear and now CEOs receive much more amount of budget than before. However, they do not always enjoy full amount of budget they conceive; a lot cases of delay are already reported. Some complained that they have not received any since the beginning of the second quarters the year. Still, some CEOs make advance on the disbursement of fuel cost and are worried about the future.

Aside from the regular arrangement, in addition, some CEOs have actually enjoyed a privilege stems from the Agricultural Support Program (ASP). However, ASP budget was provided only the selected districts and thus it should not be generalized.

Table 2.2.1 Financial Report of Kasama District for the Year 2007

Item	Kasama										Portion
	Gen. Admin	DACO	NAIS	Coop. Dev.	Agri-Busi	Extension		APH	Fisheries	Total	Portion
Receipt from Lusaka	10,781,655	39,250,000	25,000,000	42,500,000	211,395,591	186,041,919		83,700,000	99,775,000	698,444,165	
(Portion)	1.5%	5.6%	3.6%	6.1%	30.3%	26.6%		12.0%	14.3%	100.0%	
Allowance	4,138,000	17,360,000	9,467,000	13,830,000	56,970,000	73,218,000	40%	46,250,000	53,680,000	274,913,000	39.8%
Aettling in Allowance	2,504,370	1,000,000			7,900,000	7,877,000	4%	7,616,504	1,366,785	28,264,659	4.1%
Wages		1,350,000	552,000	900,000	2,452,000	3,104,000	2%			8,358,000	1.2%
Fuel		3,448,000	2,977,000	5,400,000	6,622,000	16,872,000	9%	6,364,000	9,000,000	50,683,000	7.3%
Office Materials	1,399,000	3,233,000	728,000	887,000	3,000,000	3,190,000	2%	1,000,000	3,090,000	16,527,000	2.4%
Spares		1,691,000		342,000	220,000	10,226,000	6%	4,600,000	7,689,000	24,768,000	3.6%
Office Equipment			3,900,000	4,300,000	2,000,000	12,000,000	7%	2,600,000	15,610,000	40,410,000	5.9%
Other Services	1,060,285	955,000	1,650,000	8,880,000	16,516,000	9,780,000	5%	4,900,000	2,000,000	45,741,285	6.6%
Other Purchases	1,146,000	2,000,000	2,630,000	4,024,000	5,363,000	10,084,000	5%	3,907,000	5,435,000	34,589,000	5.0%
Bank Charges		473,000	800,000	1,827,000	3,500,000	3,900,000	2%	2,400,000	1,500,000	14,400,000	2.1%
Maintenance	534,000	3,210,000	2,200,000	1,635,000	6,520,000	10,400,000	6%	4,050,000		28,549,000	4.1%
Vehicle					100,000,000		0%			100,000,000	14.5%
Bike						22,800,000	12%			22,800,000	3.3%
Total	10,781,655	34,720,000	24,904,000	42,025,000	211,063,000	183,451,000	100%	83,687,504	99,370,785	690,002,945	100.0%
(Portion)	1.6%	5.0%	3.6%	6.1%	30.6%	26.6%		12.1%	14.4%	100.0%	
Balance	0	4,530,000	96,000	475,000	332,591	2,590,919		12,496	404,215	8,441,220	

Note: Misculculation in the source was collected in this tabulation.

Allowance includes Daily Subsistence Allowance (DSA)/ Setting in allowance is the one for those who newly assigned in the district from other place.

Budget and spending for Technical Service Brach (TSB) and Agricultural Advisory Service Branch are included in the "Extension."

APH: Animal Production and Health

Simulation if Vehicle was not Purchased (By the Study Team)

Item	Kasama										Portion
	Gen. Admin	DACO	NAIS	Coop. Dev.	Agri-Busi	Extension		APH	Fisheries	Total	Portion
Receipt from Lusaka	10,781,655	39,250,000	25,000,000	42,500,000	211,395,591	186,041,919		83,700,000	99,775,000	698,444,165	
(Portion)	1.5%	5.6%	3.6%	6.1%	30.3%	26.6%		12.0%	14.3%	100.0%	
Allowance	4,138,000	17,360,000	9,467,000	13,830,000	56,970,000	73,218,000	40%	46,250,000	53,680,000	274,913,000	46.6%
Aettling in Allowance	2,504,370	1,000,000			7,900,000	7,877,000	4%	7,616,504	1,366,785	28,264,659	4.8%
Wages		1,350,000	552,000	900,000	2,452,000	3,104,000	2%			8,358,000	1.4%
Fuel		3,448,000	2,977,000	5,400,000	6,622,000	16,872,000	9%	6,364,000	9,000,000	50,683,000	8.6%
Office Materials	1,399,000	3,233,000	728,000	887,000	3,000,000	3,190,000	2%	1,000,000	3,090,000	16,527,000	2.8%
Spares		1,691,000		342,000	220,000	10,226,000	6%	4,600,000	7,689,000	24,768,000	4.2%
Office Equipment			3,900,000	4,300,000	2,000,000	12,000,000	7%	2,600,000	15,610,000	40,410,000	6.8%
Other Services	1,060,285	955,000	1,650,000	8,880,000	16,516,000	9,780,000	5%	4,900,000	2,000,000	45,741,285	7.8%
Other Purchases	1,146,000	2,000,000	2,630,000	4,024,000	5,363,000	10,084,000	5%	3,907,000	5,435,000	34,589,000	5.9%
Bank Charges		473,000	800,000	1,827,000	3,500,000	3,900,000	2%	2,400,000	1,500,000	14,400,000	2.4%
Maintenance	534,000	3,210,000	2,200,000	1,635,000	6,520,000	10,400,000	6%	4,050,000		28,549,000	4.8%
Vehicle					Deleted		0%			0	0.0%
Bike						22,800,000	12%			22,800,000	3.9%
Total	10,781,655	34,720,000	24,904,000	42,025,000	111,063,000	183,451,000	100%	83,687,504	99,370,785	590,002,945	100.0%
(Portion)	1.8%	5.9%	4.2%	7.1%	18.8%	31.1%		14.2%	16.8%	100.0%	
Balance	0	4,530,000	96,000	475,000	100,332,591	2,590,919		12,496	404,215	108,441,220	

Assuming that the purchase of the vehicle is not ordinal, expenditure for the vehicle was deleted just for a simulation purpose to see how much portion is usually spend for each item.

Table 2.2.2 Budgetal Change in MACO District Offices in Northern and Luapula Provinces (1/3)

<Northern Province>

District	Kasama		Mpika		Kaputa		Mbala		Isoka		Mpulungu		Mungwi	
	2008	2009	2008	2009	2008	2009	2008	2009	2008	2009	2008	2009	2008	2009
District Total	360,689	1,312,661	359,821	1,652,338	266,205	912,625	334,750	1,528,668	570,622	1,629,620	304,704	1,190,214	322,792	1,466,680
2009/2008 Ratio in the total budget of district	3.6		4.6		3.4		4.6		2.9		3.9		4.5	
Support to Camp and Block Operation														
1 Farmer Facilitation	7,400	120,000	6,216	163,000	8,440	50,000	11,068	100,000	13,187	130,000	0	90,000	13,680	130,000
2 Field Operations	10,520	225,000	6,000	350,000	5,000	75,000	6,000	125,000	27,360	175,000	5,000	200,000	8,000	175,000
3 Support to Pilot Camps	0	54,000	0	0	0	0	0	0	6,000	54,000	0	0	8,920	27,000
4 Rehavbilitation of Camp Houses	0	250,000	0	300,000	0	150,000	0	300,000	3,213	200,000	0	250,000	0	250,000
5 Provincial Nursery Rehabilitation	0	50,000	0	0	0	0	0	0	0	0	0	0	0	0
6 Mechanization Center Rehabilitation Kasama FTI	0	50,000	0	0	0	0	0	0	0	0	0	0	0	0
7 Farmer Training and Developmement	27,360	0	0	0	0	0	0	0	0	0	0	0	0	0
8 Farm Visits and Farmer Exchange Visits	0	0	10,187	0	0	0	0	0	0	0	0	0	0	0
9 Farmer regstration	0	0	0	0	0	0	0	0	0	0	4,920	0	0	0
10 Construction/Rehabilitation of FTC	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	45,280	749,000	22,403	813,000	13,440	275,000	17,068	525,000	49,760	559,000	9,920	540,000	30,600	582,000
Share in the district total	13%	57%	6%	49%	5%	30%	5%	34%	9%	34%	3%	45%	9%	40%
2009/2008 Ratio in "Camp and Block Operation" budget	4.5		7.9		6.0		6.7		3.9		13.9		4.2	
Pure Operational Budget (1-3, 7-9)	45,280	399,000	22,403	513,000	13,440	125,000	17,068	225,000	46,547	359,000	9,920	290,000	30,600	332,000
(share in the Camp and Block Operation Budget)	100%	53%	100%	63%	100%	45%	100%	43%	94%	64%	100%	54%	100%	57%
2009/2008 Ratio in Pure Operational Budget	8.8		22.9		9.3		13.2		7.7		29.2		10.8	
Other budget (4-6, 10)	0	350,000	0	300,000	0	150,000	0	300,000	3,213	200,000	0	250,000	0	250,000
(share in the Camp and Block Operation Budget)	0%	47%	0%	37%	0%	55%	0%	57%	6%	36%	0%	46%	0%	43%
No. of CEOs and BEOs	26		39		11		22		24		9		23	
Camp and Block Operation Budget per CEO/BEO	1,742	28,808	574	20,846	1,222	25,000	776	23,864	2,073	23,292	1,102	60,000	1,330	25,304
(Per month)	145	2,401	48	1,737	102	2,083	65	1,989	173	1,941	92	5,000	111	2,109
Pure Operational Budget per CEO/BEO	1,742	15,346	574	13,154	1,222	11,364	776	10,227	1,939	14,958	1,102	32,222	1,330	14,435
(Per month)	145	1,279	48	1,096	102	947	65	852	162	1,247	92	2,685	111	1,203

Table 2.2.3 Budgetal Change in MACO District Offices in Northern and Luapula Provinces (2/3)

<Northern Province>

District	Mporokoso		Chinsali		Chilubi		Nakonde		Luwingu		Total	
	2008	2009	2008	2009	2008	2009	2008	2009	2008	2009	2008	2009
District Total	367,846	1,203,472	547,124	1,223,345	290,270	835,554	370,046	2,176,999	4,406,810	17,118,724	8,501,679	32,250,901
2009/2008 Ratio in the total budget of district	3.3		2.2		2.9		5.9		3.9		**3.8**	
Support to Camp and Block Operation												
1 Farmer Facilitation	12,920	120,000	12,000	100,000	7,000	60,000	12,920	60,000	12,400	50,000	117,231	1,173,000
2 Field Operations	5,000	225,000	11,000	200,000	6,440	100,000	5,000	50,000	10,000	75,000	105,320	1,975,000
3 Support to Pilot Camps	0	0	0	0	0	0	0	0	0	0	14,920	135,000
4 Rehavbilitation of Camp Houses	0	200,000	0	200,000	0	100,000	0	350,000	0	350,000	3,213	2,900,000
5 Provincial Nursery Rehabilitation	0	0	0	0	0	0	0	0	0	0	0	50,000
6 Mechanization Center Rehabilitation Kasama FTI	0	0	0	0	0	0	0	0	0	0	0	50,000
7 Farmer Training and Developmement	0	0	0	0	0	0	0	0	0	0	27,360	0
8 Farm Visits and Farmer Exchange Visits	0	0	0	0	0	0	0	0	0	0	10,187	0
9 Farmer regstration	0	0	0	0	0	0	0	0	0	0	4,920	0
10 Construction/Rehabilitation of FTC	0	0	0	0	0	0	0	0	0	500,000	0	500,000
Total	17,920	545,000	23,000	500,000	13,440	260,000	17,920	460,000	22,400	975,000	283,151	6,783,000
Share in the district total	5%	45%	4%	41%	5%	31%	5%	21%	1%	6%	3%	21%
2009/2008 Ratio in "Camp and Block Operation" budget	9.3		9.7		6.7		4.4		11.2		**6.3**	
Pure Operational Budget (1-3, 7-9)	17,920	345,000	23,000	300,000	13,440	160,000	17,920	110,000	22,400	125,000	279,937	3,283,000
(share in the Camp and Block Operation Budget)	100%	63%	100%	60%	100%	62%	100%	24%	100%	13%	99%	48%
2009/2008 Ratio in Pure Operational Budget	19.3		13.0		11.9		6.1		5.6		**11.7**	
Other budget (4-6, 10)	0	200,000	0	200,000	0	100,000	0	350,000	0	850,000	3,213	3,500,000
(share in the Camp and Block Operation Budget)	0%	37%	0%	40%	0%	38%	0%	76%	0%	87%	1%	52%
No. of CEOs and BEOs	28		30		10		10		11		243	
Camp and Block Operation Budget per CEO/BEO	640	19,464	767	16,667	1,344	26,000	1,792	46,000	2,036	88,636	1,165	27,914
(Per month)	53	1,622	64	1,389	112	2,167	149	3,833	170	7,386	97	2,326
Pure Operational Budget per CEO/BEO	640	12,321	767	10,000	1,344	16,000	1,792	11,000	2,036	11,364	**1,152**	**13,510**
(Per month)	53	1,027	64	833	112	1,333	149	917	170	947	**96**	**1,126**

Table 2.2.4 Budgetal Change in MACO District Offices in Northern and Luapula Provinces (33)

<Luapula Province>

District	Mansa		Samfya		Milenge		Kawambwa		Nchelenge		Mwense		Chienge		Total	
	2008	2009	2008	2009	2008	2009	2008	2009	2008	2009	2008	2009	2008	2009	2008	2009
District Total	840,303	1,924,098	717,454	1,138,103	482,973	967,708	919,618	1,356,314	444,439	1,124,659	470,208	1,493,856	4,205,688	8,992,744	8,080,683	16,997,482
2009/2008 Ratio in the total budget of district	2.3		1.6		2.0		1.5		2.5		3.2		2.1		**2.1**	
Support to Camp and Block Operation																
1 Farmer Facilitation	2,930	137,581	3,355	110,065	2,516	52,281	3,355	110,065	2,930	41,274	3,355	88,052	2,516	41,274	20,957	580,593
2 Field Operations	27,360	450,000	27,360	350,000	10,060	150,000	13,680	350,000	5,800	125,000	0	0	10,060	125,000	94,320	1,550,000
3 Support to Pilot Camps	5,800	54,000	6,710	54,000	0	0	6,710	27,000	0	0	0	0	0	0	19,220	135,000
4 Construction/Rehavbilitation of Camp Houses	360,000	0	240,000	0	240,000	300,000	360,000	0	0	500,000	0	450,000	0	400,000	1,200,000	1,650,000
5 Construction of Camp and Block Houses	8,800	450,000	0	0	0	0	0	0	0	0	0	0	0	0	8,800	450,000
6 Farm Visits and Farmer Exchange Visits	11,700	0	13,420	0	0	0	13,420	0	11,700	0	13,420	0	0	0	63,660	0
7 Farmer regstration	0	0	10,060	0	7,550	0	10,060	0	8,800	0	10,060	0	4,500	0	51,030	0
8 Crop and Horticulture Assessment	0	0	0	0	5,030	0	0	0	0	0	6,710	0	5,030	0	16,770	0
9 Procurement of Field Transport	0	0	0	0	0	0	0	0	0	0	0	275,000	0	0	0	275,000
Total	416,590	1,091,581	300,905	514,065	265,156	502,281	407,225	487,065	29,230	666,274	33,545	813,052	22,106	566,274	1,474,757	4,640,593
Share in the district total	50%	57%	42%	45%	55%	52%	44%	36%	7%	59%	7%	54%	1%	6%	18%	27%
Increase in "Camp and Block Operation" budget	2.6		1.7		1.9		1.2		22.8		24.2		25.6		**3.1**	
Pure Operational Budget (1-3, 6-8)	47,790	641,581	60,905	514,065	25,156	202,281	47,225	487,065	29,230	166,274	33,545	88,052	22,106	166,274	265,957	2,265,593
(share in the Camp and Block Operation Budget)	11%	59%	20%	100%	9%	40%	12%	100%	100%	25%	100%	11%	100%	29%	18%	49%
Increase in Pure Operational Budget	13.4		8.4		8.0		10.3		5.7		2.6		7.5		**8.5**	
Other budget (4, 5, 9)	368,800	450,000	240,000	0	240,000	300,000	360,000	0	0	500,000	0	725,000	0	400,000	1,208,800	2,375,000
(share in the Camp and Block Operation Budget)	89%	41%	80%	0%	91%	60%	88%	0%	0%	75%	0%	89%	0%	71%	82%	51%
No. of CEOs and BEOs	44		25		13		23		15		29		9		158	
Camp and Block Operation Budget per CEO/BEO	9,468	24,809	12,036	20,563	20,397	38,637	17,705	21,177	1,949	44,418	1,157	28,036	2,456	62,919	9,334	29,371
(Per month)	789	2,067	1,003	1,714	1,700	3,220	1,475	1,765	162	3,702	96	2,336	205	5,243	778	2,448
Pure Operational Budget per CEO/BEO	1,086	14,581	2,436	20,563	1,935	15,560	2,053	21,177	1,949	11,085	1,157	3,036	2,456	18,475	**1,683**	**14,339**
(Per month)	91	1,215	203	1,714	161	1,297	171	1,765	162	924	96	253	205	1,540	**140**	**1,195**

Source: Budget-Estimates of Revenue and Expenditure (Activity Based Budget) for the Year 1st January, 2009 to 31st December, 2009 (Republic of Zambia)
Number of CEOs and BEOs-TSB at each district
Note: The budget for the year 2008 is a "Total authorized," which is a sum of "approved estimate" and "supplementary estimates or savings declared." However, there is no figures in the latter in these two provinces.
Unit: 1,000 Zambian Kwacha

Table 2.2.5 Number of District DOA Officers in Northern Province

Office/ Position	Number of Staff													
	Kasama	Mungwi	Mbala	Mpulungu	Nakonde	Isoka	Chinsali	Mpika	Mporokoso	Kaputa	Luwingu	Chilubi	TOTAL	AVE.
DACO	1	1	1	1	1	1	1	1	1	1	1	1	12	1.0
Administration	7	12	4	5	4	5	3	5	6	5	5	5	66	5.5
Total	8	13	5	6	5	6	4	6	7	6	6	6	78	6.5
SAO	1	1	1	1	1	1	1	1	1	1	1	1	12	1.0
Agricultural Advisory Services Branch														0.0
Agricultural Officer		3	3		1	2	2	2	4	1	4	1	23	1.9
Chief Agricultural Supervisor				1	1		1				1		4	0.3
Principal Agricultural Supervisor	1	2	1			2	1	2			2		11	0.9
Senior Agricultural Supervisor	1	1	1	3	1	2	1	2	1	1	4	1	19	1.6
Senior Agricultural Supervisor (W&Y)	1												1	0.1
Agricultural Supervisor					1								1	0.1
Agricultural Assistant		2	2	2									6	0.5
Subtotal (incl. SAO)	4	9	8	7	5	7	6	7	6	3	12	3	77	6.4
Technology Services Branch (TSB)														
Agricultural Specialist	1												1	0.1
Senior Technical Officer		1			1	1		1	1	1			6	0.5
Technical Officer						1		1	1	1			4	0.3
Junior Technical Officer	3	1		2	1	2		2	2	1	2		16	1.3
Agricultural Assistant							2						2	0.2
Office Orderly	1												1	0.1
Subtotal	5	2	0	2	2	4	2	4	4	3	2	0	30	2.5
Total	9	11	8	9	7	11	8	11	10	6	14	3	107	8.9
Number of Blocks	4	4	4	4	3	5	4	6	4	2	3	3	46	3.8
Number of Camps	24	22	18	18	10	24	19	34	19	10	9	10	217	18.1
Number of Units	22	23	19	10	11	24	27	31	18	11	8	6	210	17.5
Number of Farmers Training Center (FTC)	0	0	1	0	0	0	1	0	1	0	0	0	3	0.3
Number of Agricultural Supervisor (Block officer)	4	4	4	3	3	2	5	0	6	3	4	3	41	3.4
Number of Camp Extension Officers	25	20	18	9	10	24	30	31	17	12	7	6	209	17.4
Total (Extension Officers)	29	24	22	12	13	26	35	31	23	15	11	9	250	20.8
Population	170,929	112,977	149,634	67,602	75,135	99,319	128,646	146,196	73,929	87,233	79,604	67,492	1,258,596	104,881
Estimated No. of Rural Households (67% of total)	30,400	21,138	26,550	12,559	13,286	16,887	21,940	26,066	12,832	16,077	14,650	12,449	224,733	18,728
Land Area (sq. km)	10,768	9,766	8,343	9,865	4,621	9,225	15,395	40,935	12,043	18,004	8,882	4,848	147,525	12,294
Number of Camps per Block	6.0	5.5	4.5	4.5	3.3	4.8	4.8	5.7	4.8	5.0	3.0	3.3	4.7	
Number of Camps per Ag Advisory Officer	6.0	2.4	2.3	2.6	2.0	3.4	3.2	4.9	3.2	3.3	0.8	3.3	2.8	
Number of Camps per TSB Officer	4.8	11.0	N/A	9.0	5.0	6.0	9.5	8.5	4.8	3.3	4.5	N/A	7.2	
Number of Camps per Extension Officer	0.8	0.9	0.8	1.5	0.8	0.9	0.5	1.1	0.8	0.7	0.8	1.1	0.9	
Population per extension officer	5,894	4,707	6,802	5,634	5,780	3,820	3,676	4,716	3,214	5,816	7,237	7,499	5,035	
Rural households per extension officer	1,048	881	1,207	1,047	1,022	642	627	841	562	1,072	1,332	1,383	899	
Land area per extension officer (sq. km)	372	407	379	822	355	355	440	1,320	524	867	808	516	590	
To be squared (km)	19	20	19	29	19	19	21	36	23	29	28	23	24	

Source:
Establishment Register for Ministries and Provinces to Support Estimate of Expenditure for the Year 2008 volume 1 (January 1, 2008)
Number of blocks and camps: Department of Agriculture, Northern Province "Number of Agriculture Camps and Blocks" (date not known)
Population and land area: 2000 Census of population and housing, volume six, Northern Province, Analytical Report (August, 2004)
Note:
Number of Agricultural Supervisor (block officer) includes the ones for Senior or Principal Agricultural Supervisor in the camp, if any
Number of Units includes the number of FTC
TSB is not listed in Mbala and Chilubi districts in the reference

2.3 Private Extension Systems

2.3.1 Major Extension Entities and Modalities

Less has been reported about the involvement of the private entities in the agricultural extension system in the country. Bottom-line is that there are no specific policies or systems which encourage the participation of private entities in the government's agricultural extension system. For instance, no case has been found that the government contracts out the extension activities to any institution from the private sector. Rather, private entities, such as NGOs, agricultural inputs enterprises, and traders, are independently operating in accordance with their own policies or networks. For example, fertilizer retailers provide farmers with pamphlets that direct the appropriate use of their products prepared for specific types of crops.

In Northern province, for another example, World Vision, an international NGO, is acting throughout the province. Although their activities do not necessarily focus only on agricultural technology, they run some small-scale projects related to agricultural development in selected villages, those which includes distribution of piglets. However, it was also reported that not enough technical advice was provided to the beneficial farmers and thus the farmers had consumed the pigs within a year or around. It should not be overemphasized but their activities are probably more on the comprehensive promotion and facilitation of rural development at the grassroots level but not so much specific on the transfer of agricultural technologies.

2.4 Challenges and Opportunities in the Agricultural Extension System

2.4.1 Large Area Coverage in Agriculture Extension

In agricultural extension activities, the biggest challenge is outreach. As shown in Table 2.4.1, a total of 230 CEOs are assigned in Northern province as of mid 2009: 19 CEOs per district on average. In Luapula province, on the other hand, a total of 136, 19 CEOs per district are assigned. Excluding those who are stationed in the district office (number shown in parenthesis in the table), occupancy rate of camps is 93% in Northern and 81% in Luapula provinces with the overall rate of the 2 provinces being 88%.

As a matter of fact, after having reached the HIPC completion point in 2004, the government, MACO, started recruiting extension officers. An example can be seen in the participants who came to a kick-off training for pilot project implementation held on April 16-18, 2009. The year of service was less than or equal to 5 years for more than half of the participants (17 out of 35 participants), suggesting that many extension officers were recruited recently. Thus the number of CEOs has far increased recently, however number of BEOs is still at a low level especially in Northern province. In those areas where no BEO is assigned, an active or senior CEO has to operate as the acting BEO.

Table 2.4.1 Number of BEOs and CEOs Per District

District	No. of Blocks	BEO	Ratio	No. of Camps	CEO (at District)	Ratio	BEO+CEO	Motor-bikes
Chilubi	3	1	33%	9	9 (1)	89%	10	3
Chinsali	5	(4)	(80%)	32	30	94%	30	0
Isoka	5	0	0%	24	24	100%	24	12
Kaputa	2	1	50%	10	10	100%	11	0
Kasama	4	0	0%	26	26	100%	26	13
Luwingu	5	(5)	(100%)	16	11	69%	11	3
Mbala	4	4	100%	18	18	100%	22	6
Mpika	6	1	17%	34	38 (4)	100%	39	24
Mporokoso	4	4	100%	26	24	92%	28	4
Mpulungu	3	0	0%	15	9	60%	9	2
Mungwi	4	2	50%	22	21	95%	23	10
Nakonde	3	(3)	(100%)	10	10	100%	10	0

District	No. of Blocks	BEO	Ratio	No. of Camps	CEO (at District)	Ratio	BEO+CEO	Motor-bikes
Northern Total	48	13	48%	242	230 (5)	93%	243	77 (32%)
Chiengi	4	(4)	100%	11	9	82%	9	3
Kawambwa	7	7	100%	37	16	43%	23	3
Mansa	7	7	100%	43	37	86%	44	12
Milengi	0	0	N/A	13	13	100%	13	3/5 bikes
Mwense	5	5	100%	24	24	100%	29	0/3
Nchelenge	3	3	100%	15	12	80%	15	0/2
Samfya	0	0	N/A	25	25	100%	25	5/10 bikes
Luapula Total	26	22	85%	168	136 (0)	81%	158	26 (16%)
Grand Total	**74**	**35**	**47%**	**410**	**366 (5)**	**88%**	**401**	**103 (26%)**

Source: TSB at each district
Note/ Parenthesis in the column of BEO indicate the number of CEOs who take care of the block in stead of BEOs.
Ratio of number of CEO to number of camps excludes the ones who is stationed in district office.
Number of motorbike does not include the ones that are not functional at all.

The mode of transport for BEOs and CEOs is supposed to be motorbike taking into account the wide coverage of area, but it is not always the case. Donor supporting projects, e.g. ASP and PaViDIA, have provided motorbike to the participating extension officers, and the government is also procuring motorbikes at a national level[7]. However, as of 2009, there are total 103 motorbikes as against total number of 401 BEOs/CEOs (see the far right column of Table 2.4.1). This means one out of four extension officers is narrowly provided with motorbike, otherwise the rest has to operate on foot or bicycle.

Table 2.4.2 explores how many rural household CEOs have to deal with and how much extended area they have to cover. Average numbers of rural households that a CEO has to take care of are estimated at as many as 1,301 households and 1,398 households in Northern and Luapula provinces respectively. Though not all the rural households are engaged in farming, one may see it is practically impossible for CEOs to take care of all their clients.

As such, area that has to be covered by a CEO is also extended very much. Coverage area of one CEO is estimated at around 657 km^2 (or 611 km^2 per camp) in Northern province and 372 km^2 (or 301 km^2 per camp) in Luapula province, arriving at an average coverage area of 550 km^2 per CEO (or 484 km^2 per camp) for the 2 provinces. These coverage areas are geographically equivalent to 26 km square (25 km square per camp) and 19 km square (17 km square per camp) respectively, arriving at an overall coverage area of 23 km square (22 km square per camp).

Table 2.4.2 Ratio of Fertilizer Cost against Gross Income of Maize per Hector

District	No. of CEOs*	Rural Population 2009	Rural Household 2009	Land Area (km^2)	Per CEO			
					Rural Pop.	Rural HH	Land Area	Square (km)
Chilubi	8	90,155	19,490	4,648	11,269	2,436	581	24
Chinsali	30	162,446	31,914	15,395	5,415	1,064	513	23
Isoka	24	104,044	20,137	9,225	4,335	839	384	20
Kaputa	10	131,680	27,956	13,004	13,168	2,796	1,300	36
Kasama	26	127,260	26,073	10,788	4,895	1,003	415	20
Luwingu	11	83,157	17,378	8,892	7,560	1,580	808	28
Mbala	18	173,141	35,390	8,343	9,619	1,966	464	22
Mpika	34	140,055	28,766	40,935	4,119	846	1,204	35
Mporokoso	24	92,572	18,654	12,043	3,857	777	502	22
Mpulungu	9	87,808	18,791	9,865	9,756	2,088	1,096	33
Mungwi	21	154,952	33,398	9,766	7,379	1,590	465	22
Nakonde	10	95,292	19,411	4,621	9,529	1,941	462	21
Northern Total	225	1,423,621	292,808	147,826	6,327	1,301	657	26

[7] As an example, Northern province has received total 4 motorbikes in 2009 for the extension work of BEOs/CEOs.

District	No. of CEOs*	Rural Population 2009	Rural Household 2009	Land Area (km^2)	Per CEO			
					Rural Pop.	Rural HH	Land Area	Square (km)
Chiengi	9	140,421	31,294	3,965	15,602	3,477	441	21
Kawambwa	16	100,156	20,960	9,303	6,260	1,310	581	24
Mansa	37	182,546	37,204	9,900	4,934	1,006	268	16
Milengi	13	39,926	7,991	6,261	3,071	615	482	22
Mwense	24	122,908	26,434	6,718	5,121	1,101	280	17
Nchelenge	12	132,061	28,962	4,090	11,005	2,414	341	18
Samfya	25	192,151	41,219	10,329	7,686	1,649	413	20
Luapula Total	136	895,154	190,193	50,567	6,582	1,398	372	19
Grand Total	**361**	**2,318,775**	**483,001**	**198,393**	**6,423**	**1,338**	**550**	**23**

Note: * Exclusive of the ones assigned in district office/ Rural household is estimated based on the estimated population (2009) and number of members household in 2000 (National Census 2000)

Considering the fact that villages and individual households are scattered in the rural area, it is absolutely challenging for the CEOs to interact with farmers in the every corner of the camp. What makes it more difficult is the lack of, or delay of, funding for the transportation arrangement. On average one out of every four extension officers has now motorcycle as aforementioned, meaning that the majority of CEOs yet to have such devise. Although specific data are not available, the majority of CEOs are equipped only with bicycle or just no means of transportation. To deal with this situation, CEOs often borrow motorcycle from their colleagues in the district.

Furthermore, outreach is not an easily task even for those who have motorcycle. BEOs/CEOs are often given a very limited, if not at all, funding for fuel or spare parts. Therefore, their extension activities repeatedly get stuck or they have to bear the cost by themselves unless they are given special funding from the donors as ASP had provided as much as 20 litters per month for each CEO.

By 2008, budget for CEOs' activities was treated as a part of whole budget of the district. In this system, DACO had a full authority and responsibility in the allocation of the district budget. Therefore, if CEOs' activities were not given higher priority among other items, or if there were other necessary expenditures in the district, DACO would not allocate any or enough funding for BEOs/CEOs' fuel cost. Therefore, lack or delay of budget had been a chronic constraint for the extension work of BEOs/CEOs.

Fortunately, the funding mechanism at the district level was amended in early 2009 and the budget became to be earmarked as "activity-based budget." Now, CEOs are supposed to receive full entitlements they bear. In fact, this system has been in place since before but the budget allocated to this item was so much limited and thus this budget was not practically recognized as a real activity budget. However, it became significant in 2009. For example, in Northern province, average budget for pure extension operation, exclusive of infrastructural arrangement, was ZMK 96,000/month/peson in 2008; it increased to ZMK 1,126,000/month/person. Although not full amount of budget is usually disbursed, this change of official budget is quite in favor of CEOs and BEOs.

Yet, they still face a lot case of delays: some complained that they have not received any Kwacha since the beginning of the second quarters of year 2009 by July. Still, some CEOs need to make advancement on the disbursement of fuel cost and are worried about the future.

2.4.2 Difficulty for BEOs/CEOs to Meet at Plenary

In principle, BEOs/CEOs are supposed to meet quarterly. However, in reality, it is often once a year for CEOs to meet as plenary unless they have special occasions. Although BEOs are, reportedly, meeting as planned, the lack of meeting opportunity makes them difficult to communicate each other and to exchange up-dated information. As a result, it is rarely possible to organize peer-to-peer training opportunity. For example, a BEO did not see one CEO out of seven in a block in Mbala district for a year. He met another CEO only two times in a year 2008, that is, he has only four to five CEOs meeting on regular basis. On top of that, CEOs are supposed to submit a monthly report to the BEO in person or by consignment; however, there are some CEOs who do not regularly submit his/her report.

Beside, the capacity building of BEOs/CEOs themselves is also a handful task. In general, CEOs are given supervision from SAO and technical support from the subject matter officers in each technical branch of the district or the province, including TSB officer in charge of irrigation. However, it is only once a quarter that BEOs and CEOs have an assemble meeting with technical officers, implying a very limited number of opportunity wherein they can share what they are doing and learn what the other are doing. Even in the Study, training of CEOs thorough peer-to-peer training does not work fast as it was hoped; on average, a CEO can train only three fellows at once due to the transportation problem.

The findings suggest that CEOs can organize Training of Trainers (TOT) only to neighboring officers by inviting them to his/her own site. As shown in Table 4.3.3, on average 2.9 officers per one time of TOT were actually trained by fellow BEOs/CEOs during the pilot project in 2009 dry season. In Mungwi and Mporokoso[8], specifically, TOTs were organized at district when they had an opportunity of quarterly meeting. However, for other districts, CEOs were able to train only around two fellows in one time, implying the limitation of TOT as a modality of capacity development.

Table 2.4.3 Number of TOTs held during the Pilot Project in 2009 Dry Season

District	Mbala	Mpika	Mungwi	Kasama	Mporokoso	Luwingu	Kawambwa	Mansa	Total/Ave.
No. of TOT	10	6	6	2	3	3	0	15	45
No. of BEO/CEO	13	10	36	2	25	7	0	36	129
BEO/CEO per TOT	1.3	1.7	6.0	1.0	8.3	2.3	-	2.4	2.9

Source: JICA Study Team (2009). Based on the report from each district.

2.4.3 Shortage of Technical Staff in Irrigation Development

Acute shortage of technical staff in irrigation sector is one of critical constraints in pursuing smallholder irrigation development. In fact, dominant present practice in promoting smallholder irrigation is a sort of 'direct force account' whereby TSB is in charge of all the technical services starting from survey of the area, then designing of the required structures, aligning of the canal/pipes, preparation and procurement of foreign construction materials such as cement and iron bars, and also supervision of the construction work.

Almost all the construction works in smallholder irrigation development do not engage civil contractor, rather are carried out by direct force account participated by the beneficiary farmers. Beneficiary farmers are required to provide whatever available in and around the construction site, e.g. sand and gravels/cobbles for concrete work. As for labour force, skilled labors such as masonries and carpenters are recruited in and around the village and paid according to the prevalent wage rate while unskilled labor forces are to come from the beneficiary farmers voluntarily.

In some cases, however, unskilled labours are paid with a minimum level of payment, in most cases equivalent to the government official minimum wage (ZMK9,400 as of mid 2009) or alike. This case where participating farmers are paid often takes place in a site which requires a long construction period, say more than 1 month like earth dam construction. Typical example for it is an earth dam

[8] It is necessary to confirm if 25 officers were actually trained in Mporokoso. In this district, TSB officer in charge of irrigation did not work actively for health reason, but his colleagues in other section like land husbandry and firm power mechanization were involved in stead of him.

constructed within Mansa Resettlement Scheme. Approximately 100 farmers had been paid official minimum wage during the construction period that needed as long as 7 months. Otherwise, payment for pre-agreed days would sometimes apply, say days for 1-2 week are to be paid, meant for providing startup capital for irrigated agriculture.

Though organizing and mobilizing of the relevant farmers are the task of CEOs, in any case of above examples TSB officers should play the major role in technical matters including the supervision of the construction. This implies even if there are a lot of potential sites to develop a permanent structure, one technical officer may be able to manage only one to maximum two sites per season. So-called engineering preparatory work alone, e.g. identification of the specific diversion site, topographic survey, and designing and billing of quantities, shall need at least more than two months though it very much depends on the size of the irrigation scheme envisaged. Including the period of construction would easily stretch out to the end of the dry season, though again dependent on the size of the scheme.

Table 2.4.4 below summarizes the TSB officers at different cadres. Looking at the above part of the table, one may see there are 63 staff in the irrigation section of the TSB in total. In fact, there are as many as 72 district offices aside from 9 provincial ones over Zambia. Though some of the districts may not need to develop irrigation, this comparison simply indicates that not all the districts countrywide can be allocated with TSB staff in irrigation. In addition, such cadres from chief irrigation engineer to principal technical officer are degree holders specialized in irrigation or agricultural engineering. They are however only 22 over the Country.

Table 2.4.4 Approved Staffing for Irrigation Engineering Section under TSB

Order	Title of the Cadre	Posted	Remarks
1	Chief Irrigation Engineer	1	as of June 2007
2	Senior Irrigation Engineer	3	ditto
3	Irrigation engineer	15	ditto
4	Chief Technical Officer	1	ditto
5	Principal Technical Officer	2	Total 22 for above, ditto
6	Senior Technical Officer	7	ditto
7	Technical Officer	17	ditto
8	Junior Technical Officer	17	ditto
Total in the Country		63	ditto
Place	**Offices**		
1	Headquarters	2	
2	TSB at Northern province	6 (1), 1/	Including Land Husbandry & FPM
3	TSB Luapula province	6 (1), 1/	Including Land Husbandry & FPM
4	TSB at districts in Northern province	2.8	Average/ district
5	TSB at district in Luapula province	2.0	Average/ district

Source: For the staff numbers by title of the cadre, paper presented to JICA Preparatory Team, June 2007. For the number of staff at different levels of offices, directly interviewed as of July 2009.
1/; Although there are six officers at each of the two provinces, officer with the educational background of irrigation/ agricultural engineering is only one each, and others are in general agriculture.

Staffing by office, as shown in the lower part of the table, indicates there are only 2 irrigation officers at the TSB headquarters as of July 2009, and six each in the two provinces of Northern and Luapula. In fact, officer specialized in irrigation at the provincial level is only one each, and others either fall in the different sections of the TSB such as land husbandry and farm power and mechanization, or otherwise they are technical/junior technical officers educated in general agriculture who work across the sections under the TSB[9]. At the district level, as far as the Study area is concerned or alike

[9] At the headquarters, the TSB is divided into 3 sections administratively and technically as Irrigation, Land Husbandry and Farm Power and Mechanization. However, TSBs at provincial level and district level do not have administratively divided

nationwide, there are only 2-3 TSB officers, who should undertake not only irrigation but also land husbandry as well as farm power and mechanization. Officers of district TSBs are not specialized in irrigation but in most cases in general agriculture.

If they intend to put up temporary structures instead of permanent one, they may develop more than 10 sites per district in a season provided that the CEOs are well engaged in the development with the district and provincial officers as back-stopper. However, taking above staffing into account, if the intended irrigation structure is of permanent, a typical district can probably manage only 1 to maximum, say, 2 sites to be developed in a dry season as far as it is constructed by direct force account. Current staffing could definitely be one of critical elements if the government intends to develop permanent irrigation structures at an extended scale.

2.4.4 Short Message Service (SMS) <Potential>

Information and Communication Technology (ICT) is seen as a potential medium in development. In the recent past, radio broadcasting has played and still plays an important role in the dissemination of agriculture-oriented information, which includes farming technology, market information, and announcement from the government. When the timing meets, farmers are able to obtain useful information at the marginal cost zero. And today, mobile phone appeared to be a promising technology for the peer-to-peer communication even in the developing countries.

In fact, Africa has been ranked as “the fastest growing mobile phone market in the world with mobile penetration in the region ranging from 30% to 100%[10]” and Zambia is not an exception with a yearly growth rate of 72.5% from the first quarter of 2006 to the first quarter of 2007 (African Mobile Factbook 2008). In effect, all the participants in the Kick-off training were identified as mobile phone user.

Based on the observation throughout the phase I study, TSB officers, CEOs, and even farmers often communicate one to another through text messaging rather than calling so as to save unnecessary expenses. They use text messaging to arrange an engagement with farmers, request some information, and claim the fuel for their mobility. Now, the text messaging became to be an essential tool for communication in their daily life.

Accordingly, it is recommended for them to fully utilize the fruit of this technology for agricultural development. First of all, as a large number [data not known] of government officers seems to have mobile phones, text messaging should be incorporated into the basic and legitimate communication channel for the smallholder irrigation development.

The benefit of using mobile phone as a communication tool can be maximized in Zambia because Zambia, including Northern and Luapula provinces, is one of the countries that maintain the least population density in Sub-Saharan Africa. As one CEO usually covers an area of about 20km square, it is rarely available for them to have a face-to-face communication with their fellows. In this circumstance, CEOs tend to work alone and have fewer opportunities to learn from the others or be encouraged by the fellows. Therefore, overcoming a remote communication should be a primary target in the sub-sector of the agricultural extension system.

Expected effects of using mobile phone are as follows:

sections, not like the headquarters, but they should undertake the 3 areas of irrigation, land husbandry and farm power and mechanization.

[10] African Mobile Factbook 2008, available online at http://www.web4dev.org/images/8/8d/Africa_Mobile_Fact_Book_2008.pdf

- Recipients of the message can see the message anytime when available (different from radio, timing of sending message does not matter);
- By updating the extension activities, i.e., promotion of smallholder irrigation, of each CEO in the area, competitive consciousness can be stimulated and CEOs can be motivated; and
- CEOs can receive real-time feedback or advice from supervisors whom they actually know.

Possible constraints are also summarized below:

- Remote area is often an out of coverage;
- Long sentence or complicated description may not be suited as the display of mobile phones are usually not so large; and
- CEOs may not be always willing to bear the “airtime” or may fail refilling the “airtime” for a certain period of time.

Fortunately, as of July 2009, Short Message Service (SMS) that enables sending messages to a large number of mobile phone users at once is already in hand in Zambia. As shown in the picture, operator can send text message by logging in an website and, like sending a web mail, message can be sent to a large number of recipient who are registered in the list. For more efficient and effective communication, therefore, it is encouraged for MACO, to facilitate sending bulk messages to its tail-end officers.

An example of bulk SMS provided by an internet provider: you can easily send a text message to a large number of mobile phone users at once.

Furthermore, it is anticipated that, in near future, sending electronic money will become available. For instance, it is already in place in the Philippines, not just Japan as industrialized one, wherein mobile phone users can send “units” to the other users or even purchase goods by paying “unit” on the phone. Information and Communication Technology is a fast-evolving and wide spreading technology. Even for now, exchanging “airtime” is popular amongst the users in Zambia. They texts the code number of scratch card through SMS; air time itself is now like a virtual currency. Moreover, a credit swapping service is already offered and is popular now in Mozambique. If those services become available in Zambia, the disbursement of ear-tagged budget for particular officers, for example a disbursement of fuel cost to CEOs, can be easily managed and monitored at a fewer expense.

CHAPTER 3 POST HARVEST AND MARKETING

3.1 Distribution and Marketing of Agriculture Products

Figure 3.1.1 Location of the Marketing Survey

To see a general picture of the current marketing activities and thus its potential in the area, agricultural marketing survey was carried out during the dry season in 2009. As shown in the map, the survey covered nine districts: Kasama, Mbala, Nakonde, Mpika, Mporokoso, and Luwingu in Northern province, and Mansa, Kawambwa, and Nchelenge in Luapula province.

Firstly, a series of focus group interviews were carried out in nine villages in the nine districts with the ratio of one village per one district. The targeted villages were selected in such places along the main road and are near from district centers. For the focus group interviews, relatively advanced farmers were selected as they were considered more market-oriented than the others, that is, the picture described in this section does not necessarily represent whole population but reflect more the reality of progressive farmers.

Secondly, market survey was carried out in the same nine districts, in which profiles of major markets were identified: for example, type of facilities, market prices, and destinations where the commodity is come from and goes to. The following describes general picture of the agricultural marketing in the Study area based on the findings from the survey, although there might be some limitations in the size of samples.

1) Agricultural Produces Marketed

Table 3.1.1 Produces Marketed

Crops	Portion sold (%)
Maize (Irrigated)	87.65
Maize (Rainfed)	66.55
Cassava	60.39
Finger Millet	69.22
Sweet potato	57.86
Groundnuts	51.89
Soybeans	93.17
Beans (Irrigated)	50.47
Beans (Rainfed)	40.10
Onion (Irrigated)	86.78
Onion (Rainfed)	79.45
Tomato (Irrigated)	87.04
Tomato Rainfed)	80.23
Eggplant	75.45
Rape	77.89
Cabbage (Irrigated)	84.50
Cabbage (Rainfed)	90.95
Chinese Cabbage	78.66
Simple Average	73.24

Source: Agricultural marketing Survey by the Study Team

With the condition mentioned above, it was found that more than half of farmers' produces, 73% on average, are sold in the market – about quarter is consumed at home. It seems that quite a good portion of produces are being marketed in the sample areas. Looking at each crop, most of crops that are grown both in rain and dry seasons have a tendency that a more portion in irrigated agriculture is sold out than rainfed production. For example, 87.65% of irrigated maize is sold, while 66.55% of rainfed maize is sent to the market. On the other hand, only cabbage shows completely opposite result; rainfed cabbage (91%) is sold at more percentage than irrigated (85%) as shown in Table 3.5.4.

Again, this data was drawn under a relatively advantageous condition where market access is preferable and the interviewees are seen as advanced. However, as shown in Table 3.5.5, result of the baseline survey has also thrown similar result. Although data are limited and thus a careful interruption is required, the percentages of produce sold are generally high. For example, 55% of hybrid maize is sold in Molwani village in Kasama district, while it reaches 65% in Kalemba Chiti village in Mungwi district. Those villages are located in 16km and 32km away from their district capital. This another source of results support the hypothesis that the food security is already at high level and the agriculture here in the Study area is more market oriented.

Table 3.1.2 Produces Marketed

Village	Molwani		Kalemba		Remarks
Distance from town	16 km		32 km		
Crop	Portion Sold	No. of Farmers Produced	Portion Sold	No. of Farmers Produced	
Local maize	40%	8	62%	17	
Hybrid maize	55%	20	65%	4	
Cassava	53%	17	59%	25	
Millet	65%	8	43%	28	
Sorghaum	56%	2	63%	2	
Beans	68%	12	75%	24	
Soya bean	75%	1	88%	1	
Sweet potato	52%	11	75%	19	
Irisht Potato	50%	1	30%	1	
Ground nuts	55%	19	63%	27	
Tomato	91%	13	88%	4	
Cabbage	81%	3	87%	4	
Onion			75%	1	
Rape	90%	16	14%	5	
Pumpkin	71%	2	0%	1	
Eggplant	88%	1			
Okra	88%	2	80%	1	
Banana			70%	1	
Citrus	97%	1	67%	1	
NTFPs	0%	1	68%	12	
Average	65%	8	62%	9	
No. of Samples		31		30	

Source: Baseline Survey by the Study Team (2009)

Note: Ratio of selling is calculated based on the total amount of produces sold per total amount produced among all the samples. Therefore, the result derived from less number of samples, such as eggplant, citrus, and Soya beans, may be significantly biased.

2) Marketing Channels

As shown in Figure 3.1.2, the extent of marketing channel is relatively wide; to the maximum extent, some of agricultural products produced in the area are delivered to major cities in other provinces including Lusaka and Copperbelt provinces, and even to other countries, e.g., Tanzania and DRC. This wide distribution channels generally provide farmers with a potential in marketing. That is to say, as far as cash crops are concerned, there are a variety of marketing opportunities. One may aim at higher selling price by selling his/her produce to a big city where potential demands is far bigger than the production area, while other may stick on the neighboring markets that may not require exaggerated arrangement for transportation.

According to the agricultural marketing survey carried out in the Study, some percentages of agricultural produces go to other provinces including other countries. As shown in Table 3.1.3, for example, of the total amount of produces brought to market, 22.5% goes outside of the original province. In the share of produces marketed within provinces (77.6% of total), 70% is actually shipped within the districts, that is, only 8% of the marketed produces are targeted toward other districts in the province. Although this data is based only on a survey carried out in nine districts in the Study area, it draws such a contrast in which farmers tend to choose either high potential big market in other provinces or, if not, local market in their own district.

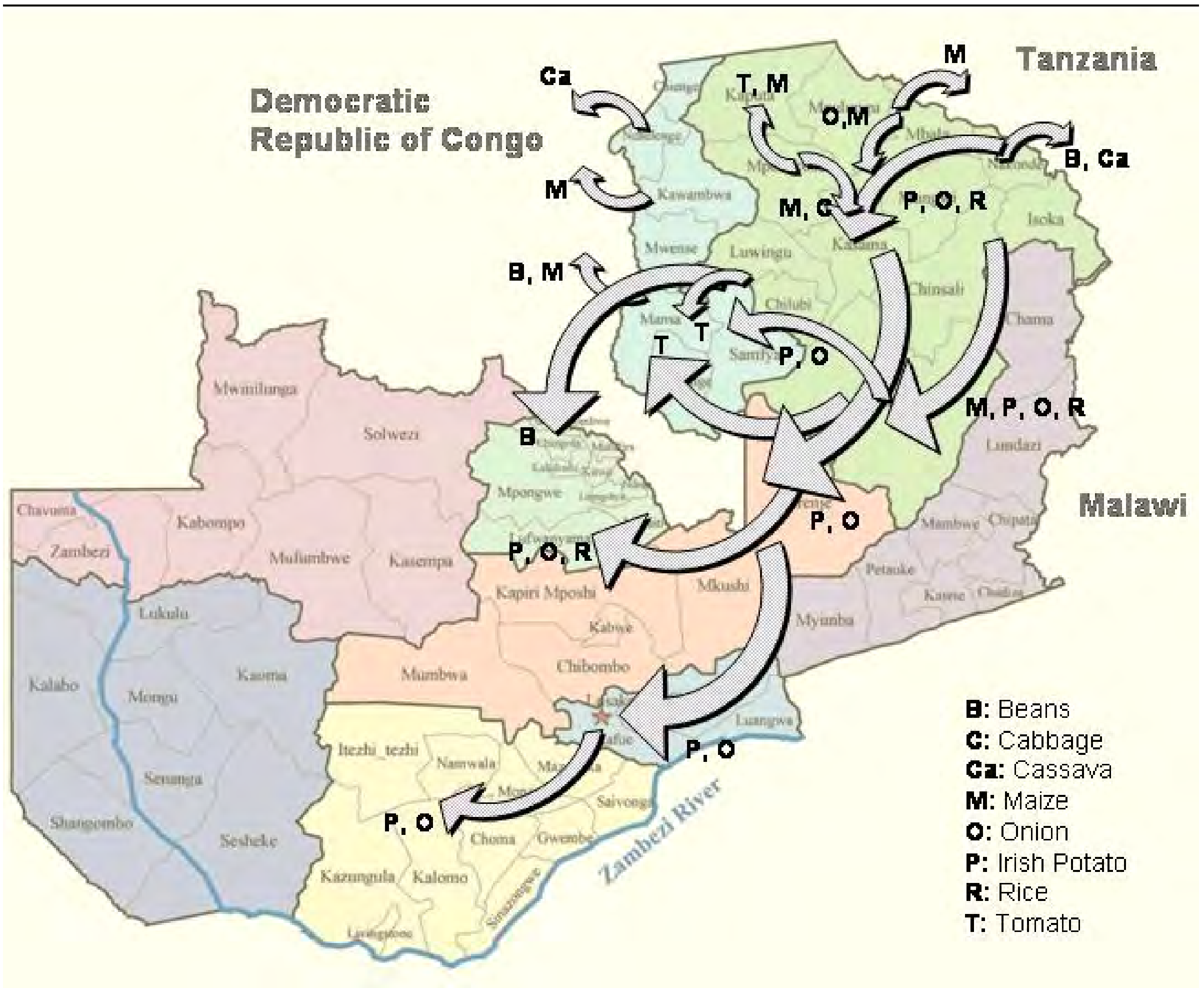


Figure 3.1.2 Primary Marketing Channels of Major Crops

Source: Agricultural Marketing Survey (2009)

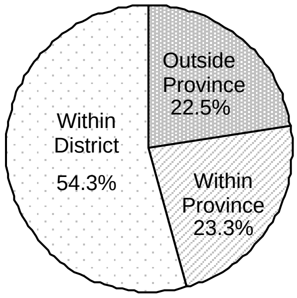
It further implies that if farmers are prepared with required conditions such as quantity of produce, means of transportation, and funding for marketing arrangement, they target the best potential market in the mega-cities, while those who are not satisfied with those conditions stick on the nearest market even though market prices are not preferable.

Yet, this situation actually varies depending on the types of produces. For example, Chinese cabbage is not shipped to other provinces at all, while more than 40% is marketed to outside provinces for maize (46%)[11], groundnuts (44%), beans (43%) and onion (40%). It looks that the perishable produces are marketed to nearer market, while non-perishable foods tend to go to big markets. However, it is too hasty to conclude; as much as 31% of tomato, one of perishable foods, is shipped to other provinces. A hypothesis from the findings: the actual marketing channels are, thus, more likely governed by the market mechanism of supply and demand rather than the level of perishability.

11 Due to an involvement of FRA in the marketing of maize, the data may be biased. Therefore, data refinement is necessary.

Table 3.1.3 Share in the Destinations of the Produces

Crops	% of HH Selling Out	Share of Destination of Produce (%)			
		Outside the province	Within the province	Within the district	(% to "within the province")
Maize	74	46	52	40	(77)
Cassava	80	13	87	79	(91)
Finger Millet	N/A	N/A	N/A	N/A	N/A
Sweet Potatoes	100	17	83	82	(99)
Groundnuts	76	44	57	61	(91)
Soybeans	60	11	89	89	(100)
Beans	60	43	58	58	(100)
Cowpeas	28	20	80	58	(73)
Onion	100	40	60	48	(80)
Tomatoes	92	31	69	64	(93)
Impwa (egg plant)	98	8	93	88	(95)
Rape	97	6	94	91	(97)
Cabbage	94	13	87	67	(77)
Chinese Cabbage	100	0	100	84	(84)
Simple Average		22	78	70	(90)



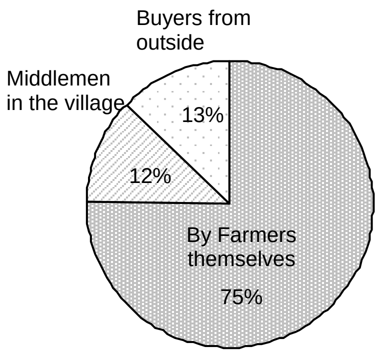
Source: JICA Study Team (Agricultural Marketing Survey). Note: Due to rounding, total may not be 100%.

3) Types of Transporters

Because of its lower population density, markets are generally far from farmers' farmland. Thus, the means of transportation or marketing chain are important. It actually changes according to the types of crops. As shown in Table 3.5.7 and Figure 3.5.17, for example, soybean is sold completely by farmers themselves, while the least percentage, 55%, is sold by farmers in Chinese cabbage. In terms of the types of transporters, majority, or 75%, of the produces sent to market are carried by farmers themselves. Other than that, 12% of the produces are sold to someone who acts as a "middleman" in the same village and the rest, 13%, are to buyers from outside the village. It changes according to the types of crops.

Table 3.1.4 Type of Transporters of Produces

Crops	% of HH Selling Out	Carriers to Outside the Village (%)		
		Farmers themselves	Middlemen in the village	Buyers from other places
Maize	74	66	13	21
Cassava	80	62	15	23
Finger Millet	N/A	N/A	N/A	N/A
Sweet Potatoes	100	88	5	7
Groundnuts	76	59	16	25
Soybeans	60	100	0	0
Beans	60	68	33	0
Cowpeas	28	99	0	1
Onion	100	81	5	14
Tomatoes	92	71	9	20
Impwa	98	84	14	3
Rape	97	68	14	17
Cabbage	94	78	9	13
Chinese Cabbage	100	55	23	22
Simple Average		75	12	13



Source: JICA Study Team (Agricultural Marketing Survey). Note: Due to rounding, total may not be 100%.

In the case of soybean, production in the Study area is not outstanding. Accordingly, there might be a limited number of buyers coming into those villages and therefore farmers may have to sell their produce by themselves. If it is the case, quantity of the produce may be one of decisive factors in the availability of buyers from outside.

4) Means of Transportation

Bicycle with a basket called "umutonga."
Farmers carry their produces as far as 30km

Based on the agricultural marketing survey, of those carried by farmers themselves, 77% of the produces are carried by bicycle, 58% are on the head of farmer, and 20% are shipped by vehicle[12]. The use of vehicle is found mostly for transportation of bulky produces such as maize and, in some part, onion. For marketing, bicycle is usually improvised with the traditional large basket called '*umutonga*' to ferry tomatoes, cabbages, rape and any other produce. The size of the basket varies in size to carry weights of between 20 to 60 kg of produce. Farmers are able to cycle long distances to the market. Farmers in Katongo Kapala village, for example, carry their produces more than 30 km from the village centre to the market—this is not a special case.

5) Market Price

Market prices change significantly along the timeline. Based on the lowest marketing price in a year, price increases by 112% on average of all the crops; it is more than twice as much as the lowest price. Specifically, tomato shows the largest rate of increase at 305%; it changes from ZMK 15,778/ 20kg to ZMK 63,889/ 20kg. The least price change is found in soybean, 28%, suggesting the relative stability of the price in this crop. In addition, prices generally rise during the wet season, November to March, when less supply is available on the market due to the difficulty in vegetable production under moisture condition. Then price hits the bottom when dry season produces appear in the market. According to some interviews in the market, despite the seasonal price fluctuation of market price, prices do not generally change a lot within each of wet and dry season. As collective marketing is not major in the area, fluctuation of marketing price at the farm gate directly influences the marketability of the crops at the village level.

Table 3.1.5 Change in Market Price

Crop	Unit	Farm Gate Price (ZMK)		Increase (%)
		Lowest	Highest	
Maize	5kg	3,000	7,722	157%
Cassava	5kg	2,722	5,000	84%
Finger Millet	5kg	2,875	7,188	150%
Sweet potatoes	25kg	6,444	15,333	138%
Groundnuts	5kg	12,813	21,571	68%
Cowpeas	5kg	10,000	16,667	67%
Soybeans	5kg	12,500	16,000	28%
Beans	5kg	9,833	20,833	112%
Onion	5kg	9,625	21,786	126%
Tomatoes	20kg	15,778	63,889	305%
Impwa	5kg	6,700	16,100	140%
Okra	5kg	8,333	17,667	112%
Rape	25kg	9,056	19,389	114%
Cabbage	25kg	11,944	23,889	100%
Chinese Cabbage	25kg	10,944	19,313	76%

[12] Based on a multiple answer question. Percentage is estimated based on the aggregated number of crops that are carried by designated means of transportation in nine villages per aggregated number of all the crops sold in the nine villages.

Crop	Unit	Farm Gate Price (ZMK)		Increase (%)
		Lowest	Highest	
Simple Average				112%

Source: JICA Study Team (Agricultural Marketing Survey).

6) Market Demand

The agricultural marketing survey was also focused on the marketing destinations in major markets. Based on the survey carried out in nine markets in a total of nine districts, difference of marketing channel in each crop was identified, although a limitation still remains. Table 3.5.8 shows major production area where the crops are from as well as the crops are shipped to.

Based on this result, a lot number of crops such as cassava leave, Chinese cabbage, cowpea, and cucumber are from the same district where the market is located. Of a total of 37 commodities listed in the table, 12 items are completely from the same district. In contrast, there are some crops more than half of which are from outside of the district: garlic (33.3% from the same district), groundnuts (48.6%), Irish potato (23.1%), onion (34.4%), and paprika (2.5%).

On the other hand, looking at the destination of the produces, there are also some varieties; some are mostly sold targeting to the same province and even to the same district, while the others are sold to other provinces, reportedly Lusaka and Copperbelt. The latter case includes beans (66.4%), chillies (50.0%), curry (60.0%), and groundnuts (56.4%). High percentage in shipping to other province implies higher demand from the big cities and thus higher potential for smallholder irrigation development.

Table 3.1.6 Origin and Destination of the Produces Traded in Major Markets in the Nine Districts

Crop	Major Production Area Where Crops Are Collected From (%)			Major Marketing Destinations Where The Crops Are Shipped To (%)		
	In the District	Outside of the District	Outside of the Province	Other Provinces (A)	Within Province (B)	of (B) within District
Maize	76.1	17.8	6.1	40.0	60.0	66.7
Cassava	67.5	40.0	4.4	28.8	68.8	88.8
Rice	**15.0**	22.9	62.1	42.9	57.1	76.4
Finger millet	66.7	21.7	11.7	31.7	68.3	74.2
Sweet potatoes	88.8	11.3	0.0	13.8	86.3	72.5
Irish potatoes	**23.1**	4.7	72.1	12.7	87.3	83.6
Pumpkins	100.0	0.0	0.0	16.7	83.3	83.3
Groundnuts	**48.6**	34.3	17.1	56.4	43.6	62.1
Beans	57.1	23.6	19.3	66.4	27.9	74.3
Cowpeas	100.0	0.0	0.0	0.0	100.0	100.0
Green Beans	100.0	0.0	0.0	0.0	100.0	100.0
Onion	**34.4**	28.0	37.6	35.3	64.7	55.2
Tomato	61.1	25.6	13.3	20.6	79.4	62.8
Impwa (local egg plant)	88.6	11.4	0.0	10.7	89.3	87.1
Carrot	85.0	0.0	15.0	0.0	100.0	90.0
Okra	55.0	45.0	0.0	25.0	75.0	100.0
Cucumber	100.0	0.0	0.0	0.0	100.0	100.0
Rape	100.0	0.0	0.0	0.0	100.0	91.7
Cabbage	86.1	12.8	1.7	3.3	89.4	79.4
Chinese cabbage	100.0	0.0	0.0	0.0	100.0	91.7
Cowpea leaves	100.0	0.0	0.0	0.0	100.0	100.0
Pumpkin leaves (chibwabwa)	100.0	0.0	0.0	0.0	100.0	100.0
Sweet potato leaves (kalembula)	100.0	0.0	0.0	0.0	100.0	100.0
Cassava leaves	100.0	0.0	0.0	0.0	100.0	100.0
Green maize	80.0	0.0	20.0	0.0	100.0	70.0
Sugarcane	50.0	37.5	12.5	18.6	91.3	100.0
Bananas	55.0	27.5	17.5	1.3	98.8	86.3

Crop	Major Production Area Where Crops Are Collected From (%)			Major Marketing Destinations Where The Crops Are Shipped To (%)		
	In the District	Outside of the District	Outside of the Province	Other Provinces (A)	Within Province (B)	of (B) within District
Mangoes	86.7	13.3	0.0	13.3	86.7	100.0
Water melons	55.0	45.0	0.0	25.0	75.0	75.0
Pineapple	50.0	50.0	0.0	0.0	100.0	80.0
Oranges	55.6	36.0	8.4	8.0	92.0	100.0
Curry	100.0	0.0	0.0	60.0	40.0	30.0
Garlic	**33.3**	33.3	33.3	0.0	100.0	100.0
Ginger	0.0	0.0	100.0	0.0	100.0	100.0
Paprika	**2.5**	47.5	50.0	0.0	100.0	100.0
Chillies	80.0	0.0	20.0	50.0	50.0	100.0

Source: JICA Study Team (Agricultural Marketing Survey).

7) Potential for Smallholder Irrigation

Gaining a quantitative understanding on agricultural marketing is extremely difficult because less is recorded in each market and on boarders with other countries. Notwithstanding, the agricultural marketing survey generally provides some positive signs for marketing.

First, the extent of existing marketing channel is quite wide, including big cities in other provinces and neighboring countries. Thus, peripheral part of the Study area, such as Mbala, Mansa and Nakonde, can enjoy comparative advantages for wider marketing. On the northeastern side, for example, there is a good chance of marketing to Tanzania especially from the area near to Nakonde district where the boarder town exists. On the northwestern side, including some districts in Luapula province, farmers sell their produces like cassava to DRC. Furthermore, elsewhere along the main road or major cities can enjoy selling their produces to Lusaka and Copperbelt provinces.

For the best instance, an onion farmer in Mbala district located in northern part of Northern province delivers his produce to Copperbelt by himself. He takes a shuttle-truck by paying ZMK 60,000/bag (50kg) to reach there and then he can enjoy the higher price in Copperbelt, twice as much as the price in Mbala (ZMK200,000 /bag in Mbala to ZMK 400,000/bag in Copperbelt). After deducting the transportation cost and storage cost in Copperbelt, the difference in two prices is estimated ZMK 335,000/bag. As a result, he can earn a net profit of ZMK 12,010,000/lima by selling at Copperbelt, while it is expected ZMK 6,610,000/lima when selling at local market.

In addition, some specific crops were found having more potential for marketing than the others. As of the price fluctuation, cassava, Chinese cabbage, cowpea, groundnuts, and soybean showed relative stability (less than 100% of price change), suggesting less risk in price change and thus easier to start producing them. Further, market demand is another key factor for the market potential. To measure market demand, extent of current market channel gives us a clue; the longer the market channel is, the more the market demand in the big cities may be. For example, while carrot, cucumber, and green maize are sold mostly within the district where they are produced, beans, curry, and groundnuts are shipped outside the province, implying a strong “pulling” power of the market from urban area. Therefore, those who would like to break into urban market, such commodities can be the first ones to consider.

Moreover, although not much is discussed in the report, green maize is another potential crop during the dry season. Different from the dried maize produced in rainy season, the price of green maize stays high: ZMK 500-1,000/cob. As farmers are familiar with maize production itself, once irrigated water becomes available, farmers can easily start cultivating it in the dry season without much hesitation. In fact, according to an interview survey to TSB officers in six districts, average net profit is estimated to be ZMK 5.7 million/lima, while it is approximately ZMK 403,500/lima in the rainy season.

As the market potential varies place to pace, time by time, and crop by crop, it should not be over generalized. However, the marketing survey revealed some evidences of market-oriented agriculture for some crops. At least, agricultural production is not just at the level of home consumption. Since people are scattered in the area, availability of transportation and distance to the market are the absolute factors for marketing. For those who are located in relatively advantageous situation in those regard, smallholder irrigation can be a strong contributor for them to improve their livelihood through market-oriented agriculture.

3.2 Food Reserve Agency (FRA)

1) Outline

Food Reserve Agency (FRA), a parastatal organization under MACO, was established in 1996 upon the enactment of the Food Reserve Act of April 1995. Originally, it started with approximately 30 staff and the number has increased up around 100, across the country, by 2009. The FRA's primary mission is to stabilize national food security and market prices of designated crops through the marketing and storing services. Specifically, it administrates a national strategic reserve, marketing, and storage facilities (FRA website as of May 2009). Historically, it has dealt several types of crops: maize, groundnut, soybean, rice, beans, and cassava. However, as far as the types of crops are concerned, its focus has narrowed on maize and rice by today.

For the effective marketing and storing, the FRA maintains a total storage capacity of 2,000,000 metric tons throughout the country. The FRA focuses primarily on the rural population in disadvantaged area; it does not purchase crops in such area where the private sector is active. For example in Northern province, it is not buying rice in Chambeshi region, the largest rice production area in the province, according to the officer in charge. Instead, it, so far, focuses only on Kaputa district, where road condition is bad and the distance from the market is relatively far, notwithstanding the enough surpluses to sell. As the access to the market is not preferable, virtually no private company is attracted enough in that area and the FRA is one of a few entities who can stretch its logistics to that area.

The target volume of purchase is generally set based on the national food balance; when it is deficit, the FRA handles the importation of the commodity. For example, it imported maize from South Africa in 2008. In the recent history, in fact, South Africa is the only country the FRA imported maize from. For the marketing or procurement of the crops, food balance in each province or district is also considered so as to avoid creating a hunger in the area, or to keep away from an inefficient procedure in which buying some produces in an area and deliver it back again to the same area through a food aid program.

Furthermore, when setting a purchasing target, dynamism of the private sector is also taken into an account; the target should be lowered in Lusaka and Copper Belt provinces where the demand is high and the activities of the private sector is intensive. At the district level, higher priority is given to the hunger-prone area or such area where production level is high while the other factors such as road condition, the distance from market, and activities of buyers are not preferable. As for the 2009 cropping year, a total of 110,000 metric tones are targeted in the country for maize and 1,200 tones for rice.

Recently, the year 2008 was the only year when the FRA was not able to achieve the target set for the whole country. In that year, the private sector was so active for buying up maize throughout the country and the FRA had to go through a very competitive circumstance. To react to this dynamics, the FRA had to increase the price from 45,000 ZMK per 50kg bag to 55,000 ZMK per bag and also to extend its marketing period by one month. Excepting the year 2008, however, the FRA usually achieves the target each year. Rather, it sometimes goes beyond the target. As shown in Table 3.2.1, for example in the Northern province, the FRA achieved 188% of the target, ranging from 97% in Kaputa to 342% in Mbala. In Kaputa, the FRA also bought 8,706 bags of rice at 40kg/bag.

As also shown in the table, although the target numbers of bags were set equally amongst the districts, different amount of budget had been disbursed. Most probably, the FRA adjusts purchasing plan by tuning the monetary allocation in stead of changing the target itself. In the year 2008, for instance, a total of 30,651 million ZMK was spent in the province and the stock of maize reached as many as 566,847 bags, of which 38,382 bags were carried over from the previous year.

Table 3.2.1 No. of Bags of Maize Purchased by the FRA in Northern Province in 2008

District	Target (No. of bags)	Purchased (No. of bags)	Achievement (%)	Allocated (Million ZMK)	Disbursed (Million ZMK)	In Stock (No. of bags)
Mpulungu	27,980	30,318	108	2,000	1,395	26,936
Mbala	27,980	95,910	342	4,550	4,819	41,999
Mungwi	27,980	56,064	200	2,742	2,643	24,447
Kasama	27,980	59,094	211	1,650	2,791	117,925
Mporokoso	27,980	48,724	174	2,350	2,302	23,541
Luwingu	27,980	39,060	136	1,900	1,850	37,423
Nakonde	27,980	66,088	236	4,231	3,789	96,282
Isoka	27,980	131,810	235	6,500	6,109	95,061
Chinsali	27,980	46,236	165	3,050	2,107	41,932
Mpika	27,980	32,830	117	2,075	1,609	33,948
Kaputa	27,980	27,353	97	1,492	1,243	27,353
Total	335,760	633,487	188	32,540	30,651	566,847

Source: Food Reserve Agency, "a report presented to the fourth quarter PDCC meeting, Sinamu lodge Kasama Dec. 23, 2008"

The main clients of the FRA are smallholder farmers as they are the majority of the farmers in the country. To reach out to the smallholder farmers in remote area, the FRA works with Camp Extension Officers (CEOs). In Northern province, for instance, an average of seven satellite depots are available in each district and those are taken care of by the CEOs. Farmers are responsible for the transportation of their produces to the satellite depots. Consequently, farmers are encouraged to form any type of group for the efficient transaction but it is not necessarily obligated. When dealing with individual farmers, a sealing is applied both for minimum and maximum. The minimum amount is 10 bags of 50kg bag per household and the maximum is 153 bags. As a matte of fact, an act was enacted in 2006 whereby anyone who deals agricultural commodities 10 million ZMK or more has to pay a tax. The maximum amount of 153 bags per household was, therefore, set in accordance with this arrangement. With the price of 65,000 ZMK/bag which is currently designated by the FRA, a total of 153 bags, equivalent to 9,945,000 ZMK, is the maximum number of bags with the exemption of the tax.

2) Quality of Grains to be Purchased by the FRA

According to the interviews to some farmers, not all the farmers like to sell their produces to the FRA because of its complicated procedure and required quality to meet. For example, grade "A" standard required by the FAR is specified as follows:

Table 3.2.2 Quality of Maize Required by the FRA

Characteristic	Unit	Specifications
Color	-	White
Moisture content	% max	12.5
Diseased grain	% max	2.0
Shriveled grain	% max	0.1
Insect damaged grain	% max	3.0
Discolored grain	% max	4.0
Other colored grain	% max	2.0
Broken grain	% max	2.0
Foreign matter	% max	1.0
Total defectives	% max	14.1

Characteristic	Unit	Specifications
Aflatoxin content	ppb max	10.0

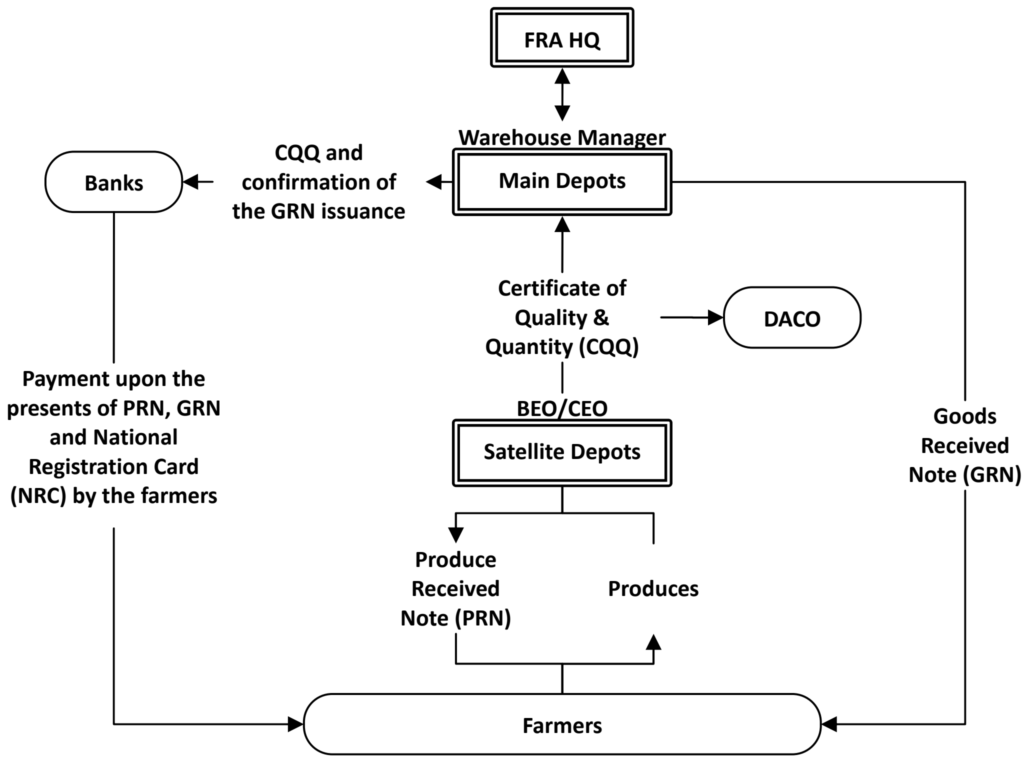
Source: FRA, Crop Marketing Arrangements for 2009/10 Marketing Season

The quality of the produce is inspected by CEOs or BEOs at the satellite depot. However, not all the items are always and strictly inspected. In general, inspectors check color and moisture contents more strictly but they do not usually calculate percentage of contamination. In any case, this requirement is sometimes too much for some farmers and the process required for the inspection is tiresome.

3) Operational Modality of the FRA

As shown in Figure 3.2.1 below, the modality of the FRA's operation is composed of several steps in order to assure accountability and credibility of the system, wherein a number of interest groups are involved. First, farmers receive "Produce Received Note (PRN)" upon the delivery of their quality produce to the satellite depots. BEO or CEO of the satellite depot, then, issues a Certification of Quality and Quantity (CQQ) after she or he confirmed the quality and quantity of the produce. The CQQ bears the name of farmer and PRN number entitled to the farmer. Afterward, one copy of CQQ is sent to the warehouse manager at the main depot and two copies are to DACO's office. The warehouse manager is the one who is in charge of issuing "Goods Received Note – Crop Purchases (GRN) that accredits the delivery of the indicated quality and quantity of the produce so that the farmers can receive the payment at the partner banks that participate in the program.

When withdrawing the payment, the farmers have to show their National Registration Card (NRC) in addition to PRN and GRN. The warehouse manager is fully responsible in the entire transaction described above but they are also monitored and given feedback by the inspectors from the FRA headquarters. It should be further mentioned that the FRA is supposed to accomplish the payment within 10 days after the delivery of the produce. Some fraudulent activities in some depots, however, have caused some delay in operation as an investigation should be undertaken in such case.



Source: Based on FRA "Crop Marketing Arrangements for 2009/10 Marketing Season"

Figure 3.2.1 Purchasing Modality of the FRA

As discussed above, the FRA is purchasing significant amount of maize every year. As far as this policy continues, therefore, farmers do not have to worry so much about the marketing arrangement of maize.

4) The FRA as a Marketing Potential

In the marketing sector of maize, the FRA maintains a big presence in Zambia. As shown in Table 3.2.3, 12.3% of maize production in Northern province is being purchased by the FRA. Based on several assumed factors such as the self consumption ratio, it is estimated that 24% of the expected surplus is being purchased by the FRA. As such, potential of the FRA's purchasing power is significant.

Table 3.2.3 Share of FRA's Purchase in the Total Production in Northern Province

District	Production (2008) Mt	Purchased (2008) Mt	Share in the Total Production %	Population Estimated (2008) num	No. of Maize farmers Estimated num	Self Consumption Estimated Mt	Expected Surplus Mt	Share in the Surplus %
Mpulungu	10,659	1,516	14.2%	94,675	56,805	7,953	2,706	56.0%
Mbala	49,324	4,796	9.7%	189,552	113,731	15,922	33,402	14.4%
Mungwi	13,957	2,803	20.1%	157,012	94,207	13,189	768	364.8%
Kasama	24,493	2,955	12.1%	218,215	130,929	18,330	6,163	47.9%
Mporokoso	13,052	2,436	18.7%	93,651	56,191	7,867	5,185	47.0%
Luwingu	15,578	1,953	12.5%	88,144	52,886	7,404	8,174	23.9%
Nakonde	29,539	3,304	11.2%	104,420	62,652	8,771	20,768	15.9%
Isoka	32,621	6,591	20.2%	115,458	69,275	9,699	22,922	28.8%
Chinsali	23,155	2,312	10.0%	172,039	103,223	14,451	8,704	26.6%
Mpika	36,969	1,642	4.4%	167,303	100,382	14,053	22,915	7.2%
Kaputa	7,187	1,368	19.0%	128,883	77,330	10,826	-3,639	-
Chilubi	1,703	N/A	N/A	91,489	54,893	7,685	-5,982	-
Total	258,236	31,674	12.3%	1,620,841	972,504	136,151	131,707	**24.0%**

Source:
Production: Central Statistic Office (2009). Purchased quantity: FAR "a report presented to the fourth quarter PDCC meeting, Dec. 23, 2008" converted from number of bags at 50kg/bag. Population estimate: Based on the census 2000, estimated with the annual population growth rate during the 90s. Number of Maize farmers: estimated based on the percent of maize farmers in Northern province (69%) from the "Living conditions monitoring survey report (2004) (p.76) CSO. Self consumption: estimated based on the assumption at 140kg/capita (FAOSTAT).
Note:
Chilubi is not included in the list of district for the source provided by FRA.
A total of expected surplus is exclusive of the negative figures in Kaputa and Cilubi.

CHAPTER 4 AGRICULTURAL DEVELOPMENT ACTION PLAN

4.1 Lessons learned from the Past Development Activities

(1) A direct funding to CEOs

Fuel cost is a critical factor that has a decisive influence to the extent of the extension service. The government has many times faced a difficulty in delivering the necessary cost for the full mobilization of CEOs on the ground. In addition to the lack of total funding, some CEOs claim that they are not always paid as expected because DACO, their supervisor at the district level, does not acknowledge the importance of CESs' activities or does not put higher priority on them. As a result, very limited funding, if not at all, is often disbursed to cover the cost of CEOs' mobilization.

In this context, an ad hoc funding mechanism was attempted by Agriculture Support Program (ASP) in its target area where some target districts of this study are also included. To supplement the mobilization cost of CEOs, the ASP provided a set of funding directly to the CEOs in the target area. In short, the ASP established a completely different funding mechanism in parallel with the government's recurrent funding mechanism. First, a project office was established at the central and then all the necessary budgets were disbursed directly to the CEOs of the target camps. It should be noted that DACO or SAO, supervisor of CEOs, was bypassed in this mechanism so that necessary budget can be actually delivered to the CEOs.

It was probably successful in delivering necessary funding, usually 20 to 30 litters a month, surely to the target CEOs, while it might have disturbed the regular interaction between DACO/SAO and CEOs. In this mechanism, DACO did not have much authority to administrate the CEOs. The problematic issue was that DACO and SAO did not have enough funding or did not receive any funding from the ASP for the fuel and thus faced some difficulties in supervising the CEOs. It might have been an ambitious attempt but did not have a concrete exit strategy; the government funding system was not harnessed through this attempt.

Nevertheless, mobilization of CEOs and BEOs is a vital factor in promoting a new technology such as smallholder irrigation and it can be a primary constraint as the coverage area of one CEO is far bigger than the neighboring countries: 20km squire in Zambia comparing to other countries of Sub Saharan Africa. Considering the fact that the majority of the CEOs in the study area do not necessarily have motorcycle, or sometimes bicycle too, unless they received from PaViDIA or the ASP, another extension mechanism should be incorporated. Possible approach may include the distribution of bicycle and/or spare parts rather than just distributing fuel to those who already have motorcycles.

(2) Provision of livestock

Based on the team's observation and experience, livestock rearing does not seem to be as popular in the study area as other neighboring countries. When asking about the possibility of making compost, a lot of farmers responded that they did not have any cattle, swine or goat to obtain manure. In such area, livestock rearing is sometimes promoted by donors and NGOs. In a case of World Vision, pigs were provided to each household in Mayanga village in Mbala district, Northern province. However, it turned out that a large number of villagers just abandoned the activity in stead of grazing and multiplying them. Reportedly, major reasons include:

- i) sensitizing was not enough so that some villagers thought that was just a "present;"
- ii) villagers were not ready as they did not have any stall to keep;
- iii) pigs messed up their or neighbors' field crops;
- iv) pigs were stolen, and
- v) villagers were not familiar with the procedure of raising pigs.

Farmers in the study area may not have enough knowledge, experience and necessary establishments for livestock rearing. Therefore, provision of domestic animals may not guarantee the improvement of their livelihood in a long run, or more simply, it may not be sustainable. To be sustainable, therefore, more close and continuous support is necessary from the very beginning of the program: provision of technical assistance, explanatory workshop to the program, selection of farmers who are willing to participate, and also technical and, if necessary financial assistance for the establishment of surrounding facilities.

4.2 The Irrigated Agriculture Action Plan

The final goal of the irrigated agriculture development is to improve livelihood of the smallholder farmers through irrigated agriculture. In this regard, farming system and marketing are as important as irrigation development itself; indeed, irrigation development and irrigated agriculture development are two wheels of one cart that runs toward better rural development.

To pursue sustainable agricultural production, diversified cropping system has to be addressed; productivity of each crop needs to be enhanced; and market potential should be taken into consideration. Thus, in this section of the report, three major plans are proposed: market-oriented agriculture development plan, soil management plan and recommended cropping systems.

4.2.1 Market-Oriented Agriculture Development Plan

In practice, farmers may not be able to gain any kwacha unless they can produce enough amount of quality harvest that the market demands. However, market is ever changing. Consumer demand shifts from one commodity to the other. Producers react with different strategies. As a result, no one can predict the market dynamics accurately. In this regard, there is no point to set a concrete plan of crop production or farming system suitable to the current market demand. Rather, specific decisions have to be made by the each and single stakeholder on a case-by-case basis. In this concern, this section intends to provide a conceptual approach with which farmers can make better decisions applicable to the market dynamics.

A series of data evidenced that the production of staple food is to a large extent sufficient to its population in the Study area. Thus, it is persuasive to envisage a bold plan, whereby more market-oriented agriculture be promoted, rather than putting too much emphasis on self sufficiency of food crops. First of all, the plan aims to increase the agricultural production in the dry season by tapping unused water resource. Then, by marketing the surpluses of the produces, enhance the livelihood of the target farmers in the area. To be sure, surplus does not automatically guarantee improved income level. It is strongly required to produce not just what farmers can produce but what the market want.

Furthermore, physical access to the market is another important factor especially in this area where population is scattered in a vast range of area, with a low population density. In this regard, the agricultural marketing survey revealed a favorable result; generally, more than 60% of the produces are “currently” traded on the market, including, local, district, provincial, national and international ones (see 3.5.5). In fact, sampled farmers are living 16 km and 32km away from the district towns; that much distance may not be a big deal for farmers to carry their produces. In sum, there is enough reason to believe that market-oriented agriculture is feasible, or at least worth trying.

1) Issues to be concerned for Decision Making

Farmers are required to make a decision on whatever they can choose. For some, choices are quite limited or sometimes there is no choice, while difficult decisions are required for those who have many choices. In any cases, decisions should be made by considering best available information that farmers can access to. Here listed are typical issues to be concerned for profitable agricultural production.

a) Expected Profitability

Simple and typical approach to choosing appropriate crops is to consider expected profitability of crops. Profitability differs in accordance with the types of crops, although it is affected by the location, season, and quality of the produces. Expected level of profitability, therefore, should be first of all taken into account in deciding what crops to produce. For instance, result of harvest survey carried out by the Study Team provides an overall picture of profitable crops in the area. As shown in Table 5.2.2 in the next chapter, the most profitable crop in the sampled villages in six districts was onion at ZMK 3.6 million per lima for the net income, which was followed by cabbage at ZMK 3.3 million per lima. Although profitability should be carefully assessed in each case because the selling price may vary greatly, it can be a first step to consider the options of best crops.

b) Level of investment required

Required investment level of production is also an important factor. Even if profitability is preferable, it is sometimes difficult for such farmers who have limited access to funding to go for that crop. For instance, required level of investment for cabbage is approximately ZMK 1.9 million per lima, while it is only ZMK 0.15 million per lima for groundnuts; namely, required cost of input are totally different. It should be clearly understood that, as agriculture always involves some levels of risk, crops should be selected with concern to the required cost and availability of funding of farmer household.

One important fact which should be clearly understood is that farmer should not expect the same amount of harvest that neighbor farmers get unless he/she put the same amount of input as the neighbor put. Unfortunately, it was revealed that the production of green maize in the existing irrigated schemes was quite depressed, only ZMK 1,173,000 per lima net, even though some particular cases suggest the potential net profit of green maize up to ZMK 9.9 million per lima. According to some follow-up interviews, this low level of net profit was mostly caused by significantly low level of fertilizer application.

Same as rain-fed maize production, standard cropping system suggests farmers to apply 50 kg/lima of D-compound fertilizer and another 50kg/lima of urea, totaling 100kg of chemical fertilizer per lima (equivalent to 400 kg per hector). However, there are many cases that farmers do not apply that much. For instance, according to the harvest survey, number of farmers who applied 50kg/lima or more of D-compound was 97 out of 194, only 50% of all the samples. Instead, 62 farmers, 31% of the samples, applied less than 30 kg/lima (see Table 4.2.1). It implies that the many farmers are having difficulty to purchase the amount of fertilizer that is dully required for good harvest.

Table 4.2.1 Number of Farmers by Amount of Fertilizer Applied to Green Maize

Amount of Fertilizer Applied per lima	D-compound	Ratio	Urea	Ratio
50kg or more	97	50%	91	47%
40~50kg	15	8%	17	9%
30~40kg	20	10%	17	9%
0~30kg	46	23%	52	27%
0kg	16	8%	17	9%
Total No. of Samples	194	100%	194	100%

Source: Harvest Survey by JICA Study Team 2010-2011

For those farmers who are facing such challenges, it is recommendable to consider other type of crops, e.g. groundnut, that require relatively low input cost, which could sometimes result in better net profit.

c) Technical difficulty

In addition to the economical aspect of crop production, level of technical difficulty or, on the other word, farmers' experience, also is an essential factor. There should not be much problem if farmer have some experience of growing that crops in the past. However, if it is completely a new crop for the one, it should be confirmed if he or she is familiar with the cropping practice from A to Z. In this doing, it is a key factor if he or she can get a technical support from extension officers or if there are some neighbor farmers who have enough experience in that crop. In other word, it is an important task for extension officers to provide farmers with technical support especially on new crops in the area.

d) Labors required

For many farmers in the area, irrigated agriculture is on small-scale basis. As shown in Table 4.2.2, typical size of land irrigated only by family labor resulted in an average of 0.57 lima per household, while it was 1.00 lima/ household with labor. It can be said that the area with labor is roughly 1.8 times larger than what is managed without labor. Yet, if farmer aims to expand his/her cultivating land, availability of labor becomes crucial. Although an opportunity cost in general is quite low in the rural area as there are only a few major income generating activities other than agriculture, labor becomes scarce in a particular timing of the year.

Table 4.2.2 Area Irrigated per Household (with /without labors)

Item	Area Irrigated (lima/households)		
	Without Labor	With Labor	Average
Average	**0.57**	**1.00**	**0.87**
Max	3.53	8.33	8.33
Min	0.01	0.03	0.02
No. of Samples	318	229	471

Source: Harvest Survey by JICA Study Team 2010-2011
Note: Average is inclusive of both plots cultivated with and without labor.

For instance, November to December is the beginning for preparation of rain-fed maize production. Farmers start land preparation and there appears to be so much demand in labor. In this case, if the harvest of irrigated crops gets into this season, it may conflict with the preparation of rain-fed maize over the limited labor force including family labor. Therefore, when planning the type of crops to be planted, timing and required amount of labor should be carefully considered. If it is anticipated that enough labor cannot be secured, timing or cultivated area may have to be adjusted or simply the type of crop may better be changed.

e) Growing period

Farmers should not disregard the growing period required for the crop production. Different crops require different periods of times for growing. Leaf vegetables usually require shorter period of time, while the fruit vegetables require longer. For instance, as Table 4.2.3 shows, rape requires about 2 months from sowing to starting harvest, while onion requires 6 months. Required time simply means the time farmers have to bear without income. Cash flow of smallholder farmers is generally constrained and thus they often need immediate cash. In this context, farmer in such situation better choose rape and Chinese cabbage rather than going for onion, even if onion promises higher profit.

Table 4.2.3 Growing Period of Major Crops

Crop	Required Time (days)			
	Nursery	Growing	Harvest	Total (standard)
Rape	20	30-35	90-120	140
Chinese Cabbage	30-40	120-150	15	165
Beans	-	60-90	30	120
Green maize	-	90	30	120
Tomato	30	90	60	180
Irish Potato	-	105	30	135
Cabbage	30-40	120-150	30	180
Groundnuts	-	60-120	30	120
Onion	60	120-180	30	210

Source: TSB Northern Province (2010)

In other word, needs of immediate cash accounts when choosing the combination of crops to be planted. There is some seasonal fluctuation in the significance of household expenditure. For instance, for those who have school children, they have to clear the school fee, including PTA fee and other related fee, at the beginning of each semester, January, May and September in this country. Also, certain amounts of cash are required for other agricultural activities: rain-fed maize, Chitemene shifting cultivation, and Fundikila composting. Typically, farmers tend to hire labors for the land preparation for rain-fed maize from November to December. During this time, certain amount of cash is particularly needed.

For Chitemene, as another instance, farmers often ask other farmers to help cut the branches during May to July. So, for those who also manage Chitemene agriculture, conflict between Chitemene and irrigated agriculture over the investment cost becomes critical. Same story is applied to Fundikila, which is usually practiced in March to April. As such, profitability of a crop should not be only a factor to decide what to grow. If farmers need immediate cash, short maturity crops should be incorporated into the cropping system.

f) Price Trend

Consequence of market dynamics appears to be as a form of price trend. For instance, price of Tomato was found fluctuating from 50,000ZMK/busket to 100,000ZMK/basket in Kawambwa district. And, price of onion was ranging from 20,000ZMK/5kg to 40,000 ZMK/5kg. The highest price was twice as much as the lowest price in both cases. Price is one of the most important explanatory variables of the profitability. Although it is far difficult for farmers to double the yield, they can get same effect by changing the timing of the planting time.

Table 4.2.4 Price Trend of Tomato and Onion in Kawambwa

Month	Tomato (ZMK/Basket)	Month	Onion (ZMK/5kg)
Jan-Feb	95,000	Jan-Mar	35,000
Mar	100,000	Apr-May	30,000
Apr-May	90,000	Jun-Aug	25,000
Jun-Jul	100,000	Sep-Nov	20,000
Aug	75,000	Dec	40,000
Sep-Oct	50,000		
Nov-Dec	60,000		

Source: Intrview to Farmers in Kawambwa (2010) Note: this is an example of individual farmers.

g) Quality of Produces

As the price is an important explanatory variable of the profitability, it also depends on the quality of produces. Needless to say, the better the quality is, the higher the price should be. Furthermore, here is a vital implication on the effect of quality to the price. In a course of the Study, it has been observed that the price of green maize was set as discrete figure. For instance, small size was sold at 500ZMK/cob, while the big one was at 1,000ZMK/cob. There were only two prices. In this case, depending on how the size of cob is regarded, what the farmer can get changes significantly. As such, the practical effect of quality control is much bigger than what it implies.

h) Market Linkage

Market linkage is the last and biggest issue of market-oriented agriculture. Even after getting plenty of water through irrigation development, and producing an amount of quality produces, farmers cannot sit and comfort themselves. They have to sell it at a fair price. As discussed, price varies a lot depending on where and to whom farmers sell their produces. For example, one may not be able to expect much if he/she sell his/her produce in the village where demand is limited. On contrary, if he/she is able to sell it at the town or even at the big city, higher price can be conceived.

Therefore, in addition to choosing and growing right crop in a right timing, farmers have to make significant effort to link themselves to a better market. As described, a farmer in Mbala district sold onion in Copper Belt province at the price twice higher than the price in Mbala. For another example, a group of farmers in Mpika district happened to get linkage with a middleman from the DRC who were on the way to Nakonde district to buy onion. After they got know to each other, a new business has started under win-win situation in which farmers can sell a bulk of onion at higher price and the trader can minimize the transportation cost.

For another instance, there have been interviewed two farmers both of them were producing same crop in the same village in Kasama district: one was selling at cheaper price at farer place, while the other is selling at higher price nearby market. Although the amount of deals per day in the smaller market is quite limited, farmers can still take advantage of higher price or less labor for marketing.

Market linkage is influenced by many factors including distance from the market, means of transportation, physical condition of the access road, and existence of marketeers. At the time the Study was carried out, relatively few percentage of farmers enjoy the access to middlemen. According to the harvest survey, for example, only 16% of the sample farmers were selling to middlemen; other 81% were selling either in the village or nearby town by farmers themselves. It implies a limited linkage to the middlemen in the area. There should be therefore more rooms for improved marketing.

As a principle, to take full advantage of smallholder irrigation development, farmers are required to make a rational decision of what kind of crops to grow and when to grow, orchestrating the issues and concern discussed above. And then, they need to make great effort to establish linkage to a better market. However, farmers alone cannot do everything. There should also be something the government sector can do.

2) Recommendation to Extension Officers

As discussed above, there can hardly be definitive plan for market-oriented agriculture development. Decisions should not be made as a holistic plan of the government. Instead, specific decisions should be made on a case-by-case basis at farmers' own risk. For field extension officers who work directly with farmers to support them in this decision making, here are some recommendations.

First, farmers are always challenged by imperfect information. They do not always know market trend, whereby they often sell their produces at disadvantageous price. Second, they are not confident enough to encourage themselves to do whatever they have never tried. Therefore, the main task of extension officers would be to provide farmers with the latest information related to crop production and marketing.

For instance, general profitability of major crops should be presented. Generally, farmers know well about the market price of crops in the area. However, they do not necessarily know the profitability of that crop. In fact, they were often surprised at the profit of their farming when the Study Team computed it. Support in getting market linkage is also a potential activity of extension officers, as they usually have better access to market oriented information including market prices in different locations and existence of buyers from those places. What they can do may be limited but that could make a difference.

4.2.2 Soil Management Plan

The fundamental strategy of the irrigated agriculture development action plan is to address the bottleneck throughout a course of agricultural production and marketing. As known as the “law of the minimum” formulated by a German chemist Dr. Justus von Liebig, plants’ growth is limited not by the total resource available, but one essential mineral that is in the shortest supply[13]. As well described in this analogy, it is a recommendable strategy to address the “scarcest of the scarce.” In the Study area, resource relatively in short is soil fertility as compared to other necessary resources such as precipitation and temperature.

As discussed in Chapter 3 of this report, the Study area is widely covered by acidic soil called “acrisols.” A soil sampling test carried out by the Study team revealed that an average acidity of 10 soil samples in Kasama district was pH 4.2, ranging from pH 3.9 to pH 4.7. Other factors important to plant growth were not desirable as well. For example, Cation Exchange Capacity (CEC), a measurement for nutrient retention capacity of the soil, was low: averaging 4.3 $cmol(+) \cdot kg^{-1}$ as compared to the value of more than 20 recommended in Japan. As such, soil fertility is generally unfavorable in the Study area. As a result, even applying enough amount of water at right time, the plants may not be able to perform their full potential.

Moreover, it is not just a matter of fertility but is also associated with the physical characteristics of the soil sphere. Even if farmers apply a plenty of premium chemical fertilizer, it could be a waste of money unless soil maintain enough amount of organic materials to hold the chemical substances; nutritious elements can easily leach out without retention effect from organic materials (CEC is one of the measurements to see the retention power). To manage and improve soil condition, therefore, the soil management plan proposes several countermeasures: application of organic fertilizer, intercropping of legumes, and crop rotation.

1) Application of Organic Fertilizer

There are two different dimensions in the effect of organic fertilizer: improve soil fertility including physical characteristics of it, and minimize the cost of fertilizer. In addition to helping improve soil fertility, applying enough amount of organic fertilizer improve physical characteristic of the soil, whereby effect of chemical fertilizer becomes more efficient and durable. Also, improved soil sphere help the growth of plants’ roots. Thus, the plan recommends farmers to produce organic fertilizer by themselves.

There are two major types of making methods of compost: one that facilitates anaerobic microorganisms and the other that makes the use of aerobic microorganisms for the decomposition process of organic matters. The former type takes much more time than the latter: the former type takes about three months to finish, while the latter takes only two to three weeks to go. The former

[13] http://en.wikipedia.org/wiki/Liebig's_Law_of_the_Minimum

type can be commonly observed in the area as a form of mounded compost—the one extension workers usually promote. A traditional farming practice of *Fundikila* is also considered as a sub-type of this method. On the other hand, the latter is rarely seen in the area for whatever reasons.

Considering the whole range of cropping calendar in the area, it is far recommendable to incorporate the latter one because farmers can produce the compost in a short period of time so that everything can be ready before the commencement of the dry season agriculture. For instance, if farmers start producing compost right after the end of rainy season and start dry season agriculture soon, there is not much time to wait for a three-month period of time. Therefore, compost that can be made in a short period of time can be best applicable to the dry season agriculture.

Fortunately, there is a unique method of compost called BOKASHI developed in Japan. BOKASHI compost fully utilizes the ability of aerobic microorganisms by which decomposition process can be much faster than conventional method. To maintain appropriate population of aerobic microorganisms, the method becomes to be relatively labor-intensive; farmers have to keep the temperature of the organic materials below the threshold for the bacteria. They need to overturn the materials every once a few days for two to three weeks. To be more practical, two sessions of technical manual prepared through the Study specifically address how to make BOKASHI compost and how to make accelerator of decomposition process in BOKASHI making.

Application of organic fertilizer can enhance soil fertility and even improve soil structure by which effects of chemical fertilizer can be further increased through improved retention capacity of the soil. More specifically, by applying organic fertilizer, soil structure becomes more complex, having different size of individual soil granules. Under such condition, root penetration and thus access to soil moisture and nutrients is improved, while infiltration and retention capacity of water and nutrients themselves become high, resulting in a greater growth of crops. Therefore, even after applying organic fertilizer, or “because” it is applied, use of appropriate amount of chemical fertilizer is still recommended as they create synergy effect for the cropping system.

2) Intercropping of Legume

It is well known that legume help improve soil fertility as it fixes nitrogen in the atmosphere to ammonia. In fact, this process, biological nitrogen fixation, is facilitated by bacteria within nodules in the root system of the plants. Therefore, soil fertility can be improved just by planting legume crops in the plot. To make use of it, intercropping of legume with other crops is recommended. For example, beans or groundnuts should be planted with other crops like maize.

Intercropping of climbing beans and maize was tried in the pilot project in the 2009 dry season. Although the effect of beans in improving soil fertility is yet to be assessed, it was found that climbing beans well provide farmers with fresh vegetable; farmers can pick bean leaves while standing—it is much easier to harvest than dwarf varieties. Another lesson from the pilot project suggests that planting timing of climbing beans should be long after maize is planted. Otherwise, they compete with each other and beans physically obstacle the growth of maize.

To make it easier, relay cropping is recommendable. Plant the climbing bean before the harvest of maize and the beans climb the standing residues of maize even after maize is harvested. It can avoid unnecessary competition between beans and maize. Although dwarf varieties are also a good alternative, introduction of climbing beans has a couple of advantageous effects over dwarf varieties. First, climbing beans generally demonstrate much higher productivity per unit of land than dwarf varieties. Second, climbing beans is much more tolerant to diseases associated with moisture on the ground.

There are other recommendable combinations of intercropping: tomato-cassava, onion-cabbage, and eggplant-marigold for example. An intercropping of tomato and cassava was found in the Study area as an indigenous technique by which tomato can benefit from the perennial support of cassava stem, while cassava can enjoy irrigation water originally applied to tomato. Combination of onion and cabbage can reduce the damage of cabbage from a variety of warms as onion repels those warms. Combination of eggplant and marigold is well known. Although eggplant is easily affected by nematode through continued planting in the same land, marigold has an ability to deter it; in fact, marigold is given a lot of credit as pest deterrent and applicable to other crops too.

In any case, introduction of legume is highly recommended unless it is combined with onion—it is believed having some antagonistic effect, because legumes improve nutritious balance of the farmers' diet. Even though estimated calories consumed per person are seen sufficient, there still are a lot of children having unnecessarily large belly, implying chronic malnutrition. Adding beans to their daily diet can increase their protein intake and help improve their health status especially for those who are in growing phase.

Planting groundnuts for the first year of irrigated agriculture—it helps improve the soil fertility.

3) Crop Rotation

It is not well understood amongst the farmers in the area that continued production of single type of crop cause disadvantageous effect in its production. For example, pathogenic microbes, viruses or even nematode stimulate their population under a supportive environment created by the continued production of a particular crop. In addition, continued production of a particular crop absorbs and consumes particular nutritious elements in the soil—in other word, soil fertility decreases. To cope with those problems, it is strongly recommended to rotate the farmland from one crop to others. Fortunately, land area is not quite a decisive factor in this area, as population density is extremely low and water resource is abundant.

As to consider the rotation pattern, availability of funding by individual farmers should be taken into consideration, that is, not all the farmers can enjoy monetary investment in farming. For those who cannot buy enough amount of fertilizer, it is good to start with legumes. For instance, beans or groundnuts should be planted without so much investment for fertilizer. Then, for the second year, vegetables, such as tomato, can be introduced. Planting legume makes difference in the second year production. In fact, the one who ever tried crop rotation from groundnuts to maize claimed he was able to enjoy higher productivity than others.

Note that rotation between the crops in the same family is not as effective as ones in distant relations. For instance, tomato, eggplant, and Irish potato are in the same family and thus rotation among them is not recommended. Same is true for cabbage, Chinese cabbage and rape. To make it simple, combination of common vegetables with legume crops like beans, soybean and groundnuts is highly recommended.

4.2.3 Recommended Cropping Systems

When planning the cropping systems suited to the Study area, agro-ecological condition, profitability of crops, and technical and financial applicability lies as central issues. Conditions of those factors differ from place to place, time to time, and farmer to farmer. Thus, it is rather inappropriate or sometimes risky to set a concrete plan that is oriented to the entire area of two provinces.

1) Benefit of Intercropping

Here, therefore, recommended is a typical strategy harmless but having a positive effect applicable to various circumstances: intercropping. Intercropping is a way of diversifying the farming system by which crop production can be more stabilized at lower risks. Specifically, there are several advantageous aspects in this mechanism. First, by mixing two or more types of crops, it can dramatically increase the production per land area. Second, by enriching the diversity in the farming system, stability generally increases with reduced risk of pest and disease.

In addition, with the use of crops with different root systems, shape plants, and growing characteristics, water, nutrient and sunlight can be used more efficiently, leading to higher production level comparing to aggregated production of individual crops. Furthermore, increased leaf cover in intercropping helps reduce weed populations once the crops are established.

2) Type of Crop Arrangement

There are three typical types of crop arrangements: strip/ row cropping, mixed cropping, and relay cropping. In strip cropping system, two or more crops are planted in a row separately. If the each row is determinately wide, it is called strip. On the other hand, in mixed cropping, two or more crops are planted randomly with no specific row arrangement. In the Study Area, it is sometimes observed that small number of pumpkin is planted in a groundnuts field; this is a kind of mixed cropping. Lastly, relay cropping is associated with a sequence of planting timing. In this system, one crop, for example maize, is planted preliminarily. Thereafter, second crop, for example climbing bean, is planted before the harvest of the first crop. The benefit of relay cropping includes the less competition between/among the combined crops. In the case of maize and climbing bean combination, bean can climb maize stakes.

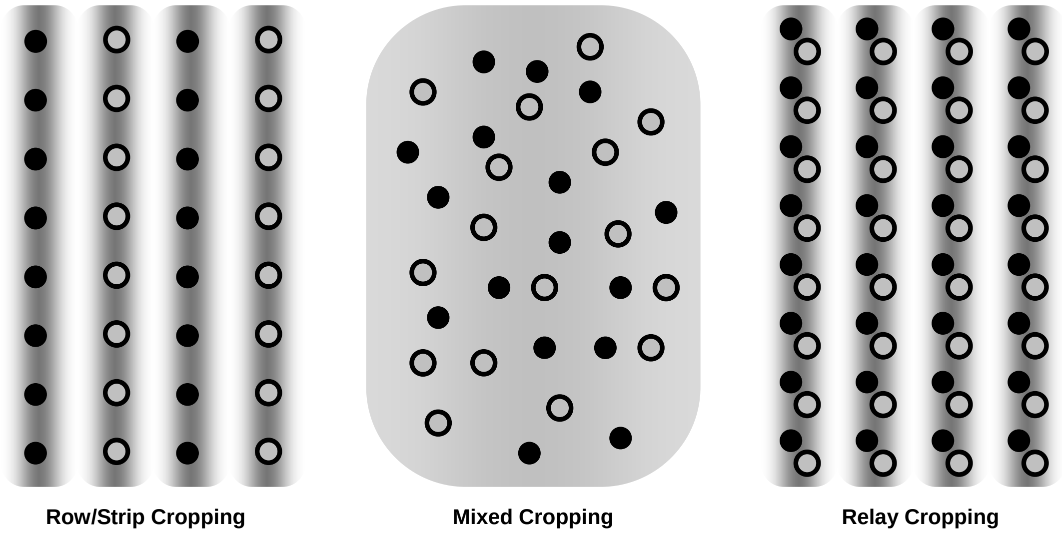


Figure 4.2.1 Three Types of Crop Arrangement For Intercropping

Note: One type of crop in the relay cropping is planted significantly later after another crop.

Reference: Intercropping of Annual Foodcrops AGROMISA (http://www.allindiary.org/resource/435)

3) Recommendable Combinations

Recommendable combinations of crops for intercropping are summarized in Table 5.1.1. Concerning the generally depleted and thus low fertile soil in this area, it is recommendable to mix legume crops with other crops. By incorporating legume crops in the system, nitrogen fixation can be facilitated depending on the existence of appropriate bacteria in the soil, whereby soil fertility is to be improved and maintained. Furthermore, legume crops are generally rich in protein and can be a good source for nutrition management of the rural population. Another good aspect of intercropping is that when incorporating deep rooting crops, such as pigeon pea, physical characteristics of soil can be improved deeper.

Table 4.2.5 Recommendable Combination of Intercropping

Crop	Particulars
Maize-climbing bean (Relay-cropping)	Maize is sown in row at 75cm between rows and 20cm between each plant in a row. After at least 4 weeks after sowing maize, but before the harvest, plant climbing bean so that the bean can use maize stalks as stakes. Climbing beans can produce 3-4 times more yield than bush beans.
Maize-Legume (2 by 2 system)	Instead of establishing the rows of maize with 90cm of uniform intervals, establish two rows close (50cm) and create wider gap (100cm or more) with next two rows. And in the wide gap, plant legume crops in two rows. This is why it is called 2 by 2 system. Common bean, Soybean, green gram, and groundnuts can be used in this system. By creating a wide space, legume crops can receive more sunlight and thus a total production can be increased.
Maize-Pigeon pea	Maize and Pigeon pea are sown at the same time in rows. When using long duration variety, Pigeon pea takes 5-11 months to grow. Therefore, harvest of pigeon pea can be done after expected after the harvest of maize. Pigeon pea is a deep-rooting crop and thus effect of improving soil fertility is good. Pigeon pea is relatively resilient to drought and is suited to such irrigation scheme where water volume becomes significantly low during the peak of dry season.
Maize-Sweet potato (Leaves) (mixed cropping)	Maize is sown in row and after the first weeding, and fertilization if applicable, sweet potato tubers are planted in between the maize. Sweet potato plants cover the surface of the soil by which damage of weeds can be reduced. Farmers can harvest sweet potato leaves according to their preference.
Maize-Cowpea (Relay-cropping)	Maize is sown first and after approximately 45 days, cowpea is sown. Maize serves as support for cowpea. After harvesting both crops, they are to be left on the soil or incorporated in the soil as green manure.
Cabbage-Tomato	Tomato acts as a physical barrier against insects like Diamondback moth and it also has a characteristic to reduce the population of insect with its repellent odor. Tomato is first transplanted. Two weeks later, cabbage is planted in alternate rows.
Cabbage-onion	Onion is famous with its repellant effect against common insects including aphids. Therefore, onion is a useful intercrop for many crops. One of recommended combination is with cabbage and carrot. However, combination of onion with pea is not recommended Because it is reported that pea can be a host for some kind of bacterium that cause disease specifically to onion.

Source: JICA Study Team

4) Recommended Cropping Calendar

There is no solid cropping calendar exclusively recommendable over the others. Here recommended is, therefore, a sample model to be planted under irrigated agriculture for smallholder farmers. As shown in Table 4.2.6, it is assumed that smallholder farmers can maintain 0.25 limas of farmland for irrigated agriculture in addition to other field for rainfed agriculture in rainy season. Accordingly, the dry season agriculture starts with the preparation of irrigation in and around April when the dry season is commonly expected to begin. It may take a few days just to repair the weir originally constructed in previous season, or take a few weeks to reconstruct the weir and rehabilitate the whole length of canal; in this model, a one-month period is shared for that activity in April.

After irrigation system becomes to be an ideal setting, next step is to prepare Bokashi compost. By using water from the irrigation mixed with other materials necessary for the compost, Bokashi compost can be prepared in a two-to-three week period. Therefore, mid or late May is an expected time for the actual planting of dry season crops. The benefit of planting in an early stage of the season is that farmers can share their workforce to maize harvesting after they prepared the dry season crops.

The table provides three patterns of cropping calendar. First pattern is, as discussed previously, a mixed or relay planting of green maize and climbing beans. Green maize is planted in May and, before its harvest, climbing beans are planted underneath the maize plants so that beans can climb the maize plant. They can enjoy the residue stands of the maize even after the harvest of maize cobs. Note that if the climbing beans are planted too early, it may disturb maize's growth.

Next pattern is just a production of single crop represented by tomato in this particular table. The point here is to plant these crops in a different timing little by little. First of all, in this method, farmers can disperse the labor force for planting. Then, risk of damage by the change of natural condition can be averted. Also, produce can be harvested and marketed little by little for a longer period of time. As marketing modality is quite primitive in the area, carrying on the head or using bicycle, it can help avoid unnecessary loss of harvest. Finally, farmers can hedge the risk of price change, if at all.

Table 4.2.6 Recommended Cropping Calendar and Its Expected Profit under Irrigation

Area	Apr	May	Jun	Jul	Aug	Sep	Oct	Expected Profit
Other Activities	Weir & Canal	Bokashi Compost			Conventional Compost			ZMK per 1.00 lima ZMK per 0.87 lima ZMK per 0.25 lima
Pattern 1 G-maize & beans (0.25 lima)			Green Maize		Relay planting	Climbing Beans		2,772,000 2.412,000 693,000
Pattern 2 Tomato (0.25 lima)				Tomato	Tomato	Tomato		1,764,000 1,535,000 441,000
Pattern 3 Groundnuts & Year 1 (0.25 lima)				Groundnuts				1,466,000 1,275,000 367,000
Cabbage Year 2 (0.25 lima)				Cabbage				2,664,000 2,318,000 666,000
Pattern 4 Tomato and Cabbage Intercropping (0.25 lima)				Tomato Cabbage				2,214,000 1,926,000 554,000
Pattern 5 Cabbage and Onion Intercropping (0.25 lima)				Cabbage Onion				3,154,000 2,744,000 789,000
Pattern 6 Rape and Green maize (0.25 lima)				Vegetable e.g. Rape			Green Maize To be harvested in rainy season	2,731,000 2,376,000 683,000

Source; JICA Study Team

The last pattern recommended is a model of rotation cropping. As described in chapter 5, there are some farmers who may not be able to purchase fertilizer, or would not like to purchase for whatever reasons. For such farmers, incorporation of legume in the system is highly recommended. For example, cultivate groundnuts for the first year and cabbage in the following year; it helps improve soil fertility to some extent. However, it should be noted that use of legume crop does not simply mean no chemical fertilizer is necessary.

5) Crop Rotation

Basic way to cope with undesirable soil condition is by crop rotation—it is quite manageable even for the resource-poor farmers. In other word, continuous cropping of single crop will deteriorate the soil condition. The most important principle is not to continue a single type of crop. By cultivating same type of crop, particular type of soil element necessary for that crop will be reduced, by which that type of crop will suffer from the lack of the elements. Also the particular type of pathogenic bacteria or nematode can easily increase its population.

Continued planting of crops in the same family should also be avoided. For instance, rape, cabbage, and Chinese cabbage should not be planted one after another because they are in the same brassica family. Similarly, continued planting of tomato, eggplant, and Irish potato should also be avoided as they are in the same Solanaceae family. Table 4.2.7 shows major crops by the type of family which are prone to disease under continued cultivation. On the other hand, sweet potato, pumpkin, carrot, onion, and garlic are relatively tolerant to continued cultivation.

Table 4.2.7 Crops in the Same Family Prone to Disease under Continued Cultivation

Family	Crop Prone to Disease under Continued Cultivation
Brassica	Rape, Cabbage, and Chinese cabbage
Solanaceae	Tomato, eggplant, Irish Potato, Chili Pepper, Paprika, Tobacco,
Cucurbitaceae	Cucumber, Watermelon, Melon
Fabaceae	Soybean, Groundnuts, Cowpea, Pigeon pea, Common beans

Source: Agronomic aspects of irrigated crop production, FAO (2002)

The level of pathogenic effect by the continuous cropping is also a dependent on soil condition. If the soil is rich in organic materials with a large population of microorganisms, risk of disease can be kept relatively low. However, if the organic matters are poor in the soil, population of pathogenic bacteria can easily increase. There are some farmers in Japan who continued eggplant production for years through application of organic fertilizer, for instance.

When planning the crop rotation, furthermore, frequency of cultivating same kind of crop should be carefully considered. Some kinds of crops should be kept away from the same plot for years, while some can be planted more often. Recommended frequency to be kept is shown in Table 4.2.8. As shown in the table, eggplant should be planted at least four years of absent from the first planting in the plot, while it can be just two years for beans, cabbage, and groundnuts.

Table 4.2.8 Crop Rotation Frequency

Frequency	Crop
4 Years	Eggplant, Okra, Pepper, Irish Potato, Sunflower, Tobacco, and Tomato
2 Years	Beans, Cabbage, Carrot, Groundnuts, Rape, Soybean, Wheat

Source: Agronomic aspects of irrigated crop production, FAO (2002)

Considering all those issues discussed above, here is a set of recommendable crop rotations. As shown in Table 4.2.9, several different crops of different families should be rotated year by year. If the farm plot of irrigated agriculture and rain-fed agriculture are different, plot is better kept under fallow (not cultivating anything) during the rainy season. For instance (case 1), tomato, Chinese cabbage, green maize and cabbage can be rotated each year. In addition, continued usage of the farm plot during the rainy season is also applicable.

Table 4.2.9 Example of Crop Rotation

<table>
<tr><th>No</th><th colspan="2">Dry 1</th><th>Wet 1</th><th>Dry 2</th><th>Wet 2</th><th colspan="2">Dry 3</th><th>Wet 3</th><th>Dry 4</th></tr>
<tr><td>1</td><td colspan="2">Tomato</td><td>-</td><td>C cabbage</td><td>-</td><td colspan="2">Green Maize</td><td>-</td><td>Cabbage</td></tr>
<tr><td>2</td><td colspan="2">Green Maize</td><td>-</td><td>Tomato</td><td>-</td><td colspan="2">Onion</td><td>-</td><td>Carrot</td></tr>
<tr><td>3</td><td colspan="2">Cabbage</td><td>-</td><td>Soybean</td><td>-</td><td colspan="2">Tomato</td><td>-</td><td>Onion</td></tr>
<tr><td>4</td><td colspan="2">Soybean</td><td>Sunflower</td><td>Tomato</td><td>Maize</td><td colspan="2">Groundnuts</td><td>Maize</td><td>Soybean</td></tr>
<tr><td>5</td><td>Rape</td><td>G Maize</td><td>-</td><td>Soybean</td><td>-</td><td colspan="2">Onion</td><td>-</td><td>Groundnuts</td></tr>
<tr><td>6</td><td>Groundnuts</td><td>Cabbage</td><td>-</td><td>Green Maize</td><td>-</td><td>Soybean</td><td>Tomato</td><td>-</td><td>Onion</td></tr>
<tr><td>7</td><td colspan="4">Eggplant (continuous harvest)</td><td>-</td><td colspan="2">Groundnuts</td><td>-</td><td>Rape</td></tr>
</table>

Note: This model assume that rain-fed maize is managed in different plots except No.4 (conservation agriculture).

For another instance (case 4), a rotation of soybean- sunflower- tomato- maize- groundnuts- maize- soybean can be managed under non-tillage practice or conservation agriculture wherein crop residues are used as soil cover and eventually to be incorporated in the soil (for more detail, refer to Technical Manuals, Part II, ‘Conservation Agriculture’). Lastly, double cropping of two different crops in a single dry season is also recommendable considering the increased income opportunities and high price of vegetables at the beginning of rainy season. For double cropping, however, it is highly recommended to incorporate legume crops in the rotation as soil fertility is to be easily depleted through intensive usage of the land.

4.3 Conservation Agriculture under Irrigation

As briefly mentioned in the “crop rotation,” conservation agriculture can be incorporated in the smallholder irrigation schemes. Smallholder farmers are by and large associated with low productivity caused by reduced retention of organic matters in the soil. As irrigated agriculture provides farmers with an opportunity to do agriculture more intensively in the same plot, maintenance of soil fertility becomes to be a central issue.

To sustain the farmland, conservation agriculture can be considered one of the effective measures; it helps protecting the farmland from erosion and also improving the soil condition. In fact, conservation agriculture is being widely promoted in Zambia in cooperation with MACO, FAO, and EU, focusing in rain-fed season.

Conservation agriculture is a set of practices, in which, 1) crop residues are to be retained on the soil surface as soil cover; 2) crops with different characteristics, including legumes, are to be rotated, and 3) soil disturbance (tillage) is to be reduced. By applying this method, soil erosion by water and wind can be minimized and heat from direct sunshine can be lowered, and organic materials can be incorporated, resulting in more sustainable agricultural production.

Tomato is planted on the soil entirely covered by the plant residue from previous season (Nakonde).

Although the conservation agriculture promoted by FAO is focused mainly on the rain-fed season, it is also applicable to the irrigated agriculture during the dry season. Especially, for smallholder farmers who cultivate relatively smaller size of farmland, it is due manageable. In fact, during the pilot project in the 2010 dry season, it was already tried by a local farmer in Nakonde (see picture). In his plot, soil was thoroughly covered by the plant residue from the previous season, by which soil erosion is being avoided. One may think that the plant residue should block the water way for irrigation. However, the empirical evidence suggests that the on-farm irrigation can be managed as usual even with plant residue on the soil. In short, conservation agriculture should be incorporated into the farming practice in smallholder irrigation scheme.

CHAPTER 5 PILOT PROJECT IN THE AGRICULTURE SECTOR

5.1 Agricultural Trials in Smallholder Irrigation Development

Developing water resource does not necessarily guarantee the immediate improvement of farmers' livelihood. As a next step, agricultural practice is the way to tap the output from the smallholder irrigation development. In the pilot project, several types of farming systems are to be carried out. The main aim of the agricultural trial in the pilot project is to test the adoptability of relatively new crop or new farming method based on the irrigated agriculture.

As discussed earlier, however, the smallholder irrigation development itself, a basis of irrigation agriculture, faced a variety of challenges in the course of pilot project and then took some time to see the actual water flow running in the furrow. Therefore, after waiting for some time, agricultural trial started at the site where there were existing irrigation schemes. Although it was a bit late to start, the trials began in the mid July 2009. There were three main trials: mixed cropping of green maize and climbing beans, introduction of wheat as a new crop, and introduction of New Rice for Africa (NERICA) variety under irrigation. Table 5.1.1 shows the basic profile of the agricultural trials.

Table 5.1.1 Basic Profile of Agricultural Trials

Trial	District	Camp	Participant	Area of the Plot	Provision
2009					
Maize/ Climbing Beans	Mungwi	Nseluka	4	Not Specified	Bean seeds
Maize/ Climbing Beans	Mungwi	Chabukila	4	Ditto	Bean seeds
Wheat as new crop	Kasama	Lukulu	4	Ditto	Bean seeds
2010					
Maize/ Climbing Beans	Mungwi	Chabukila	8	1/4 by 8=2 lima	Bean seeds
Maize/ Standing Beans	Kasama	Mulobolo	4	1/4 by 4=1 lima	Bean seeds
Maize/ Cow Pea	Kasama	Chipompo	4	Ditto	Pea seeds
Maize/ Soybean	Kasama	Chipompo	4	Ditto	Bean seeds
Maize/ Sweet Potatoes	Kasama	Mwika	4	Ditto	Seed Sweet potato
Cabbage/ Tomato	Kasama	Mwamba	4	Ditto	Cabbage and tomato seeds
Cabbage/ Onion	Kasama	Kasonde Chisuna	4	Ditto	Cabbage and onion seeds
Carrot / Onion	Kasama	Kasonde Chisuna	4	Ditto	Carrot and onion seeds
NERICA	Kasama	Chipompo	7	Ditto	NERICA seeds
Total		8	36	9 lima	

Source: JICA Study Team

5.1.1 Intercropping of Different Set of Crops

As described in Chapter 4.3.3 Recommended Cropping Systems, intercropping is one of recommendable farming systems in the Study Area where soil is highly depleted and thus farmers are challenged by lower productivity per land. Although not much farmers are engaged in this faming system, intercropping itself is not a completely new technology in the area. For instance, some combinations of crops have been already observed: maize-cabbage, cassava-tomato, and maize-beans for instance. Those existing cases of practicing intercropping are the positive sign for higher adoption rate of this technology.

Intercropping would be best fitted to the farmers in the area because their average size of irrigated land is quite limited: roughly 20-35m square per household. Thus, increasing the productivity per land becomes to be a life-changing strategy for smallholder farmers. Also, by integrating legume crops in the system, problems associated with low fertility can be addressed. In the pilot project, to build up as many best practices as possible, eight different combinations of intercropping were proposed:

- ✓ Green Maize and Climbing Bean (relay cropping)

- ✓ Green Maize and Standing Bean
- ✓ Green Maize and Cow Pea
- ✓ Green Maize and Soybean
- ✓ Green Maize and Sweet Potato
- ✓ Cabbage and Tomato
- ✓ Cabbage and Onion
- ✓ Carrot and Onion

1) Green Maize and Climbing Beans

For those who used to do an extensive farming practice like *Chitemene* shifting cultivation, soil management might not necessarily a big issue as they can shift the farm plot given the limitless forest lands to cultivate. However, under irrigated condition, or more intensive agriculture in the generic term, soil management becomes to be a key practice as the soil fertility can be easily degraded under a continued cultivation.

One of the recommendable practices is to introduce any kinds of legumes that fix nitrogen. Accordingly, mixed cropping of beans and green maize is planned as one of the farming packages suited to the irrigated agriculture. Green maize can be a good alternative to be mixed because farmers are familiar with growing maize during rainy season and it is easier to grow even under newly irrigated sites. As seen in the picture, climbing-type beans well match with maize; theoretically, it can climb along with the stem of maize.

Mixed cropping of green maize and climbing beans (circled)

Subsequent but very important effect of producing beans is to obtain quality protein. Unfortunately, there are a lot of children in the Study area who suffer from malnutrition and have unnecessarily big belly. Apparently, beans can be a good source of protein for them.

Maize tied up by beans

With those rationalities, mixed cropping of green maize and climbing beans were tried under irrigation during the 2009 dry season. Firstly, a variety of climbing beans was identified and 45 kg of them were purchased through Misanfu Agriculture Research Center. They were then distributed to some farmers who were willing to participate in the trial in Seluka village where smallholder irrigation scheme was newly developed. In Seluka village, beans were planted at the end of August 2009, a week after the germination of maize. As a basal fertilization, some farmers applied 10kg/0.25 lima of D-compound fertilizer and others applied 5kg/0.25 lima.

At the end of November 2009, the Study team visited the site to see the progress of the trial. Unfortunately, the growth of maize was not uniform and some of them were stagnant, while the growth of beans was quite promising; it was too early to plant beans. As the growth of beans prevailed over the maize, some maize plants were covered or fasten up by the beans. Another reason of stagnant maize plants was the amount of fertilizers applied. In the plot where half of recommended amount of D-compound was applied, the growth of maize was obviously suppressed; they were just above the knee height as compared to shoulder height in other plot where recommended amount was applied.

There was a good aspect of this trial; bean leaves were used as a “vegetable.” Farmers in this area commonly consume a various types of crop leaves such as potato leave, sweet-potato leaves, and bean leaves. What was good with this trial was that farmers can pick the bean leaves while standing, as shown in the picture; you do not have to bend yourself down to pick. It was also found that picking the bean leaves incidentally controls the growth of exuberant bean as compared to the growth of maize.

A woman picking bean leaves while standing

Both crops are expected to be harvested at the end of December, about four months after the planting. As rainy season starts in and around November, the harvest time is in the middle of rainy season and thus some negative effects from the moisture might be foreseeable. On the other hand, farmers can also expect higher price of maize and beans at that time because the produce is scarce in the market during that time. If one would like to minimize the risk of production, it is recommended to start as early as the rainy season ends.

Lessons:

1) Beans should be planted with an enough amount of time after maize is planted. As a week after the germination is too early and cause physical interference to maize. A month after or even relay-planting is recommended, in which beans are planted shortly before the harvest of maize so that beans can climb the remaining of maize stand without any competition.

2) Especially for those who do not like to do careful tuning in planting schedule of beans, dwarf beans can be a good alternative to mix with maize as it has mulching effect. Note that productivity of dwarf type per a unit of land is lower than climbing type and relatively prone to the pest.

3) Start planting as early as the rainy season ends to get harvest before the rainy season. If it is early enough, relay-planting of green maize and beans is also applicable within the period of the dry season. To do so, irrigation has to be ready soon after the rainy season.

4) For those who are willing to take some risk to maximize his/her profit, late planting is also an option. At the beginning of the rainy season, agricultural produces are generally scarce and thus farmers can take an advantage of selling at higher price. However, the one has to be aware that the labor is also scarce in that season for the preparation of rainy season agriculture and the risk of disease increases.

Green maize to be ready in one month

2) Green Maize and Standing Bean

Overall situation of green maize and standing bean trial was not promising due mainly to the delay of conduct. Also, among those who were doing intercropping trials as planned, there were some challenges reported. In Mulobolo camp, for example, maize seeds have been eaten by rat, resulting in lower germination rate in the plot. Instead of the damage on maize, however, the growth of beans went quite well and the second sowing of maize also worked.

One thing confirmed from this plot was that double lining of beans seemed to work well. It was designed to plant beans and maize in double lines each so that beans, shrub-shaped plant, can receive enough sunshine. And now, from the observation of the field, it was confirmed that the bean grows quite fine next to maize.

Intercropping of maize and bean (double lines each)
Bean grows quite well, while maize was attacked by rat.

On contrary, another farmer in the same camp experienced completely opposite result; maize went well, while beans did not grow well. As shown in the photo, a woman is about to harvest maize grown very good in her irrigated field. Before the harvest of maize, in addition, she was able to enjoy continuous harvest of beans and bean leaves (she has some bean seeds in her hand). Not just an economic value added through irrigated agriculture, diversification of harvest timing seems to be a positive effect of intercropping of maize and beans.

A woman is harvesting bean seeds, while waiting for the forth coming harvest of green maize.

3) Cabbage and Tomato

It is generally said the combination of tomato and cabbage can reduce the incidence of damages caused by insects. Therefore, this combination of intercropping has been tried under irrigation in 2010. In Mwamba Camp of Kasama district, four farmers have carried out this trial, of which two farmers were interviews: Mr. Augustine Mukuka and Mr. Abel Mwewa. As they say, cabbage-tomato intercropping was found “helps reduce the cost of production and labor.”

For example, Mr. Augustine was able to reduce the cost of chemicals by 38% from 195,000ZMK (135,000ZMK for tomato and 60,000ZMK for cabbage)/ 0.25lima to 120,000ZMK/ 0.25lima. Because the emergence of insect/disease had reduced, he was able to reduce the frequency of chemical application from “every week” for conventional single cropping of cabbage and tomato to “every two weeks” for the intercropping.

In the conventional single cropping of both crops, he often experiences severer emergence of aphid on cabbage and cutworm and/or black spot on tomato. However, under the arrangement of cabbage-tomato intercropping, aphid on cabbage was obviously reduced and so was cutworm on tomato.

One of the aspects should be concerned was the relatively unfavorable price of cabbage. Mr. Augustine sold his cabbage at the Kasama Chambeshi market about 22km away from his village at around 15,000 to 22,000 ZMK/50kg bag, which was not so attractive to him. The both crops were planted on October 18, 2010 and cabbage had been harvested from mid December 2010 to late January 2011. During this time, the price of cabbage hits the bottom as a lot of others also cultivate the same crop in and around the area, while the price of tomato is still good this time. Reportedly, cabbage from Mbala district was a lot in the market this time.

What was learned here was that the price trends of tomato and cabbage are totally different. As stated in Table 4.1.1, tomato has two peaks of price trend: June-July and January-February, while Cabbage maintains a longer period of one peak: June-October. That is, most profitable harvesting seasons of each crop has different behaviors.

Table 5.1.2 Price Trends of Tomato and Cabbage

Crop	Dry Season						Rainy Season					
	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr
Tomato	M	**H**	**H**	M	L	L	M	M	H	H	L	M
Cabbage	M	**H**	**H**	H	H	H	M	L	L	L	L	M

Source: Interview at Mwamba Camp, March 2011

Note: L) low price, M) medium price, and H) high price

Yet, looking at the table more carefully, there found is a two months of period, in which both crops hit the top: June to July. Therefore, it is strongly recommended for farmers to carry out intercropping of tomato and cabbage as soon as rainy season ends so that they can fetch a best price for both crops in July or at least better price in August.

In addition, it was confirmed by Mr. Abel liked that the intercropping of cabbage and tomato would enhance the quantity of the produces harvested in a unit of land. In his case, he did not reduce the frequency of chemical application and he enjoyed large quantity of cabbage production. In a common practice, cabbage is accommodated around 26 heads in a 50kg bag. Besides, 16 heads of cabbage fulfilled a same size of bag in the case of intercropping. Much more money can be expected from the same piece of land.

4) Maize and Cowpea

Intercropping of maize and cowpea was also introduced in the agricultural trial. Cowpea, an African-origin legume crop, is well known as to enhancer soil fertility. Thus, especially for farmers in the Study area where soil condition is quite depleted, it is quite a recommendable crop to be planted.

This intercropping was tried out in Chipompo village where four farmers participated. According to Mr. Evaristo Kasengele, one of the four farmers, benefit of maize-cowpea intercropping was quite pronounced; as cowpea covers the surface of soil, 1) it suppresses the growth of weed, and 2) minimizes the evaporation of irrigated water. In fact, he organized weeding only one time during the entire growing period as compared to three times in the conventional single cropping of maize.

On the other hand, there was a little drawback to the growth of maize. Although cowpea was sawn one month after sawing maize seeds, it still overwhelmed the growth of maize; growth of cowpea is considerably strong. As a lesson, cowpea should be sawn roughly two months after sawing maize.

5) Maize and Soybean

Combination of maize and soybean was also organized in Chipompo village with another four farmers. Ms. Agness Mumba, one of the participants, gave a credit to this practice with five major reasons: 1) frequency of watering can be minimized; 2) less numbers of weeding is required; 3) two crops can be harvested; 4) land fertility might be improved; and 5) it is applicable even in rainy season.

On the other hand, some drawbacks have been also observed. The most considerable one was too strong vegetative growth of both crops. As they grow too strong, harvest was not so impressive. She assumed that the land fertility became too good by the soybean by which crops grow too tall. It is, however, more likely that the inter-row spacing was not enough: 30cm in between the rows of soybeans.

5.1.2 Wheat as a New Crop

Under irrigation, farmers' alternative to the type of crop can dramatically increase. For example, farmers can introduce new types of crops and they can plant crops in a different timing so that they can enhance the market potential. A series of discussions had been carried out between the Study team and provincial and district TSB officers on the types of potential crops to be newly introduced in the Study area.

The suggestion began with Irish potato that is now mostly imported from Tanzania, garlic that is seen as high value in the market and NERICA. Further suggested was wheat; it has accumulated a good reputation in some areas including Mpika. In fact, wheat was once promoted by CIDA during the late 80s in Mbala, Mpika and Nakonde in Northern province. And, in Mpika, there were some wheat farmers who performed well and are still cultivating it. Wheat flour is usually given higher price than the same amount of maize and thus the potential was seen high. For example, as of the end of November 2009, the price of bread flour was ZMK 105,000/25kg, while it was ZMK 59,000/25kg for milled maize in Kasama.

In addition to vegetables like tomato, onion, and cabbage, it could be another good model of irrigated agriculture if grain crop can be introduced in the smallholder irrigation development because grain is generally stable and can be kept for a longer period of time. As the progress in the construction of irrigation schemes for the year 2009 dry season was a bit slow, the location for this trial was selected from the existing irrigation scheme: Lukulu North irrigation scheme in Kasama district, where there were a number of farmers who were willing to produce wheat under irrigation.

Wheat growing nicely six weeks after planting

As of July 20, 2009, six bags of "*Lorie 1*" variety in 25kg bag were purchased and conveyed to the site. A total of 150kg of wheat seeds is applicable to around 2 ha or 8 limas. Then, the seeds were distributed to eight farmers and planted in a total area of 1.75 ha or 0.22ha/farmer. According to Mr. Lupili John, one of the farmers who participated in this trial, he planted 6 kg in 0.25 lima on August 15, 2009. Following the instruction from the district TSB officer, he planted in a row with a distance of 20-25cm in between the each row. In his farm, a group of four rows were surrounded by the ridge so that he can irrigate them under "sunken-bed" irrigation. Through this method, he applied irrigation water three times a week, in which it took about two hours per time to irrigate whole plot. His cropping calendar is shown below:

Table 5.1.3 Cropping Calendar of a Farmer for the Wheat Production Trial in 2009

Date	Activity	Remarks
Aug. 15	Planting	6kg of Lorie 1 variety in 0.25 lima in row
Aug. 31	Applying basal fertilizer	2 gallon (10kg) of D-compound (ZMK 56,000 in total) Applied in between the rows
Sep. 7	1st Weeding	Hand weeding at the stage of 30cm in height of the wheat
Sep. 21	Applying top-dressing fertilizer	2 gallon (10kg) of Urea (ZMK 56,000 in total) Applied in between the rows
Sep. 28	2nd Weeding	Hand weeding at the stage of flowering
Nov. 13	Harvesting	By a labor (ZMK 5,000 in total) Only 1/4 of the plot was harvested due to a lack of labor 5 bags of dried panicles in 50kg bag (about 10kg) (not threshed yet)

Source: Interview to Mr. Lupili John (November 23, 2009) / Irrigation: three times a week for 2 hours per time

During the production period, he faced some problems. First, there was an occurrence of termites and maggot-type insects. It occurred in the plot of wheat and groundnuts but not in the plot of onion, implying avoidance effect of onion against the insects. He claimed the water shortage as a primary cause of this problem. In fact, irrigation stopped for about two weeks early October due to the construction work. Another problem was a lack of labor during the harvest season. Starting from November, farmers, all at once, start land preparation for the next rainy season and consequently labor becomes scarce. Due to the lack of labor force and the appreciated cost for labor, he gave up harvesting some part of his plot.

Wheat already germinated before harvesting

In addition to his case, there was an observation of differentiated productivity by the timing of planting. One farmer planted a half of his plot in July and the other in August, about two weeks later. After a while, he was able to harvest the first plot but he gave up the second plot as the latter was affected by the rain and some grains started germinating (see the picture). Interviewed farmers were willing to continue this trial for the next year. They said they will not sell their produce but keep it all as the seed for the next year.

Still, the Study team is considering that the market is the key factor to examine whether wheat can be promoted. Originally, TSB officers and farmers who participated claimed that they can sell their produce to National Milling Corporation at Kasama town. However, through a discussion with the corporation and the Study team, it was revealed that their procurement procedure is highly centralized; all the transactions are managed by their central office in Lusaka. Therefore, marketability still remains a major issue to be solved before the planting season next year.

Lessons:

1) Planting in late July or even August is too late for wheat production as it will be affected by the rain before the harvest. It is therefore recommended to start as early as the dry season begins. Also farmers will face the lack of labor force in the late dry season.

2) Family labor cannot manage harvesting 0.25 limas of wheat. It is necessary to make sure the size of plot not to be too big, considering other crops in his/her entire field, unless one can assume enough labor force.

3) (although marketing is not tried yet), marketability of wheat is questioned, as one of the major buyer did not show much interest in buying small quantity of wheat from individual smallholder farmers.

5.1.3 Introduction of NERICA under Irrigation

1) NERICA under Irrigation (2009)

New Rice for Africa (NERICA) is a set of new rice varieties newly developed through an inter-specific hybridization between African and Asian rice species. NERICA, as a group of varieties, is seen having relative advantages derived from both species: higher yield potential, tolerance to dry condition, shorter maturing period, etc. It is now seen as one of the promising tools for agricultural development throughout Africa and being promoted in many African countries: Zambia is not an exception.


On the "swampy" area, water easily wells up on the ground and makes it difficult to prepare the land

In Zambia, it is still a new type of crop and it can be seen only in the field under trials by research center or the donors' project. Furthermore, although NERICA is commonly categorized in upland rice[14], it is mainly being grown during rainy season for the seed multiplication, for example, by Misanfu Agriculture Research Center in Northern province. Therefore, growing NERICA under irrigated condition would be a good trial to see if there is a good chance of introducing NERICA for smallholder irrigation development.

One of the objectives of this trial was to find a model by which upland rice can be cultivated under irrigation for a relatively wider rage of area because, different from vegetables, grain crop should be produced in a bulk. So, it was proposed to plant NERICA in and around *dambo* area, swampy condition, so that it can enjoy the residual moisture in the soil and therefore, irrigation can be a supplemental measurement. Accordingly, the site was selected in a periphery of *dambo*, in Kasama district. Actually, the site is not the beneficial area of the small-scale irrigation development of pilot project but irrigated by treadle pump.

The first step was a selection of a particular location in the farmland. The farmland stretches from upland toward the bottom of *dambo*. As simplified in Figure 5.6.1, physical condition of the farmland varies in a short range, say 200 meters in length, across the topography. At the bottom of the *dambo*, there is still a flow of water in the stream during the mid of dry season this year 2009. For about 50 meters from the stream, swampy area stretches out. At the first glance, this area seems appropriate for rice production as the water table reaches as high as the ground level. However, it is still far difficult for farmers to prepare the land.

As shown in the picture, although the ground looks solid, just by removing the grasses, water naturally wells up. Hence, the location was selected in between swampy land and upland where soil is solid enough but still maintains enough moisture for the upland rice production. The site was identified in the mid July 2009 and, after a measurement of the land (50m by 25m) and some instructions, seeds were given to a farmer who showed his interest in this trial. He also agreed to do intercropping of NERICA as described below.

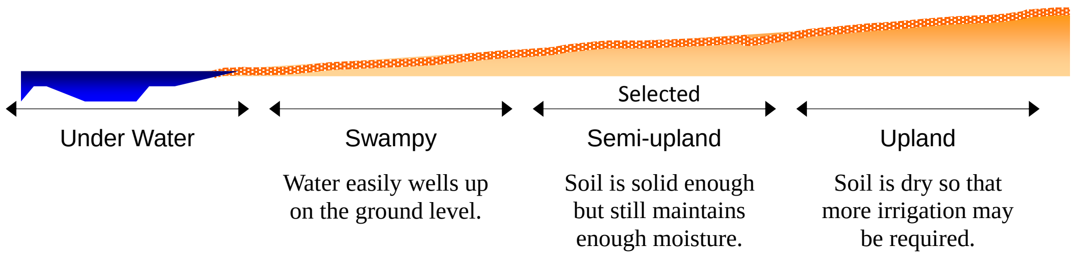


Figure 5.1.1 Topography and Moisture Condition of the Farmland in the Pilot Plot

[14] Note: there are several traits of lowland NERICA. However, they are not available in Zambia yet. Therefore, NERICA in this report is treated as a set of upland varieties.

2) NERICA for Intercropping

In addition to the main plot, intercropping of NERICA was also promoted. As described earlier, farmers in the Study area widely apply a relatively large ridge for upland crops as a form of traditional farming practice called "Fungikila." Because of its size to construct, there is usually wide space in between the Fundikila ridges as seen in the picture. Considering these spaces as an untapped resource, it was proposed to take advantage of them as a planting space. The plan was to grow NERICA in between the ridges as an intercropping so that the plant can enjoy the moisture from the irrigation originally applied for other crop on the ridge.


Fungikila, a large ridge for decomposition of organic matters: there are a lot of spaces in between the ridge.

On July 14, 2009, a total of 10kg of NERICA-4 seeds were provided, which is applicable to as large as 0.25 ha or one lima. The seeds were separated to two portions: one for main plot and the other for intercropping. As it was required to prepare the land before sowing, a hands-on training was provided to the farmers by the rice agronomist from Misanfu Agricultural Research Center. Mr. Sonwell Mungalu gave overall instruction including land preparation, sowing, weed management, and water control.

He specifically demonstrated how to prepare the field and how to sow the seeds as shown in the picture. Particularly, it was recommended to set a string so that farmers can sow in a straight line. He further recommended 30-35cm interval would be appropriate for NERICA production. Thus, in the 120 cm width of space in between the ridges, three lines can be prepared. Based on what he learned, the farmer was encouraged to cultivate the land for the intercropping where there were already "Fundikila"-type ridges and then open the main plot.


Seeds are planted in a row. For the constant seeding, knead the seeds in hand.

It was provisioned that the farmer immediately opens the farm plot and saw the seeds. However, when the Study team came back to the site in October, it was found that he did not do anything. It was a total disappointment that this trial was completely failed.

Lessons:

No technical lesson from the trial, as it was abandoned. There are however some lessons on the logistical aspect.

1) Participants should not be only one as it is risky and is difficult to see the variation. By involving as many farmers as possible, they can help each other too.

2) Continuous support is necessary to follow up and encourage the collaborating farmers. In this particular case, involvement of CEO was not enough and no one, including CEO and TSB officers, might not be confident about NERICA production, causing some hesitation to lead the farmer.

3) NERICA under Irrigation (2010)

Introduction of NERICA was once again being tried with more number of farmers in 2010. there were a total of 4 farmers participating in NERICA cultivation trial. First, Chipompo irrigation scheme was identified as a potential site by provincial TSB officers. Taking into the failure of last year into consideration, TSB officers firstly looked for such farmers who were serious about their farming and identified Chipompo irrigation scheme.

Although Chipompo irrigation scheme was still being constructed under the Study at that time, they already demonstrated their enthusiasm in irrigated agriculture; one of the biggest weirs has been constructed and elaborate canal was being dug notwithstanding the rocky condition of the area; they proved their seriousness. Therefore, farmers who already started irrigated agriculture in the area have been chosen to be the candidates. Same as intercropping trials, 25m by 25m plot, a quarter lima was set as standard size of the plot for the trial. To do it, NERICA seeds were provided.

NERICA variety growing well under irrigation

By the end of November 2010, it was confirmed that the growth of NERICA was quite progressive and healthy under good weed management by the farmers (see picture). Although the harvest was yet to be done, NERICA seemed to be one of the staple crops to be introduced in the smallholder irrigation schemes in the Study area.

In 2011, result of the trial was surveyed based on interviews made to the farmers. Although the growing period of NERICA was reported greater than what anyone thought at the beginning, the reproduction stage was devastated by the attack of birds. As commonly reported in other countries where NERICA is already introduced, birds' attack is severe during the reproduction stage. As a result, the harvest of NERICA rice was quite depressed and the farmers were disappointed. A farmer described that the cultivation timing was probably not appropriate; as the rainy season starts, more numbers of birds migrate back to this area and the conceivable damage may increase, he said.

Lessons:

1) Although it does not guarantee the success, it is better to start cultivating NERICA as early as possible to minimize the damage of birds which are migrating back from the beginning of the rainy season.

5.1.4 Comparative Trial of BOKASHI Compost

BOKASHI compost is being promoted since the beginning of the Study and is, by now, getting popularity. Although there is no statistical data, there have been some opportunities that farmers ask about BOKASHI compost to extension officers, to TSB officers, and to the Study Team. This is probably because farmers are suffering from a combination of depleted soil fertility and high cost of chemical fertilizer. To be an alternative measure to improve soil condition, application of compost manure is highly recommendable.

Further, BOKASHI is superior to the conventional compost making methods with its quickness required for the decomposition process of organic matters. By today, BOKASHI making trainings have been carried out by TSB officers and CEOs in many districts. Now, for this new technology to be given a concrete credit, it is a right timing to do the trial to see the performance of BOKASIH compost in the real field.

The field trial of BOKASHI compost application was thus designed to see the comparative advantage of this technology for demonstration purpose. Now that the advantage of BOKASHI compost over the conventional methods was understood in terms of required time for preparation, it was time to see the effectiveness of the compost to the growth of crops. Therefore, three different types of applications were prepared in each plot: with BOKASHI compost, with BOKASHI compost and chemical fertilizer, and without any fertilizer application. Expected outcome of this trial was to see the clear difference in the crop growth of each plot.

BOKASHI compost making training at the site

The participants of this trial were selected from Chipompo irrigation scheme with the same reason for the NERICA trial; those farmers attained reputation with their commitment in farming. As a first step, BOKASHI making training was provided for those who were interested in this technology. After the compost became ready, the plots were to be specifically prepared as a comparative trial. The best part of doing BOKASHI compost training by the group was that as many farmers were able to learn the technology. On the other hand, as the heap of sample BOKASHI was prepared by the group, final product of BOKASHI compost was equally distributed by the group member, notwithstanding the limited amount of compost. As a result, it became impossible to see the comparative effect of BOKASHI compost as originally planned.

5.2 Economic Impact (Based on Harvest Survey in 2009-2010)

To prospect the economic impact of smallholder irrigation schemes, profitability of irrigated agriculture was estimated. First, harvest survey has been carried out in a total of 27 irrigation schemes in seven districts. The detailed profile of each site is shown in Table 5.2.1, of which 25 schemes had been implemented under the pilot project of the Study in a form of either improvement of existing scheme or new development. Through the survey, a total of 478 farmers had been interviewed, averaging 18 farmers per site. In the interview, cost and benefit of 19 kinds of crops were surveyed in a total of 855 plots. Those districts and irrigation schemes were selected taking the geographical diversity into consideration.

Table 5.2.1 Profile of Harvest Survey Sites

No.	Name of the Scheme	District	Year of Establish -ment	No. of Members	Irrigated Area (ha)	No. of Farmers Interviewed	No. of plot addressed	Scheme
1	Nseluka	Mungwi	2009	32	10	13	25	New
2	Kalupa	Mungwi	1948	30	4	13	23	Improve
3	Mpangankulu	Mbala	2009	30	3	21	41	New
4	Chibalashi	Mansa	1999	25	2	10	18	Improve
5	Mwililwa Upper	Mansa	1998	25	4	11	18	Improve
6	Mwililwa Lower	Mansa	2009	25	1.5	11	21	Improve
7	Chisheta	Kawambwa	2000	36	3	21	36	Improve
8	Malashi	Mpika	2002	53	7	25	61	Improve
9	Malisawa B	Mpika	2009	25	0.75	18	21	New
10	Lunda	Kasama	1968	5	1	13	19	Improve
11	Ngulula	Mungwi	1950	80	10	20	33	GRZ

No.	Name of the Scheme	District	Year of Establish -ment	No. of Members	Irrigated Area (ha)	No. of Farmers Interviewed	No. of plot addressed	Scheme
12	Mwembezi	Mbala	1972	65	33	14	24	Improve
13	Chinenke	Mbala	1972	350	175	27	64	GRZ
14	Chipompo	Kasama	2009	60	4	23	35	New
15	Chabukila	Mungwi	2009	100	20	32	41	New
16	Itongo	Mpika	2009	54	10	29	53	New
	Mihamba	Mpika	2009		2			Improve
17	Kambafwile	Mbala	2009	28	3	29	61	Improve
18	Mpangankulu	Mbala	2009	48	13	20	39	New
19	Nseluka	Mungwi	2009	35	10	29	59	New
20	Chabukila	Mungwi	2009	75	5	28	50	New
21	Mayanga	Mbala	2009	30	2	4	8	New
22	Chilala	Mporokoso	1965	35	4	13	22	Improve
23	Sokoni	Mporokoso	2009	25	3	7	23	New
24	Kabale	Mpika	2009	40	3.5	5	9	New
25	Chikwanda	Mpika	1965	35	5	12	19	Improve
26	Chipamano	Mungwi	2009	27	11	10	20	New
27	Kalupa	Mungwi	1948	30	4	20	12	Improve
Total				1,403	N/A	478	855	
Average				52	12.6	18	32	

Source: Harvest Survey by the Study Team 2010-2011

Note: Irrigated area indicates the total area under irrigation in the whole scheme, which was indicated by the group leader.
The sites indicated by "GRZ" is not the site developed through the COBSI Study but originated by GRZ.
The total irrigated area is not calculated because some sites were surveyed twice in different years.
In the number 16, interview was made to the farmers from the two sites altogether.
Survey was carried out in 2010 for the site No.1-15, while it was done in 2011 for the site No.16-27.

The harvest survey was carried out with a manner of questionnaire survey, covering: 1) size of cultivated area (estimation and actual measurement), 2) cost of inputs, 3) portion of harvest sold, 4) portion of harvest consumed, 5) items for which income was spent, 6) change in the use of chemical fertilizer before and after starting irrigated agriculture, 7) change in the area of Chitemene shifting cultivation before and after starting irrigation, and 8) change in the rain-fed maize production before and after starting the irrigation. Following explains the major findings from the harvest survey and the detailed result of the harvest survey is attached at the end of this chapter.

5.2.1 Cost and Benefit of Major Crops under Irrigation

Table 5.2.2 shows the cost and benefit of major crops in ZMK per lima under irrigation drawn from the harvest survey for a total of 806 samples. Benefit here is estimated from the total production of the crops inclusive of those which are actually sold and those consumed in the household. Note that the selling price is based on each farm household interviewed at the prevalent farm gate price in those areas.

Table 5.2.2 Cost and Benefit of Major Crops under Irrigation, ZMK per lima

No.	Crop	No. of Samples	Cost	Income	Net Income	Cost/ Income	Ratio Sold	Disposal Benefit
1	Onion	90	1,177,000	4,821,000	3,644,000	24%	90%	3,162,000
2	Cabbage	76	1,897,000	4,561,000	2,664,000	42%	94%	2,390,000
3	Irish Potato	27	654,000	2,749,000	2,095,000	24%	84%	1,655,000
4	Chinese Cabbage	29	861,000	2,662,000	1,801,000	32%	91%	1,561,000
5	Tomato	156	1,090,000	2,854,000	1,764,000	38%	92%	1,536,000
6	Beans	20	201,000	1,800,000	1,599,000	11%	72%	1,095,000
7	Rape	106	785,000	2,343,000	1,558,000	34%	90%	1,324,000
8	Groundnuts	89	150,000	1,616,000	1,466,000	9%	80%	1,143,000
9	Green maize	194	464,000	1,637,000	1,173,000	28%	84%	911,000
10	Okra	19	598,000	1,568,000	970,000	38%	95%	892,000
	Average	806	738,000	2,520,000	**1,782,000**	29%	88%	**1,480,000**

Source: Harvest Survey by the Study Team (2010-2011)
Area is based on the amended data which was derived from the actual measurement at the fields.
Cost does not include family labor.
Income is inclusive of the value of produce which have been consumed by the producers.

The results are based on the cultivated areas which are either actually measured or amended. In fact, it was revealed that the actual cultivated areas were in many cases smaller than what were claimed by farmers based on their perception (for more details, refer to chapter 6.5.6 of the Main Report). It implies that the farmers own perception entails a risk of underestimation of crop production per a unit of land. Therefore, for the plot actually measured, actual size of cultivated area was applied and, for those not measured, the average ratio, 92.6%, was applied to what the farmers claimed.

As shown in the table, average cost and income per lima (1/4 ha) were ZMK 738,000 and ZMK 2,520,000 respectively and thus net income resulted in ZMK 1,782,000 per a lima of plot as an average of 10 types of crops which have more than 15 samples. Comparing to theoretical profitability estimated by the TSB officers in several districts (approximately ZMK 5 million per lima), this practical profit was found quite limited. In fact, there were some cases that the cost surpassed gross income, resulting in net loss, for example, in case of pest and disease prevalent.

Note that estimated net income has a wide range among the samples, ranging from minus ZMK 6,178,300 (a particular case of tomato plot in Mbala district) to ZMK 17,081,200 (another specific sample of tomato in Kasama district). Needless to say, market oriented agriculture is always associated with risks and lucks. Fertility of the soil, availability of funding, level of on-farm management, and access to the market—all those factors influence the results of the profitability. The averaged profit in the table, however, comprehends those successes and failures of each case on the ground and therefore it should be more reliable and realistic to measuring the economic impact of irrigated agriculture than the theoretical estimation.

5.2.2 Disposable Benefit of Major Crops

The harvest survey also addressed how much of the harvest the interviewees have actually sold. Table 5.2.2 summarizes the results, showing that as much as 88% of the harvest has been sold as an overall average. By crop, 95 % of produces was sold in the case of okra which is the maximum case, while 72% was sold for the minimum case (beans). It means dry season irrigated agriculture is practiced primarily for the purpose of cash income.

In addition, disposal cash income per household also became available from the harvest survey. As shown in Table 5.2.4, an average size of irrigated area per household was 0.87 lima. In this size of area, farmers spend 738,000 ZMK/household for crop production, and then 2,520,000 ZMK can be conceived as a value of total production, of which 88% of their produces are sold, resulting in a disposal cash income of ZMK 1,480,000.

5.2.3 Composition of Input Cost

As Table 5.2.3 shows, it was confirmed that the production cost, excluding family labors, shares on average 29% of the gross income, ranging from 9% for groundnut to 42% for cabbage. The table also shows the composition of input costs. In the harvest survey, six items have been designated as major inputs and then it was asked how much Zambian Kwacha was spent by each item. As shown in the table, the input that shares the most was D-compound fertilizer (29%) and the second was Urea (20%); those two kinds of chemical fertilizer shares 49% of all the input cost. Transportation, pesticide and labor follow them: 16%, 12% and 12% respectively.

This share differs depending on the types of crops. For instance, nothing is spent for chemical fertilizers and pesticide for groundnuts as it can grow in less fertile soil. As a result, shares in the costs of seeds and labor became high in this crop. For another instance, D-compound (43%) and Urea (22%) shares 65% of the total input cost of rape. This case implies that chemical fertilizer may be a decisive factor to the rape production. The bottom line in this section is that farmers who practice irrigated agriculture in the area are spending mostly for chemical fertilizer if at all.

Table 5.2.3 Composition of Input Cost, ZMK per lima

Crop	Cost/ Income	Composition of the Cost: Seed	D compound	Urea	Pesticide	Labor	Transport	Fertilizer (kg/lima): D	U
Onion	24%	18%	27%	16%	6%	9%	24%	80.4	57.6
Cabbage	42%	11%	31%	20%	9%	7%	21%	137.1	95.3
Irish Potato	24%	23%	32%	18%	6%	9%	12%	60.3	28.6
Chinese Cabbage	32%	7%	42%	27%	11%	8%	4%	80.0	59.4
Tomato	38%	6%	22%	16%	27%	17%	12%	58.7	50.1
Beans	11%	40%	21%	10%	2%	24%	4%	8.3	5.9
Rape	34%	8%	43%	22%	15%	6%	4%	71.4	43.0
Groundnuts	9%	28%	0%	0%	0%	24%	47%	0.4	0.4
Green maize	28%	10%	38%	31%	1%	12%	9%	44.5	42.3
Okra	38%	13%	30%	26%	18%	6%	7%	37.5	46.5
Average	29%	11%	29%	20%	12%	12%	16%	51.9	41.3

Source: Harvest Survey by the Study Team (2010-2011)
Area is based on the amended data which is derived from the actual measurement at the fields.
Income is inclusive of the value of produce which have been consumed by the producers.

5.2.4 Profitability per Household

Now that roughly ZMK 1.78 million can be expected from one lima of irrigated area, it is questioned how much of Kwacha can be expected per one farmer household. The result of harvest survey also provides practical size of cultivated area per farmer household under irrigation. As shown in Table 5.2.4, it was found that interviewed farmers cultivate an average of 0.87 lima per household. Based on this result, an average profit per household can be estimated at ZMK 1,554,094 per household (based on amended area). One may claim how significant this additional income can bring about to a smallholder household. The economic impact of irrigated agriculture is also discussed in the following sections using this output.

Table 5.2.4 Average Profit of Irrigated Agriculture Per Household

Item	Area Irrigated	Cost Per HH	Income Per HH	Net Income Per HH
Average	0.87	633,489 (US$ 132)	2,187,583 (US$ 455)	**1,554,094** (US$ 323)
Max	8.33	18,205,000	27,900,000	21,750,000
Min	0.02	0	12,500	-2,480,000

Source: Harvest Survey by JICA Study Team 2010-2011

5.3 Spillover Effects

5.3.1 Investing in Rain-fed Maize Production

Quantitative data from the harvest survey also supports the phenomenon of re-investing in rain-fed maize production. As shown in Table 5.3.1, production of rain-fed maize has increased since farmers started irrigated agriculture. Of an average of 373 farmers, their production has increased from 18 bags (50kg/bag) per household to 31 bags per household—74% of increase. In fact, 333 farmers out of 373 farmers answered that they experienced an increase in rain-fed maize production. Although the irrigated agriculture may not necessarily explain this increase, output from the irrigated agriculture could have brought about the positive impact to the rain-fed agriculture.

Table 5.3.1 Change in Rain-fed Maize Production After Starting Irrigated Agriculture

Item	Before	After	Increase	(%)	No. of Samples
Average, bags	18	32	13	72%	373
Increased, bags	13	25	12	92%	333
Decreased, bags	32	19	-13	-40%	35
No Change, bags	29	29	0	0%	5

Source: Harvest Survey by the Study Team (2010) Unit: (Bags (50kg)/household)

5.3.2 Investing in Chemical Fertilizer

Increased production of rain-fed maize production may be explained by several factors including increase in the use of chemical fertilizer, expansion of cultivated area and additional use of other agricultural inputs or hiring more farmer labors. The harvest survey also revealed the change in the use of chemical fertilizer since starting irrigated agriculture.

As shown in Table 5.3.2, 300 households out of 327 households increased the use of chemical fertilizer in rain-fed maize production after they have started irrigation. On average of all the farmers who increased or decreased, farmers increased from 76 kg/household to 176kg/household; 100kg/ household was newly added since having started irrigated agriculture (132% of increase). For this increase of chemical fertilizer, the income from the irrigated agriculture must have contributed at least to some extent.

On the other hand, among all the responded farmers, 19 farmers reduced the use of chemical fertilizer and 8 farmers did not change at all. To be sure, the original amounts of fertilizer for those categories who reduced or did not change were comparatively higher than that of those farmers who increased: 71kg and 251kg/household respectively as compared to 49 kg/household who increased. It was not probably really necessary for those farmers to increase because they originally apply enough, or sometimes more than enough, amount of fertilizer. In addition, there were several cases reported that some farmers reduced the use of chemical fertilizer in the rainy season because they kept those subsidized fertilizers to the dry season irrigated agriculture.

Table 5.3.2 Change in Fertilizer Use After Starting Irrigated Agriculture

Item	Before	After	Increase	(%)	No. of Samples
Average, kg/HH	76	176	100	(132%)	327
Increased, kg/HH	49	124	75	(153%)	300
Decreased, kg/HH	71	35	-36	(-51%)	19
No Change, kg/HH	251	251	0	(0%)	8

Source: Harvest Survey by the Study Team (2010-2011) Unit: (kg/household)

5.3.3 Investing in Area under Rain-fed Maize Production

There is no quantitative evidence that explains the increase in cultivated area under rain-fed maize production. Here introduced are some qualitative examples derived from a series of in-depth interview to the farmers on the ground. Among 14 farmers interviewed who are not necessary under the pilot project of this Study, all the farmers were using the outcome of irrigated agriculture for the next season's cultivation. Some buy fertilizer or other agricultural inputs for rain-fed maize production and others hire more number of labors. As a result, they all have expanded their cultivated area gradually and continuously.

For example, Mr. Henry of Chiseta village, Kawambwa district increased the cultivated area during the rainy season from 1.75 lima to 7.5 lima in 13 years since he started irrigation. He claimed that this 4.3 times of expansion of cultivated area was only available with the continued benefit from irrigated agriculture in dry season.

Table 5.3.3 Change in Cultivated Area

Item		Rain-fed	Irrigated
Before	lima/HH	2.92	0.33
After	lima/HH	6.58	1.46
Increase per HH	Times	3.67	1.13
Years	years/HH	10.58	11.33
Speed of Increase	lima/year	0.41	0.10

Source: JICA Study Team

It was not a special case only for him. As shown in Table 5.3.3, an average cultivated area in rain-fed area has increased from 2.92 lima to 6.58 lima in 10.58 years: 3.67 times increase. It is partly, if not all, due to the benefit from irrigated agriculture. Although number of samples is quite limited and thus this result cannot represent the whole Study area, it implies some degrees of positive collateral impact of irrigated agriculture. What is important is that the benefit of irrigation is not limited to the dry season but have a ripple effect toward the rainy season.

Also confirmed was the change in cultivated area under irrigation. In the dry season, cultivated area has increased from 0.33 lima to 1.46 lima as of the average of four farmer households. The cultivated area has more than doubled in 11.33 years on average. For a period of around 11 years, they have expanded their cultivated area 0.1 lima a year, which is equivalent to 14.5% of increase every year.

As discussed, irrigated agriculture can stabilize the year-round agriculture because it is far more stable than rain-fed agriculture. Even if farmers received damage during rainy season, it can be supported by the benefit from irrigated agriculture.

5.3.4 Effects on Chitemene

In addition to economical impact, irrigated agriculture also has several indirect impacts attributing to its additional income. Change in the cultivated area under Chitemene slush-and-burn cultivation may be considered as one of them. Looking at the individual cases as shown in Table 5.3.4, out of 187 farmers, 38 farmers (20%) increased their Chitemene area while 85 farmers (45%) decreased it after they started irrigated agriculture. With respect to the overall average change, it was slightly reduced: 0.69 lima of Chitemene area before irrigation became to 0.60 lima of Chitemene area after irrigation per individual farmer.

Table 5.3.4 Change in Chitemene Area After Starting Irrigated Agriculture

Item	Before, lima	After, lima	Increase, lima	(%)	No. of Samples
Average	0.69	0.60	-0.09	-13%	187 (100%)
Increased	0.10	0.18	0.08	80%	38 (20%)
Decreased	0.76	0.24	-0.52	-68%	85 (45%)
No Change	0.52	0.52	0.0	0%	64 (34%)

Source: Harvest Survey by the Study Team (2010-2011)

According to some informal interviews made to some farmers, there were a number of farmers who showed their interest to boost the cultivated area under Chitemene system. For those farmers, irrigated agriculture was a good source to hire more labors to expand their Chitemene area. On the other hand, some said they decreased Chitemene area because they liked to shift their farming style from shifting cultivation to more intensive farming system. For them, additional income from irrigated agriculture was a good source to buy fertilizer for rain-fed maize production, a more steady farming system. What makes this difference may be availability of natural forest. For those who face a decrease of natural forest around, Chitemene is, first of all, not a sustainable choice. They are originally looking for a chance to shift from Chitemene to rain-fed maize.

Those who are blessed with plenty of natural forest draw a totally opposite scenario from those who do not have enough forest. For such farmers, it could be a rational idea to further expand Chitemene area using the increased income to hire more labors specifically required for slashing and opening the area. In short, increased income from irrigated agriculture could work in both ways and it behaves as a leverage to help farmers going to whichever farmers want to go.

To be sure, it is obvious that natural resources are generally getting less and less in the Study area. It would make farmers difficult to continue the extensive Chitemene slush and burn cultivation in the long run. Given this scenario, the irrigated agriculture may lead the farmers to the direction where farmers tend to practice stable agriculture, discarding slush and burn cultivation over mid – long terms.

5.3.5 Investing out of Irrigated Agriculture

Figure 5.3.1 and Table 5.3.5 show the major items that farmers spent their cash income from the irrigated agriculture for. Based on the harvest survey carried out in 27 irrigation schemes, the most frequent one among the 13 items listed in the table was fertilizer (169 responses), which accounts for 23% of all the responses (751). The second most frequent answer was school fee, which shared 21% (160 responses). Domestic expenses came the third rank, sharing 15% with 112 responses, including meat, salt, cooking oil, kerosene for lighting, soap, etc. As such, general household expenses composed of “domestic expenses (15%),” “clothes (5%),” and “medical expenses (1%)” shared 21% of the total number of the answers.

On the other hand, investment in agricultural production for the next season is also an important consumption behavior of the farmers. In addition to fertilizer, which was first ranked, cost for “seed” including vegetables, rain-fed maize, and groundnuts came the fourth rank. Income is also spent for land preparation for the rain season agriculture. As a whole, frequency related to agricultural production accounted for 43%: fertilizer (23%), seeds (15%), land preparation (4%), chemicals (1%). This set of result implies that farmers spent cash income from the irrigated agriculture mostly for education, household expense, and re-investment in agricultural production.

Table 5.3.5 Items Income from the Irrigated Agriculture is Spent for

(A) All Items

No.	Item	Frequency	%
2	School Fee	160	21%
1	Fertilizer	169	23%
4	Vegetable Seed	60	8%
3	Household Goods	43	6%
6	Clothes	35	5%
3	Domestic Expenses	24	3%
7	Land Preparation	30	4%
5	House construction/ Materials	23	3%
4	Maize Seed	51	7%
8	Bicycle/ Spare Parts	26	3%
5	Roofing Sheet	19	3%
3	Furniture/ Mattress/ blanket	28	4%
9	Livestock	18	2%
10	Cooperative	9	1%
6	Uniform	6	1%
3	Radio	13	2%
11	Medical Expenses	6	1%
3	Battery	4	1%
12	Chemical	5	1%
13	Agricultural Labor	4	1%
13	Saving	2	0%
13	Others	16	2%
	Total	751	100%

(B) Items Integrated

No.	Item	Frequency	%
1	Fertilizer	169	23%
2	School Fee	160	21%
3	Domestic Expenses	112	15%
4	Seeds	111	15%
5	House construction	42	6%
6	Clothes	41	5%
7	Land Preparation	30	4%
8	Bicycle/ Spare Parts	26	3%
9	Livestock	18	2%
10	Cooperative	9	1%
11	Medical Expenses	6	1%
12	Chemical	5	1%
13	Others	22	3%
	Total	751	100%

Source: Harvest Survey by the Study Team 2010-2011. Data is based on an multiple answer to the open ended question.
Note: Some items in the table (A) are integrated into the table (b) in accordance with the ID number indicated.

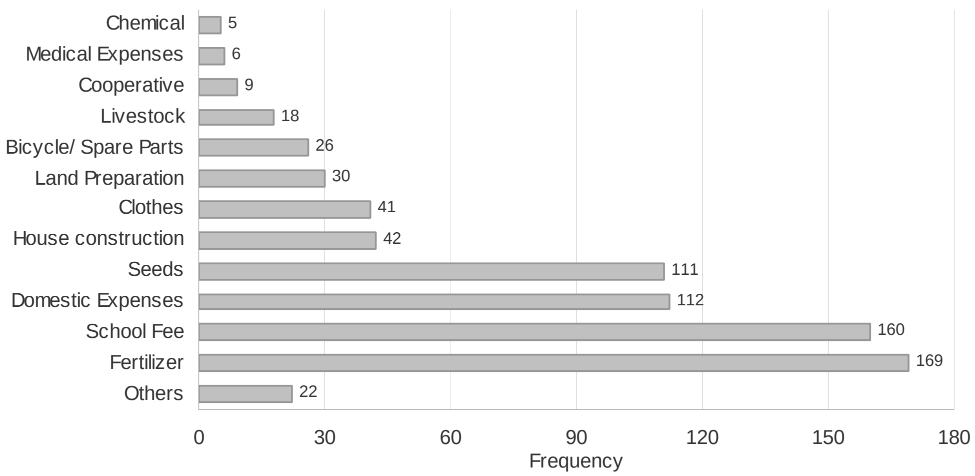


Figure 5.3.1 Items Spent For from Irrigated Agriculture

Table 5.3.6 Detailed Result of the Harvest Survey

No.	Scheme ID	Farmer ID	Crop	Area, m X (Declared)	Area, m Y (Declared)	Area, m X (Measured)	Area, m Y (Measured)	Input, ZMK Seeds ZMK	D Compound Kg	D Compound ZMK	Urea Kg	Urea ZMK	Pesticide ZMK	Labor ZMK	Transport ZMK	Total ZMK	Harvest Sold Volume	Unit	Unit Price (ZMK)	Cash Income (ZMK)	Consumed Volume	Total Production	Value of all production	Chemical Fertilizer Before (kg)	Chemical Fertilizer After (kg)	Chitemene Before (lima)	Chitemene After (lima)	Rainfed Maize Before (bag)	Rainfed Maize After (bag)
1	1	101	Groundnuts	50	50			48,000						30,000		78,000	40	Gallon	5,000	200,000	5	45	225,000						
2	1	101	Tomato	25	25			7,500	5	25,000	3	12,000	6,000	20,000		70,500	13	Bucket	15,000	195,000	4	17	255,000						
3	1	101	Egg Plants	10	10			1,200	1	3,500	1	2,500	2,000			9,200	5	Bucket	10,000	50,000	2	7	70,000						
4	1	102	Groundnuts	150	50			120,000						200,000	100,000	420,000	6	Bag	112,000	672,000	75	81	9,072,000						
5	1	102	Tomato	20	15			35,000		100,000			40,000	50,000		225,000	30	Bucket	12,000	360,000	6	36	432,000						
6	1	102	Rape	10	5			5,000	10	60,000			10,000	15,000		90,000	100	Bunch	500	50,000	50	150	75,000						
7	1	102	Pumpkin leaves	10	10									10,000		10,000	80	Bunch	500	40,000	20	100	50,000						
8	1	102	Cucumber	5	5									5,000		5,000	3	Bag	30,000	90,000	1	4	120,000						
9	1	103	Green maize	50	25			32,500	25	90,000	25	70,000		125,000	100,000	417,500	30	Bag	35,000	1,050,000	1	31	1,085,000						
10	1	104	Green maize	40	20			32,500	25	90,000	25.0	70,000		100,000	50,000	342,500	35	Bag	40,000	1,400,000	1	36	1,440,000						
11	1	104	Beans	50	25			5,000		60,000				60,000		125,000	4	Bag	84,000	336,000	2	6	504,000						
12	1	104	Pumpkin leaves	20	15											0	100	Bunch	500	50,000	40	140	70,000						
13	1	104	Groundnuts	20	10											0	6	Gallon	6,000	36,000	2	8	48,000						
14	1	105	Green maize	50	25			5,000	10	60,000	10	60,000				125,000	4	Bag	84,000	336,000	1	5	420,000						
15	1	105	Pumpkin leaves	15	10											0	70	Bunch	500	35,000	50	120	60,000						
16	1	105	Groundnuts	60	20			25,000						30,000		55,000	45	Gallon	5,000	225,000	8	53	265,000						
17	1	106	Green maize	25	25			15,000	15	90,000	10	50,000				155,000	4	Bag	25,000	100,000	1	5	125,000						
18	1	107	Green maize	25	15				15	90,000	10	50,000				140,000	4	Bag	25,000	100,000	1	5	125,000						
19	1	108	Onion	25	25			80,000	15	90,000						170,000	80	Gallon	10,000	800,000	3	83	830,000						
20	1	109	Green maize	25	25			15,000	15	90,000	10	50,000				155,000	3	Bag	25,000	75,000	1	4	100,000						
21	1	109	Beans	25	25											0	5	Gallon	5,000	25,000	5	10	50,000						
22	1	110	Groundnuts	50	50			30,000						20,000		50,000	180	Gallon	5,000	900,000	4	184	920,000						
23	1	111	Groundnuts	25	25										19,000	19,000	90	Gallon	3,000	270,000	7	97	291,000						
24	1	112	Green maize	20	15				10	45,000	5	17,000				62,000	5	Bag	45,000	225,000	1	6.0	270,000						
25	1	113	Green maize	15	10					35,000		25,000				60,000	3	Bag	35,000	105,000	1	4	140,000	0	20				
26	2	201	Green maize	25	25				50	172,000	50	150,000	35,000			357,000	10	Bag	30,000	300,000	1	11	330,000						
27	2	201	Tomato	25	25			25,000					250,000	35,000		310,000	20	Bucket	25,000	500,000	5	25	625,000						
28	2	202	Tomato	50	25			30,000	20	100,000	10	40,000	73,000	40,000		283,000	35	Bucket	25,000	875,000	8	43	1,075,000						
29	2	202	Rape	10	10			2,000	15	75,000	5	20,000	15,000	20,000		132,000	400	Bunch	500	200,000	60	460	230,000						
30	2	203	Tomato	50	50			30,000	50	50,000	15	60,000				140,000	40	Bucket	25,000	1,000,000	4	44	1,100,000						
31	2	204	Green maize	75	75			14,000	75	247,000	50	160,000		80,000	45,000	546,000	18	Bag	22,000	396,000	4	22	484,000						
32	2	204	Onion	25	10			15,000	5	25,000	5	15,000	12,000	20,000		87,000	8	Gallon	22,000	176,000	4	12	264,000						
33	2	204	Tomato	30	20			25,000	5	25,000	5	15,000	34,000	20,000		119,000	16	Bucket	8,000	128,000	5	21	168,000						
34	2	204	Rape	25	10			12,000	5	25,000	5	15,000	38,000	20,000		110,000	184	Bunch	1,000	184,000	80	264	264,000						
36	2	205	Green maize	75	75			14,000	50	172,000	50	150,000		85,000		421,000	38	Bag	35,000	1,330,000	4	42	1,470,000						
37	2	206	Green maize	50	50			7,000	50	172,000	50	150,000		80,000		409,000	33	Bag	35,000	1,155,000	5	38	1,330,000						
38	2	207	Green maize	25	25			7,000	50	172,000	50	150,000		6,000		335,000	11	Bag	30,000	330,000	3	14	420,000						
39	2	208	Tomato	25	10			15,000	15	75,000			67,000	30,000		187,000	20	Bucket	25,000	500,000	4	24	600,000						
40	2	208	Rape	20	10			5,000	10	50,000			12,000			67,000	36	Bunch	500	18,000	20	56	28,000						
41	2	209	Tomato	25	25			25,000	10	50,000	5	20,000	20,000	35,000		150,000	18	Bucket	25,000	450,000	3	21	525,000						
42	2	209	Green maize	25	25			7,000	10	50,000	10	30,000		25,000		112,000	6	Bag	35,000	210,000	1	7	245,000						
43	2	210	Green maize	50	50			7,000	50	170,000	50	150,000		50,000		377,000	18	Bag	35,000	630,000	1	19	665,000						
44	2	211	Green maize	50	50			7,500	50	170,000	50	150,000		80,000	75,000	482,500	24	Bag	22,000	528,000	2	26	572,000						
45	2	211	Okra	30	25				20	100,000	10	40,000				140,000	30	Gallon	8,000	240,000	3	33	264,000						
47	2	212	Green maize	50	25			7,000	50	170,000	50	150,000		30,000		357,000	15	Bag	25,000	375,000	1	16	400,000						
48	2	212	Onion	50	15			21,000	10	50,000				15,000		86,000	25	Gallon	12,000	300,000	2	27	324,000						
49	2	213	Green maize	25	25			14,000	50	170,000	50	150,000				334,000	24	Bag	30,000	720,000	3	27	810,000						
50	2	213	Tomato	25	25			25,000			50	150,000	88,000			263,000	26	Bucket	15,000	390,000	20	46	690,000						
51	3	301	Tomato	100	100			120,000	150	750,000	175	900,000	300,000	400,000	450,000	2,920,000	115	Bucket	25,000	2,875,000	6	121	3,025,000						
52	3	301	Onion	25	25			150,000	150	750,000			65,000	130,000	90,000	1,185,000	10	Bucket	180,000	1,800,000	2	12	2,160,000						
53	3	301	Irish Potato	45	30			150,000	150	250,000	50	250,000	85,000	60,000		795,000	20	Bag	75,000	1,500,000	2	22	1,650,000						
54	3	301	Green maize	50	46			144,000	50	250,000	50	250,000		260,000		904,000	15	Bag	70,000	1,050,000	3	18	1,260,000						
55	3	301	Okra	20	15			13,000	20	125,000						138,000	10	Gallon	12,000	120,000	3	13	156,000						
56	3	301	Rape	28	25			10,000	50	250,000	50	250,000				510,000	1,000	Bunch	500	500,000	100	1,100	550,000						
57	3	302	Green maize	50	50			5,000	10	60,000	10	50,000			20,000	135,000	4	Bag	100,000	400,000	1	5	500,000						
58	3	302	Tomato	20	10			5,000	5.5	45,000	5.5	37,500	30,000	20,000		137,500	8	Bucket	15,000	120,000	2	10	150,000						
59	3	302	Onion	50	50			60,000	50	120,000	50	100,000	30,000	30,000	50,000	390,000	4	Bag	200,000	800,000	1	5	1,000,000						
60	3	302	Rape	15	10			2,000	15	90,000			15,000			107,000	5	Bag	10,000	50,000	1	6	60,000						
61	3	302	Chinese Cabbage	10	3			1,000					5,000			6,000	4	Bag	10,000	40,000	1	5	50,000						
62	3	303	Green maize	50	25			35,000	25	120,000	25	10,000		70,000		235,000	15	Bag	80,000	1,200,000	8	23	1,840,000						
63	3	303	Rape	38	20			5,000	10	50,000	10	40,000	10,000	70,000		175,000	10	Bag	5,000	50,000	1	11	55,000						
64	3	304	Green maize	29	24			5,000	25	120,000	25	100,000		70,000		295,000	16	Bag	80,000	1,280,000	3	19	1,520,000						
65	3	304	Rape	45	30			5,000	25	120,000	25	100,000	15,000	70,000		310,000	10	Bag	20,000	200,000	2	12	240,000						
66	3	305	Green maize	26	25			160,000	50	250,000	50	250,000		120,000		780,000	24	Bag	80,000	1,920,000	4	28	2,240,000						

No.	Scheme ID	Farmer ID	Crop	Area, m X (Declared)	Area, m Y (Declared)	Area, m X (Measured)	Area, m Y (Measured)	Input, ZMK Seeds ZMK	D Compound Kg	D Compound ZMK	Urea Kg	Urea ZMK	Pesticide ZMK	Labor ZMK	Transport ZMK	Total ZMK	Harvest Sold Volume	Unit	Unit Price (ZMK)	Cash Income (ZMK)	Consumed Volume	Total Production	Value of all production	Chemical Fertilizer Before (kg)	Chemical Fertilizer After (kg)	Chitemene Before (lima)	Chitemene After (lima)	Rainfed Maize Before (bag)	Rainfed Maize After (bag)
67	3	305	Beans	25	25			15,000	5	30,000	5	25,000		20,000		90,000	2	Bag	300,000	600,000	1	3	900,000						
68	3	306	Irish Potato	50	48			64,000	20	120,000	20	100,000		50,000	90,000	424,000	18	Bag	60,000	1,080,000	5	23	1,380,000						
69	3	307	Green maize	36	20			5,000	20	120,000	20	100,000		40,000	50,000	315,000	12	Bag	80,000	960,000	3	15	1,200,000						
70	3	307	Irish Potato	25	25			12,000	20	120,000			5,000	25,000	40,000	202,000	4	Bag	50,000	200,000	2	6	300,000						
71	3	307	Rape	15	10			3,000	10	60,000			15,000			78,000	8	Bag	10,000	80,000	2	10	100,000						
72	3	308	Green maize	70	50				25	150,000	25	125,000		30,000		305,000	16	Bag	80,000	1,280,000	3	19	1,520,000						
73	3	308	Tomato	25	20			15,000	10	60,000	10	50,000	40,000			165,000	25	Bucket	15,000	375,000	6	31	465,000						
74	3	309	Irish Potato	50	30			70,000	15	90,000	15	75,000	15,000		50,000	300,000	10	Bag	60,000	600,000	2	12	720,000						
75	3	310	Onion	50	50			100,000	20	120,000	5	75,000	18,000		90,000	403,000	11	Bag	75,000	825,000	2	13	975,000						
76	3	311	Green maize	38	30			160,000	50	250,000	50	250,000		40,000	90,000	790,000	15	Bag	80,000	1,200,000	3	18	1,440,000						
77	3	311	Irish Potato	25	20			36,000	20	120,000	20	100,000	15,000	20,000	30,000	321,000	6	Bag	60,000	360,000	1	7	420,000						
78	3	312	Green maize	25	25			80,000	20	120,000	20	100,000		40,000		340,000	10	Bag	80,000	800,000	4	14	1,120,000						
79	3	313	Green maize	100	100			160,000	100	300,000	100	300,000		250,000	80,000	1,090,000	50	Bag	80,000	4,000,000	8	58	4,640,000						
80	3	313	Groundnuts	25	25			30,000						50,000	10,000	90,000	6	Bag	70,000	420,000	1	7	490,000						
81	3	314	Beans	25	25			30,000						20,000		50,000	1	Bag	150,000	150,000	1	2	300,000						
82	3	315	Green maize	50	50			5,000	20	120,000	20	100,000		40,000		265,000	8	Bag	80,000	640,000	2	10	800,000						
83	3	316	Groundnuts	50	50			60,000						40,000		100,000	16	Bag	70,000	1,120,000	2	18	1,260,000						
84	3	316	Green maize	25	25			5,000	15	90,000	15	75,000		15,000		185,000	4	Bag	80,000	320,000	2	6	480,000						
85	3	317	Beans	50	25			60,000	5	30,000	5	30,000		50,000		170,000	4	Bag	150,000	600,000	1	5	750,000						
86	3	318	Groundnuts	45	30			60,000						50,000		110,000	6	Bag	70,000	420,000	1	7	490,000						
87	3	319	Green maize	50	50			5,000	20	120,000	20	100,000		50,000		275,000	12	Bag	80,000	960,000	2	14	1,120,000						
88	3	319	Tomato	25	25			15,000	15	90,000	15	75,000	60,000	40,000		280,000	32	Bucket	20,000	640,000	3	35	700,000						
89	3	320	Green maize	50	50			10,000	50	250,000	50	250,000		70,000		580,000	18	Bag	80,000	1,440,000	3	21	1,680,000						
90	3	321	Tomato	25	25			15,000	10	60,000	10	50,000	40,000	30,000		195,000	20	Bucket	15,000	300,000	7	27	405,000						
91	3	321	Rape	25	25			5,000	15	90,000	15	75,000	5,000	30,000		205,000	10	Bag	15,000	150,000	2	12	180,000						
92	4	401	Cabbage	50	25	52.0	10.0	200,000	150	600,000	50	175,000	90,000	100,000	400,000	1,565,000	30	Bag	50,000	1,500,000	5	35	1,750,000			1	2	48	60
93	4	401	Onion	50	25	50.5	13.5	210,000	100	400,000				100,000	200,000	910,000	30	Bag	45,000	1,350,000	2	32	1,440,000	75	200	1	2	48	60
94	4	402	Cabbage	25	12	53	3	90,000	20	160,000	20	140,000	15,000	20,000		415,000	9	Bag	50,000	450,000	1	10	500,000			1	2	30	25
95	4	402	Rape	25	6	53	2.6	5,000	5	30,000			6,000			41,000	2	Bag	20,000	40,000	1	3	60,000			1	0	30	25
96	4	403	Rape	25	6	22.0	7.0	5,000	10	60,000			6,000	20,000		91,000	2	Bag	20,000	40,000	1	3	60,000			0.5	1	10	12
97	4	404	Cabbage	25	12	17.7	16.5	55,000	50	220,000	10	56,000	30,000			361,000	4	90kgBag	50,000	200,000	1	5	250,000			0.5	0.25	8	12
98	4	404	Rape	25	8	17.7	16.5	5,000	5	30,000			10,000			45,000	3	Bag	15,000	45,000	1	4	60,000			0.5	0.25	8	12
99	4	405	Chinese Cabbage	25	6	17.7	10	3,000	5	35,000	5	30,000	5,000	15,000		88,000	3	Bag	30,000	90,000	1	4	120,000	8	15	0.5	0.25	4	6
100	4	405	Bean leaves	20	5	17.7	10	5,000	2.5	17,500	2.5	15,000				37,500	3	Bag	20,000	60,000	1	4	80,000			0.5	0.25	4	6
101	4	406	Cabbage	25	25	16.9	15.7	100,000	100	500,000	2.0	400,000	70,000	50,000	50,000	1,170,000	20	90kgBag	50,000	1,000,000	4	24	1,200,000			1.5	2	15	20
102	4	406	Onion	25	25	50.7	16.8	90,000	50	250,000	20	140,000		50,000	90,000	620,000	35	Bag	45,000	1,575,000	2	37	1,665,000			1.5	2	15	20
103	4	407	Amaranth	25	12	17.7	7.7		2.5	15,000						15,000	4	Bag	40,000	160,000	2	6	240,000			2	1	12	14
104	4	407	Chinese Cabbage	25	12	17.7	7.7	4,000	5	35,000	5	35,000	5,000			79,000	5	Bag	55,000	275,000	2	7	385,000			2	1	12	14
105	4	408	Rape	25	12	20	13.7	10,000	5	35,000	2.5	15,000	8,000	20,000		88,000	5	Bag	35,000	175,000	1	6	210,000			1.5	1	20	15
106	4	409	Rape	25	12	31.2	17.3	10,000	5	35,000	5	30,000	15,000	20,000	30,000	140,000	10	Bag	25,000	250,000	2	12	300,000			0.25	1	15	25
107	4	409	Cabbage	25	25	29	19	95,000	50	170,000	1	120,000	15,000	20,000	400,000	920,000	50	Bag	50,000	2,500,000	2	52	2,600,000	35	100	0.25	1	15	25
108	4	410	Rape	25	8	17.7	5.7	5,000	5	30,000	5	35,000	5,000	75,000		150,000	6	Bag	25,000	150,000	1	7	175,000			0.25	1	10	20
109	4	410	Bean leaves	25	25	17.7	5.7	20,000	2.5	15,000	2.5	15,000		15,000	5,000	70,000	3	Bag	20,000	60,000	1	4	80,000			0.25	1	10	20
110	5	501	Cabbage	25	25	50.0	16.3	85,000	50	200,000	20	80,000	30,000	40,000	150,000	585,000	35	Bag	45,000	1,575,000	3	38	1,710,000			0.5	0.5	12	15
111	5	501	Tomato	50	25	34.6	16.4	45,000	25	120,000			30,000	25,000	90,000	310,000	40	Crate	35,000	1,400,000	3	43	1,505,000	10	100	0.5	0.5	12	15
112	5	501	Pumpkin leaves	20	15	18.5	15		5	30,000				40,000	25,000	95,000	4	Bag	60,000	240,000	1	5	300,000			0.5	0.5	12	15
113	5	502	Cabbage	25	25	30.5	23.0	85,000	50	200,000	50	196,000	30,000		210,000	721,000	30	Bag	45,000	1,350,000	1	31	1,395,000	50	100	1	2	7	15
114	5	502	Chinese Cabbage	12	6	30.5	23.0	10,000	10	50,000	5	25,000	15,000			100,000	4	Bag	50,000	200,000	1	5	250,000			1	2	7	15
115	5	503	Cabbage	50	50	44.9	19	85,000	50	210,000	50	200,000	60,000	50,000	300,000	905,000	80	Bag	50,000	4,000,000	2	82	4,100,000	150	200	0.5	1	20	40
116	5	503	Rape	25	12	24.8	10.5	10,000	20	40,000	10	70,000	12,000		100,000	232,000	10	Bag	40,000	400,000	1	11	440,000			0.5	1	20	40
117	5	504	Tomato	25	8	35.4	12.3	10,000	10	60,000	5	28,000	15,000			113,000	4	Crate	40,000	160,000	1	5	200,000			1	1	15	20
118	5	505	Rape	25	12	25.7	15	10,000	10	60,000	5	25,000	7,000	15,000	7,000	124,000	8	Bag	40,000	320,000	1	9	360,000					8	16
119	5	506	Rape	25	12	21.9	10.0	10,000	5	25,000	5.0	25,000	10,000			70,000	4	Bag	50,000	200,000	1	5	250,000			1	0.5	15	20
120	5	507	Rape	25	25	27.9	13.8	15,000	15	90,000			30,000			135,000	5	Bag	15,000	75,000	1	6	90,000			0.5	1.00	5	7
121	5	508	Rape	25	25	22.9	14.6	3,000	2	20,000			3,000			26,000	4	Bag	20,000	80,000	1	5	100,000			0.5	0.3	4	6
122	5	509	Cabbage	75	25	91	27	85,000	150	600,000	150	600,000	80,000	50,000	1,800,000	3,215,000	120	Bag	50,000	6,000,000	2	122	6,100,000			0.5	0.5	18	25
123	5	509	Chinese Cabbage	25	12	26.9	9.0	5,000	5	30,000	2.5	30,000	15,000			80,000	7	100kgBag	30,000	210,000	1	8	240,000			0.5	0.5	18	25
124	5	510	Tomato	25	12	39.4	18.8	30,000	5	30,000	5	28,000	15,000			103,000	8	Crate	35,000	280,000	1	9	315,000			1	2	3	15
125	5	510	Rape	25	8	29.0	18.0	8,000	5	30,000	5	28,000	12,000			78,000	8	100kgBag	45,000	360,000	2	10	450,000			1	2	3	15
126	5	511	Cabbage	25	25	26.4	25.5	85,000	50	250,000	50	250,000	45,000	150,000	200,000	980,000	60	Bag	50,000	3,000,000	1	61	3,050,000	25	250	0.5	1	40	60
127	5	511	Tomato	25	25	26.4	18.3	70,000	50	250,000	50	250,000	100,000	80,000	140,000	890,000	75	Crate	35,000	2,625,000	5	80	2,800,000			0.5	1	40	60
128	6	601	Cabbage	30	30	33	24	250,000	150	660,000	100	360,000	100,000	60,000	550,000	1,980,000	84	Bag	50,000	4,200,000	3	87	4,350,000			0.5	1	30	45
129	6	601	Okra	12	6	22	10.5		5	30,000	5	25,000		15,000		70,000	5	Bag	45,000	225,000	1	6	270,000			0.5	1	30	45
130	6	601	Egg Plants	25	8	26	15.4	10,000	25	120,000	25	90,000		20,000		240,000	15	Bag	30,000	450,000	1	16	480,000			0.5	1	30	45

No.	Scheme ID	Farmer ID	Crop	Area, m				Input, ZMK									Harvest Sold				Consumed Volume	Total Production	Value of all production	Chemical Fertilizer		Chitemene		Rainted Maize	
				X	Y	X	Y	Seeds	D Compound		Urea		Pesticide	Labor	Transport	Total	Volume	Unit	Unit Price (ZMK)	Cash Income (ZMK)				Before (kg)	After (kg)	Before (lima)	After (lima)	Before (bag)	After (bag)
				(Declared)		(Measured)		ZMK	Kg	ZMK	Kg	ZMK	ZMK	ZMK	ZMK	ZMK													
131	6	602	Cabbage	50	25	29	28.5	160,000	200	1,000,000	100	350,000	60,000	40,000	200,000	1,810,000	60	Bag	45,000	2,700,000	2	62	2,790,000			0.5	1	22	25
132	6	602	Onion	25	6	28.5	8	25,500	10	60,000	5	25,000		10,000		120,500	2	Bag	130,000	260,000	5	7	910,000			0.5	1	22	25
133	6	603	Cabbage	25	25	11	8	85,000	50	200,000	50	180,000	15,000	25,000	150,000	655,000	10	Bag	55,000	550,000	1	11	605,000			0.25	0.5	10	20
134	6	603	Chinese Cabbage	25	8	11	8	10,000	10	70,000	10	60,000	5,000	15,000	10,000	170,000	5	Bag	30,000	150,000	1	6	180,000			1.25	0.5	10	20
135	6	604	Chinese Cabbage	25	6	24.9	12.9	5,000	10	60,000	10	56,000	5,000			126,000	2	90kgBag	30,000	60,000	1	3	90,000			1	0.25	5	4
136	6	604	Rape	25	8	24.9	12.9	5,000	10	60,000	10	56,000	5,000			126,000	2	90kgBag	30,000	60,000	1	3	90,000			1	0.25	5	4
137	6	605	Cabbage	25	25	26.3	14.2	55,000	20	120,000	15	84,000	15,000	20,000	15,000	309,000	8	90kgBag	55,000	440,000	1	9	495,000			0.25	1	10	12
138	6	605	Chinese Cabbage	25	6	26.3	14.2	10,000	5	30,000	5	28,000	5,000			73,000	4	90kgBag	35,000	140,000	1	5	175,000			0.25	1	10	12
139	6	606	Cabbage	25	12	26.5	23	50,000	50	175,000	20	100,000	15,000		60,000	400,000	15	90kgBag	50,000	750,000	1	16	800,000	10	100	1	1.5	2	10
140	6	606	Tomato	25	25	34.5	22.7	35,000	10	60,000	10	50,000	25,000	20,000	60,000	250,000	6	Crate	30,000	180,000	1	7	210,000			1.0	1.50	2	10
141	6	607	Cabbage	50	25	51	21	170,000	200	1,000,000	100	400,000	80,000	100,000	400,000	2,150,000	80	90kgBag	50,000	4,000,000	1	81	4,050,000			0.5	0.25	20	30
142	6	607	Tomato	25	25	50.7	18.7	35,000	50	200,000	25	100,000	75,000	50,000	100,000	560,000	40	Crate	50,000	2,000,000	1	41	2,050,000			0.5	0.25	20	30
143	6	608	Cabbage	75	25	50.8	23.8	245,000	200	1,000,000	150	600,000	80,000	300,000	400,000	2,625,000	120	90kgBag	50,000	6,000,000	2	122	6,100,000	90	150	0.25	1	15	20
144	6	609	Cabbage	25	25	50.0	21.3	95,000	50	200,000	20	80,000	30,000	40,000	120,000	556,000	35	90kgBag	50,000	1,750,000	1	36	1,800,000			0.5	0.25	3	20
145	6	610	Cabbage	75	25	49.7	22.5	95,000	50	150,000	20	70,000	10,000	40,000	80,000	435,000	40	90kgBag	50,000	2,000,000	1	41	2,050,000					10	20
146	6	610	Chinese Cabbage	25	25	49.7	22.5	5,000	10	70,000	5	30,000	5,000	20,000	10,000	140,000	7	Bag	15,000	105,000	1	8	120,000					10	20
147	6	611	Tomato	50	50	91	35	160,000	150	750,000	100	500,000	500,000	900,000	300,000	3,110,000	100	Crate	50,000	5,000,000	10	110	5,500,000	20	400	1	2	63	80
148	6	611	Cabbage	75	25	78	28	160,000	200	1,000,000	150	750,000	300,000	600,000	350,000	3,160,000	150	90kgBag	60,000	9,000,000	15	165	9,900,000	40	500	1	2	63	80
149	7	701	Green maize	40	25	29.0	18.5	56,000	50	50,000	50	50,000		150,000		306,000	7	Bag	65,000	455,000	2	9	585,000			1	1	20	30
150	7	701	Tomato	25	25	22	10	50,000	25	150,000	25	150,000	65,000	80,000		495,000	13	Bucket	20,000	260,000	1	14	280,000			1	1	20	30
151	7	702	Rape	25	25	27.8	16	10,000	5	30,000			30,000			70,000	5	Bag	20,000	100,000	2	7	140,000			0.5	0.5	3	5
152	7	702	Tomato	25	25	27.8	16.0	35,000	10	60,000	10	60,000				155,000	7	Crate	40,000	280,000	3	10	400,000			0.5	0.5	3	5
153	7	703	Cabbage	30	25	32.0	23.5	35,000	5	30,000	5	30,000	35,000		10,000	140,000	4	25kgBag	18,000	72,000	2	6	108,000			1	0.5	4	12
154	7	703	Rape	30	25	50	14.6	16,000	5	30,000			35,000			81,000	10	25kgBag	25,000	250,000	1	11	275,000			1	1.5	4	12
155	7	704	Green maize	25	25	50	19		20	120,000	20	120,000				240,000	8	25kgBag	25,000	200,000	4	12	300,000			1	1	25	30
156	7	705	Tomato	25	25	36.0	28.0	25,000	10	60,000	10	60,000	7,000			152,000	10	Bucket	20,000	200,000	2	12	240,000					10	15
157	7	706	Rape	50	25	22	19	20,000	15	90,000	10	60,000	15,000			185,000	25	25kgBag	25,000	625,000	3	28	700,000			0.5	0	12	8
158	7	706	Tomato	10	5	20.0	5.6	5,000	5	30,000	5.0	30,000	25,000	15,000		105,000	10	Bucket	20,000	200,000	3	13	260,000			0.5	0	12	8
159	7	707	Chinese Cabbage	25	25	31.8	22.5	45,000	20	120,000	15	75,000	70,000	70,000		380,000	19	Bag	23,000	437,000	1	20	460,000			1	1.5	7	17
160	7	707	Rape	30	25	31.8	22.5	50,000	25	165,000	10	50,000	15,000			280,000	34	Bag	60,000	2,040,000	3	37	2,220,000			1	1.5	7	17
161	7	708	Tomato	50	25	47.6	12.6	40,000	10	70,000	10	70,000	65,000	120,000		365,000	70	Bucket	35,000	2,450,000	5	75	2,625,000	55	300	1	1	1	50
162	7	708	Cabbage	50	25	42	22.3	25,000	10	70,000	10	70,000	20,000	35,000		220,000	10	Bag	55,000	550,000	2	12	660,000			1	1	1	50
163	7	708	Carrot	25	25	24.7	6.7	45,000	5	35,000	5	35,000				115,000	3	Bag	100,000	300,000	1	4	400,000			1	1	1	50
164	7	709	Tomato	25	25	23.0	16.0	25,000	5	32,000	5	32,000				89,000	34	Bucket	12,000	408,000	3	37	444,000	20	200			22	35
165	7	709	Rape	25	25	10.8	4.5	15,000	10	64,000	5	32,000	28,000			139,000	5	Bag	20,000	100,000	1	6	120,000					22	35
166	7	710	Green maize	25	25	19.4	14.6		10	60,000	5	30,000				90,000	12	Bag	25,000	300,000	5	17	425,000			0.5	1	6	8
167	7	711	Tomato	25	15	30.0	29.0	10,000	2.5	7,500	2.5	7,500	2,500			27,500	1	Bucket	10,000	10,000	1	2	20,000			1.5	1.5	13	17
168	7	712	Green maize	50	25	50.0	19		50	50,000	50	50,000		70,000	30,000	200,000	9	Bag	25,000	225,000	2	11	275,000			1.5	1	15	25
169	7	713	Irish Potato	50	25	26	24	50,000						120,000		170,000	10	Bag	15,000	150,000	3	13	195,000					12	25
170	7	713	Tomato	25	25	19.8	19	15,000	10	60,000	10	60,000	25,000	50,000		210,000	12	Bucket	5,000	60,000	3	15	75,000					12	25
171	7	714	Tomato	25	25	50	47	50,000	10	60,000	10	60,000	50,000			220,000	30	Crate	50,000	1,500,000	2	32	1,600,000					40	100
172	7	715	Green maize	50	50	50	20		50	150,000	50	150,000		50,000		350,000	6.0	90kgBag	200,000	1,200,000	3.0	9	1,800,000					100	100
173	7	715	Tomato	75	25	50	19	100,000	50	300,000	50	300,000	200,000	100,000		1,000,000	40	Bucket	25,000	1,000,000	20	60	1,500,000					100	100
174	7	716	Tomato	25	25	65	19	25,000	5	30,000	5	30,000	20,000	15,000		120,000	8	Bucket	5,000	40,000	4	12	60,000					30	40
175	7	716	Chinese Cabbage	40	25	15	19	10,000	5	30,000	5	30,000	25,000	20,000		115,000	5	Bag	50,000	250,000	1	6	300,000					30	30
176	7	717	Tomato	25	25	9.5	4.7		2.5	15,000	2.5	15,000	25,000			55,000	4	Bucket	5,000	20,000	1	5	25,000			1	1	5	10
177	7	718	Cabbage	50	25			25,000	5	30,000	5	30,000	25,000			110,000	7	Bag	45,000	315,000	2	9	405,000			1	1	20	10
178	7	718	Rape	25	25			25,000	5	30,000	5	30,000	25,000			110,000	11	Bag	40,000	440,000	3	14	560,000			1	1	20	10
179	7	718	Sweet Potato	50	50											0	15.0	25kgBag	15,000	225,000	4	19	285,000			1	1	20	10
180	7	719	Tomato	20	10				5	30,000	5	30,000				60,000	5	Bucket	5,000	25,000	1	6	30,000					6	7
181	7	720	Chinese Cabbage	50	50			50,000	10	60,000	5	30,000	25,000			165,000	10	25kgBag	5,000	50,000	5.0	15	75,000			1	1	15	18
182	7	720	Tomato	25	25			25,000	10	30,000			25,000			80,000	10	25kgBag	10,000	100,000	5.0	15	150,000			1	1	15	18
183	7	721	Onion	100	100			180,000	100	300,000	100	300,000		200,000		980,000	15	90kgBag	500,000	7,500,000	1.0	16	8,000,000					30	8
184	7	721	Irish Potato	50	50			150,000	50	150,000	50	150,000		150,000		600,000	8	90kgBag	450,000	3,600,000	2.0	10	4,500,000					30	8
185	8	801	Onion	25	20	30.8	21.2	48,000	20	100,000			12,000			160,000	15	Bag	70,000	1,050,000	2	17	1,190,000	100	400			70	90
186	8	801	Tomato	50	25	59	19	37,000	10	50,000			60,000			147,000	35	Crate	20,000	700,000	4	39	780,000					70	90
187	8	801	Green maize	50	25	59	19		10	50,000	10	40,000				90,000	8	Bag	19,000	152,000	4	12	228,000					70	90
188	8	802	Onion	25	25	35	31.3	45,000	10	60,000	5	20,000	15,000	30,000	25,000	195,000	7	Bag	50,000	350,000	1	8	400,000	20	100			15	25
189	8	802	Egg Plants	26	25	36.5	18.2	10,000	5	30,000	5	25,000	15,000	30,000		110,000	15	Bucket	7,000	105,000	5	20	140,000	8	15			15	25
190	8	802	Green maize	58	18	50	25		10	60,000	5	25,000		50,000		135,000	16	Bag	19,000	304,000	2	18	342,000					15	25
191	8	803	Tomato	50	50			16,500	10	50,000			60,000			126,500	20	Crate	30,000	600,000	4	24	720,000					70	120
192	8	803	Green maize	54	25	52.4	35.9		10	50,000	10	40,000				90,000	18	Bag	19,000	342,000	2	20	380,000					70	120
193	8	803	Onion	45	30			35,000								35,000	32	Bag	70,000	2,240,000	1	33	2,310,000					70	120
194	8	804	Onion	30	15	28.6	11.2	25,000	5	25,000	2.5	18,000				68,000	36	Gallon	10,000	360,000	2	38	380,000					10	30

No.	Scheme ID	Farmer ID	Crop	Area, m X (Declared)	Area, m Y (Declared)	Area, m X (Measured)	Area, m Y (Measured)	Input, ZMK: Seeds ZMK	D Compound Kg	D Compound ZMK	Urea Kg	Urea ZMK	Pesticide ZMK	Labor ZMK	Transport ZMK	Total ZMK	Harvest Sold: Volume	Unit	Unit Price (ZMK)	Cash Income (ZMK)	Consumed Volume	Total Production	Value of all production	Chemical Fertilizer Before (kg)	Chemical Fertilizer After (kg)	Chitemene Before (lima)	Chitemene After (lima)	Rainfed Maize Before (bag)	Rainfed Maize After (bag)
195	8	804	Green maize	25	25	31.3	26.6		10	50,000	10	40,000				90,000	10	Bag	19,000	190,000	1	11	209,000					10	30
196	8	805	Onion	25	25			45,000	5	25,000			45,000			115,000	31	Bag	70,000	2,170,000	1	32	2,240,000					20	80
197	8	805	Cabbage	25	25			65,000	50	190,000	25	100,000	65,000			420,000	40	Bag	25,000	1,000,000	2	42	1,050,000					20	80
198	8	805	Egg Plants	45	25	39	26.8	10,500	15	75,000	20	80,000	15,500			181,000	10	Bag	50,000	500,000	2	12	600,000					20	82
199	8	806	Tomato	28	22	35.7	29.8	27,000	30	180,000	20	100,000	45,000			352,000	35	Crate	25,000	875,000	4	39	975,000			1	0.25	20	40
200	8	807	Onion	50	45	43.5	36.0	9,000	50	180,000	20	80,000				269,000	10	Bag	60,000	600,000	1	11	660,000	20	100	1	2	30	35
201	8	807	Tomato	35	25	43.5	36.3	25,000	5	20,000	5	17,000				62,000	20	Crate	18,000	360,000	2	22	396,000			1	2	30	35
202	8	807	Green maize	35	25	43.5	36.3	39,000	10	50,000	10	40,000				129,000	15	Bag	19,000	285,000	1	16	304,000			1	2	30	35
203	8	808	Onion	50	27	43.7	34.4	45,000	10	60,000	5	25,000	15,000		24,000	169,000	11	Bag	70,000	770,000	1	12	840,000	100	200			20	30
204	8	809	Cabbage	35	29	29.2	22	120,000	50	180,000	50	150,000	140,000	100,000		690,000	31	Bag	30,000	930,000	1	32	960,000	300	500			30	50
205	8	809	Onion	33	26	25	21	90,000	50	180,000	20	80,000	70,000	150,000		570,000	10	Bag	120,000	1,200,000	1	11	1,320,000					30	50
206	8	810	Tomato	50	15	46	10	15,000	20	120,000	5	20,000	130,000	15,000		300,000	35	Crate	30,000	1,050,000	4	39	1,170,000	10	15			10	15
207	8	810	Rape	39	10	36	5	10,500	50	180,000	20	80,000	45,000			315,500	540	Bunch	500	270,000	50	590	295,000					10	15
208	8	811	Cabbage	56	10	50	4	55,000	10	70,000	5	25,000	65,000	10,000		225,000	23	Bag	25,000	575,000	1	24	600,000					12	17
209	8	812	Cabbage	58	50	50	34	150,000	50	200,000	20	80,000	100,000	70,000		600,000	80	Bag	25,000	2,000,000	3	83	2,075,000			0.25	0.25	100	50
210	8	812	Rape	30	25	26	17	25,000	50	200,000	15	90,000	50,000			365,000	1,000	Bunch	500	500,000	100	1,100	550,000	100	200	0.25	0.25	100	50
211	8	813	Rape	50	46	39	15	15,000	50	200,000	15	60,000	30,000			305,000	600	Bunch	500	300,000	100	700	350,000					4	6
212	8	813	Onion	56	30	50	24	95,000	20	100,000	15	60,000				255,000	20	Bag	65,000	1,300,000	1	21	1,365,000					4	6
213	8	813	Chinese Cabbage	25	20	31.5	10	10,000	20	100,000	10	40,000	15,000			165,000	500	Bunch	500	250,000	4	504	252,000					4	6
214	8	814	Green maize	50	50	51	19.5		50	130,000	50	120,000				250,000	15	Bag	57,500	862,500	1	16	920,000					98	90
215	8	815	Tomato	20	10	35	30	10,000	10	60,000	10	50,000	15,000	70,000		205,000	10	Crate	25,000	250,000	2	12	300,000	20	100	0.25	0	20	33
216	8	815	Rape	45	10	48	17	25,000	5	30,000	5	25,000	15,000	60,000		155,000	400	Bunch	500	200,000	60	460	230,000			0.25	0	20	33
217	8	815	Green maize	40	30	48	17	150,000	20	120,000	20	100,000		40,000		410,000	10	Bag	57,500	575,000	2	12	690,000			0.25	0	20	33
218	8	816	Green maize	100	50	61	39	150,000	100	350,000	100	300,000		120,000	120,000	1,040,000	80	Bag	46,000	3,680,000	5	85	3,910,000					40	50
219	8	816	Onion	60	30	46	10	130,000	50	175,000	50	150,000	90,000	50,000	40,000	635,000	30	Bag	70,000	2,100,000	2	32	2,240,000					40	50
220	8	816	Cabbage	50	20	47	18	145,000	50	175,000	50	150,000	120,000	30,000		620,000	110	Bag	30,000	3,300,000	4	114	3,420,000					40	50
221	8	816	Tomato	70	30	49.9	9.7	110,000	50	175,000	100	300,000	150,000	50,000	75,000	860,000	125	Crate	25,000	3,125,000	4	129	3,225,000					40	50
222	8	816	Groundnuts	40	10	34.7	9.7	65,000						50,000	40,000	155,000	6	Bag	84,000	504,000	1	7	589,000					40	50
223	8	816	Rape	50	20	38	16.6	50,000	20	120,000	25	155,000	75,000	55,000		455,000	1,000	Bunch	500	500,000	100	1,100	550,000					40	50
224	8	816	Chinese Cabbage	60	20	49	17	35,000	30	180,000	20	100,000	45,000	30,000		390,000	1,500	Bunch	500	750,000	200	1,700	850,000					40	50
225	8	816	Beans	40	30	33	11.8	55,000	20	120,000			30,000	30,000		235,000	30	Bucket	10,000	300,000	2	32	320,000					40	50
226	8	817	Onion	20	15.0	37	15	45,000	20	80,000				15,000		140,000	3	Bag	50,000	150,000	3	6	300,000	20	50	2	0	50	70
227	8	817	Cabbage	45	25	45.9	15	65,000	30	210,000	10	70,000	45,000		30,000	420,000	15	Bag	30,000	450,000	2	17	510,000	100	200	2	0	50	70
228	8	818	Onion	40	20	29	15	37,000	10	40,000	5	15,000		30,000		122,000	5	Bag	60,000	300,000	1	6	360,000	60	100	2	0	50	70
229	8	818	Rape	20	10	15.6	12.9	6,000	10	40,000	5	15,000	15,000			76,000	500	Bunch	500	250,000	60	560	280,000			2	0	50	70
230	8	818	Chinese Cabbage	15	10	22	16.3	6,000	10	40,000	5	15,000	15,000	20,000		96,000	250	Bunch	500	125,000	60	310	155,000			2	0	50	70
231	8	819	Green maize	50	50	34.4	12	45,000	20	80,000	15	54,000				179,000	8	Bag	70,000	560,000	4	12	840,000					40	60
232	8	819	Rape	20	10	26.2	6.5	10,000	10	40,000	5	15,000	15,000			80,000	400	Bunch	500	200,000	70	470	235,000					40	60
233	8	819	Onion	30	20	21.7	12.6	45,000	5	20,000	5	15,000	15,000			95,000	1	Bag	100,000	100,000	1	2	200,000					40	60
234	8	820	Rape	20	20	35	9	12,000	10	50,000	5	20,000	15,000			97,000	640	Bunch	500	320,000	100	740	370,000	10	40			35	6
235	8	820	Green maize	50	20	28.4	12	45,000	15	75,000	10	40,000				160,000	8	Bag	65,000	520,000	4	12	780,000					35	6
236	8	821	Rape	25	20	33.5	20.5	15,000	5	20,000	5	25,000	10,000			70,000	1,200	Bunch	500	600,000	10	1,210	605,000					15	35
237	8	822	Onion	40.0	20	39.7	14	45,000	20	120,000			25,000	20,000	20,000	230,000	15	Bag	50,000	750,000	1	16	800,000	100	200			75	150
238	8	822	Cabbage	42	21	39.7	14	85,000	20	120,000	10	40,000	35,000	40,000	30,000	350,000	25	Bag	25,000	625,000	3	28	700,000					75	150
239	8	823	Cabbage	40	25	47	13.6	11,000	25	150,000	15	60,000	110,000			331,000	50	Bag	30,000	1,500,000	1	51	1,530,000					8	9
240	8	823	Tomato	50	40	73	19	35,000	20	120,000	20	80,000	140,000			375,000	52	Crate	25,000	1,300,000	4	56	1,400,000	70	150			8	9
241	8	824	Cabbage	20	20	47	8	55,000	10	60,000	10	50,000	30,000			195,000	35	Bag	35,000	1,225,000	6	41	1,435,000					26	30
242	8	824	Chinese Cabbage	30	20	24	21	10,000	25	150,000	25	125,000	25,000			310,000	640	Bunch	500	320,000	100	740	370,000	20	100			26	30
243	8	825	Green maize	50	50	69	38.5	130,000	50	175,000	50	150,000		200,000		655,000	27	Bag	84,000	2,268,000	5	32	2,668,000			1	0	74	89
244	8	825	Onion	40	20	39.8	32	45,000	20	120,000			28,000	40,000		233,000	16	Bag	60,000	960,000	3	19	1,140,000			1	0	74	89
245	8	825	Okra	25.0	25.0	41.6	40.6	80,000	20	120,000	50	150,000	45,000	60,000		455,000	150	Bucket	25,000	3,750,000	5	155	3,875,000			1	0	74	89
246	9	901	Tomato	50	10			25,000	50	18,000			70,000	20,000		133,000	13	Crate	25,000	325,000	16	29	725,000						
247	9	902	Green maize	40	30			20,000	10	60,000	10	50,000				130,000	4	Bag	50,000	200,000	5	9	450,000						
248	9	902	Tomato	20	15			5,000	10	60,000			30,000			95,000	20	Crate	25,000	500,000	3	23	575,000						
249	9	903	Onion	25	20			40,000	50	30,000						70,000	3	Bag	55,000	165,000	1	4	220,000						
250	9	904	Green maize	45	15											0	2	Bag	50,000	100,000	1	3	150,000						
251	9	905	Tomato	50	6				10	60,000	5	20,000				80,000	18	Crate	25,000	450,000	4	22	550,000						
252	9	906	Green maize	30	10				10	50,000	10	30,000				80,000	1	Bag	65,000	65,000	1	2	130,000						
253	9	907	Green maize	45	10				5	30,000	5	25,000				55,000	2	Bag	50,000	100,000	1	3	150,000						
254	9	908	Tomato	50	6			9,000	5	15,000						24,000	10	Crate	25,000	250,000	2	12	300,000						
255	9	909	Tomato	50	6			8,000	5	25,000						33,000	8	Crate	20,000	160,000	1	9	180,000						
256	9	910	Tomato	50	10			9,000	5	25,000	5	20,000				54,000	5	Crate	25,000	125,000	3	8	200,000						
257	9	910	Green maize	50	10				15	90,000	10	40,000				130,000	4	Bag	50,000	200,000	1	5	250,000						
258	9	911	Green maize	50	6				10	50,000	10	40,000				90,000	5	Bag	50,000	250,000	2	7	350,000						

No.	Scheme ID	Farmer ID	Crop	Area, m				Input, ZMK									Harvest Sold				Consumed Volume	Total Production	Value of all production	Chemical Fertilizer		Chitemene		Rainfed Maize	
				X (Declared)	Y (Declared)	X (Measured)	Y (Measured)	Seeds ZMK	D Compound Kg	D Compound ZMK	Urea Kg	Urea ZMK	Pesticide ZMK	Labor ZMK	Transport ZMK	Total ZMK	Volume	Unit	Unit Price (ZMK)	Cash Income (ZMK)				Before (kg)	After (kg)	Before (lima)	After (lima)	Before (bag)	After (bag)
259	9	912	Tomato	50	10				5	25,000	5	20,000				45,000	5	Crate	25,000	125,000	2	7	175,000						
260	9	913	Tomato	50	6				5	25,000	5	20,000				45,000	3	Crate	25,000	75,000	1	4	100,000						
261	9	914	Green maize	50	10											0	2	Bag	50,000	100,000	1	3	150,000						
262	9	915	Green maize	50	6											0	1	Bag	50,000	50,000	0.5	2	75,000						
263	9	916	Rape	50	6								15,000			15,000	30	Bunch	500	15,000	10	40	20,000						
264	9	917	Tomato	45	10			50,000	15	75,000						125,000	12	Crate	25,000	300,000	2	14	350,000						
265	9	918	Irish Potato	40	6				5	25,000			35,000	10,000		70,000	2	Bucket	35,000	70,000	1	3	105,000						
266	9	918	Tomato	50	6				10	50,000						50,000	4	Crate	25,000	100,000	1	5	125,000						
267	10	1001	Cabbage	50	50			14,000	50	250,000	50	180,000	60,000			504,000	5	Bag	26,000	130,000	3	8	208,000						
268	10	1002	Tomato	50	50			7,000	50	130,000	50	45,000	8,000			190,000	110	Crate	35,000	3,850,000	6	116	4,060,000						
269	10	1002	Rape	50	50			6,000	50	250,000			6,000			262,000	80	Bag	35,000	2,800,000	1	81	2,835,000						
270	10	1003	Tomato	25	10			15,000	5	25,000			18,000			58,000	8	Bucket	15,000	120,000	2	10	150,000						
271	10	1003	Rape	15	10			4,000	10	15,000			15,000			34,000	300	Bunch	500	150,000	30	330	165,000						
272	10	1004	Tomato	25	25			20,000	20	100,000			10,000			130,000	25	Bucket	10,000	250,000	2	27	270,000						
273	10	1004	Rape	15	10			5,000	10	50,000			3,500			58,500	80	Bunch	500	40,000	50	130	65,000						
274	10	1005	Tomato	20	15			45,000	50	180,000	10	75,000	100,000			400,000	42	Bucket	20,000	840,000	3	45	900,000						
275	10	1006	Tomato	20	15				10	50,000	10.0	36,000	45,000			131,000	40	Bucket	20,000	800,000	1	41	820,000						
276	10	1007	Rape	25	18			5,000	10	50,000	5	18,000				73,000	25	Bag	10,000	250,000	3	28	280,000						
277	10	1007	Tomato	15	10				5	25,000	5	18,000				43,000	15	Bucket	15,000	225,000	2	17	255,000						
278	10	1008	Tomato	20	10			25,000	10	50,000	5	18,000				93,000	28	Bucket	13,000	364,000	3	31	403,000						
279	10	1009	Tomato	25	10			10,000	10	50,000	5	18,000	45,000			123,000	40	Bucket	15,000	600,000	3	43	645,000						
280	10	1010	Tomato	15	10				5	25,000	5	18,000	45,000			88,000	20	Bucket	25,000	500,000	2	22	550,000						
281	10	1011	Tomato	25	10			14,000	10	60,000	5	25,000	9,000			108,000	15	Bucket	12,000	180,000	4	19	228,000						
282	10	1011	Rape	20	10			6,000	10	60,000	5	25,000	7,000			98,000	15	Bag	5,000	75,000	2	17	85,000						
283	10	1012	Tomato	22	18			15,000	5	30,000	5	25,000				70,000	40	Bucket	10,000	400,000	3	43	430,000	0	200				
284	10	1013	Tomato	100	50			15,000	20	120,000			50,000			185,000	30	Bucket	15,000	450,000	4	34	510,000						
285	10	1013	Onion	20	15			6,000								6,000	200	Bunch	1,000	200,000	20	220	220,000						
286	11	1101	Carrot	25	25	36.4	15	15,000	30	150,000				20,000	35,000	220,000	30	Bag	25,000	750,000	1	31	775,000	10	250			10	12
287	11	1101	Cabbage	30	25	31	24	150,000	50	180,000	50	175,000	90,000	20,000	275,000	890,000	55	Bag	30,000	1,650,000	1	56	1,680,000	10	250			10	12
288	11	1101	Green maize	45	15	47.7	37	100,000	100	400,000	100	400,000		200,000	200,000	1,300,000	30	Bag	50,000	1,500,000	3	33	1,650,000	10	250			10	12
289	11	1102	Cabbage	40	6	45	8	150,000	100	360,000	100	300,000	20,000	100,000	250,000	1,180,000	50	Bag	30,000	1,500,000	1	51	1,530,000	350	400			30	40
290	11	1103	Cabbage	50	10	43.4	5	7,500	20	100,000	20	80,000	15,000	105,000		307,500	15	Bag	30,000	450,000	1	16	480,000	100	200			10	30
291	11	1103	Rape	50	8	49.6	4	5,000	5	25,000	5	20,000	15,000		100,000	165,000	20	Bag	15,000	300,000	1	21	315,000	100	200			10	30
292	11	1104	Green maize	50	15	47	10		15	75,000	15	60,000			182,000	327,000	2	Bag	50,000	100,000	1	3	150,000	400	200			20	30
293	11	1105	Pumpkin leaves	25	15	20	13		5	25,000	5	20,000				45,000	8	Bag	8,000	64,000	2	10	80,000	100	200	0.5	0.25	15	10
294	11	1105	Tomato	70	20	60	25	50,000	10	50,000	10	40,000	20,000			160,000	15	Crate	60,000	900,000	2	17	1,020,000	100	200	0.5	0.25	15	10
295	11	1106	Cabbage	50	30	36.6	16.2	10,000	20	100,000	10	40,000	50,000		250,000	450,000	50	Bag	30,000	1,500,000	3	53	1,590,000	200	100	0.5	0.25	9	10
296	11	1106	Tomato	40	25	36.6	16.2	25,000	15	75,000	10	40,000	100,000		100,000	340,000	20	Crate	60,000	1,200,000	2	22	1,320,000	200	100	0.5	0.25	9	10
297	11	1106	Sweet Potato	25	25	36.6	16.2									0	12	Bag	25,000	300,000	1	13	325,000	200	100	0.5	0.25	9	10
298	11	1107	Cabbage	25	25	27	20	7,500	20	100,000	20	60,000	10,000		200,000	397,500	40	Bag	30,000	1,200,000	1	41	1,230,000	100	200	0.5	0.25	8	12
299	11	1108	Green maize	25	25	20	21		30	150,000	15	60,000		40,000	180,000	430,000	36	Bag	30,000	1,080,000	1	37	1,110,000	50	100	0.5	0.25	8	12
300	11	1109	Green maize	40	5	30	10		5	25,000	5	17,000				42,000	5	Bag	20,000	100,000	1	6	120,000	15	200			2	1
301	11	1110	Tomato	50	50	52	49	60,000	100	360,000	100	350,000	100,000	250,000	100,000	1,220,000	60	Crate	50,000	3,000,000	2	62	3,100,000	50	400			15	15
302	11	1110	Rape	50	10	53	8	30,000	5	25,000	5	18,000	24,000			97,000	10	Bag	50,000	500,000	1	11	550,000	50	400			15	15
303	11	1111	Onion	25	25	21.5	17.7	50,000	20	100,000			15,000			165,000	4	Bag	125,000	500,000	1	5	625,000	100	200			15	40
304	11	1111	Cabbage	30	25	32.4	13	55,000	50	175,000	50	165,000	50,000		150,000	595,000	30	Bag	25,000	750,000	1	31	775,000	100	200			15	40
305	11	1111	Green maize	50	50	76.4	43.3		50	175,000	50	165,000				340,000	20	Bag	50,000	1,000,000	3	23	1,150,000	100	200			15	40
306	11	1111	Pumpkin leaves	22	9	19	7		5	25,000	5	17,000				42,000	8	Bag	8,000	64,000	1	9	72,000	100	200			15	40
307	11	1112	Green maize	50	50	50	45		50	175,000	50	165,000			50,000	390,000	10	Bag	65,000	650,000	2	12	780,000	10	200			7	12
308	11	1113	Groundnuts	40	37	33.7	30.4									0	3	Bag	60,000	180,000	1	4	240,000	200	400			30	35
309	11	1113	Green maize	55	30	52.7	25		20	100,000	15	60,000				160,000	6	Bag	40,000	240,000	1	7	280,000	200	400			30	35
310	11	1114	Green maize	50	50	48	39.6		15	75,000	15	60,000				135,000	20	Bag	45,000	900,000	1	21	945,000	100	200	0.25	0.25	7	5
311	11	1115	Green maize	50	50	60	45		25	125,000	25	100,000				225,000	20	Bag	30,000	600,000	1	21	630,000	10	200			3	6
312	11	1116	Irish Potato	25	25	39.2	21.6	60,000	50	180,000			60,000		200,000	500,000	25	Bag	120,000	3,000,000	1	26	3,120,000	100	200			20	23
313	11	1117	Green maize	39.5	10	39.5	10		20	100,000	20	80,000	50,000	30,000		280,000	15	Bag	35,000	525,000	1	16	560,000	50	100			18	20
314	11	1118	Cabbage	50	25	48	20	85,000	50	180,000	50	165,000	80,000	100,000	200,000	810,000	80	Bag	30,000	2,400,000	2	82	2,460,000	100	200			6	7
315	11	1118	Egg Plants	25	25	26	41	25,000	20	80,000	5	15,000	50,000	50,000		220,000	24	Bag	36,000	864,000	1	25	900,000	100	200			6	7
316	11	1119	Cabbage	25	25	30	25	85,000	50	180,000	50	165,000	80,000			510,000	60	Bag	30,000	1,800,000	1	61	1,830,000	300	200	0.25	0	6	8
317	11	1120	Cabbage	30	22	28	22	65,000	50	180,000	50	165,000	50,000	200,000	250,000	910,000	50	Bag	30,000	1,500,000	1	51	1,530,000	100	200			10	15
318	11	1120	Irish Potato	20	15	18	18.6	150,000	50	180,000	50	165,000		50,000		545,000	12	Bag	80,000	960,000	1	13	1,040,000	100	200			10	15
319	12	1201	Egg Plants	50	30	55	26		10	80,000	10	60,000	20,000	80,000	50,000	290,000	80	Dozen	20,000	1,600,000	5	85	1,700,000	100	100			22	18
320	12	1201	Green maize	70	70	75	68.8	10,000	20	160,000	20	120,000		100,000	35,000	425,000	10	Bag	70,000	700,000	2	12	840,000	100	100			22	18
321	12	1202	Onion	50	50	60	48	150,000	50	220,000	50	150,000	20,000	70,000	30,000	640,000	7	50kg Bag	200,000	1,400,000	1	8	1,600,000	800	1,000			21	14
322	12	1202	Tomato	50	50	56	52	70,000	50	220,000	50	150,000	700,000	1,200,000		2,340,000	60	Crate	45,000	2,700,000	2	62	2,790,000	100	150			21	14

No.	Scheme ID	Farmer ID	Crop	Area, m X (Declared)	Y (Declared)	X (Measured)	Y (Measured)	Input, ZMK Seeds ZMK	D Compound Kg	D Compound ZMK	Urea Kg	Urea ZMK	Pesticide ZMK	Labor ZMK	Transport ZMK	Total ZMK	Harvest Sold Volume	Unit	Unit Price (ZMK)	Cash Income (ZMK)	Consumed Volume	Total Production	Value of all production	Chemical Fertilizer Before (kg)	Chemical Fertilizer After (kg)	Chitemene Before (lima)	Chitemene After (lima)	Rainfed Maize Before (bag)	Rainfed Maize After (bag)
323	12	1203	Green maize	100	50	90	60	12,500	50	220,000	50	150,000		200,000		582,500	8	Bag	85,000	680,000	1	9	765,000	100	150			10	12
324	12	1203	Onion	50	50	58	49.5	200,000	50	180,000	50	140,000		110,000	80,000	710,000	16	Bag	270,000	4,320,000	1	17	4,590,000	100	150			10	12
325	12	1204	Onion	50	30	46	35	250,000	100	500,000	100	400,000		150,000	660,000	1,960,000	11	Bag	270,000	2,970,000	2	13	3,510,000	50	100			4	6
326	12	1204	Chinese Cabbage	20	15	18	10	10,000	15	105,000	15	75,000	35,000			225,000	15	Bucket	25,000	375,000	2	17	425,000	50	100			4	6
327	12	1204	Tomato	50	50	57	48	140,000	100	500,000	100	400,000	1,900,000		330,000	3,270,000	40	Bucket	100,000	4,000,000	4	44	4,400,000	50	100			4	6
328	12	1205	Onion	25	25	28	24	100,000	50	250,000	50	200,000	65,000	100,000		715,000	10	50kgBag	270,000	2,700,000	2	12	3,240,000	20	200			12	15
329	12	1205	Chinese Cabbage	15	10	12	9	20,000	10	70,000	10	40,000	35,000	35,000		200,000	10	Bucket	25,000	250,000	2	12	300,000	20	200			12	15
330	12	1205	Egg Plants	50	50	45.3	41	250,000	50	250,000	100	400,000	65,000	150,000		1,115,000	500	Bucket	5,000	2,500,000	20	520	2,600,000	20	200			12	15
331	12	1206	Onion	90	70	75	65	350,000	150	600,000	175	500,000	210,000	300,000		1,960,000	84	90kgBag	270,000	22,680,000	1	85	22,950,000	100	800			60	75
332	12	1207	Onion	40	40	32	29	210,000	100	400,000	100	300,000	105,000	120,000		1,135,000	10	90kgBag	250,000	2,500,000	1	11	2,750,000	100	300			10	26
333	12	1207	Tomato	25	25	30	23.6	65,000	20	140,000	30	120,000	140,000			465,000	84	Crate	30,000	2,520,000	2	86	2,580,000	100	300			10	26
334	12	1208	Okra	15	12	10	8	30,000	10	70,000	20	100,000	2,000	13,000		215,000	10	Basin	25,000	250,000	1	11	275,000	100	150			3	7
335	12	1208	Onion	27	18	32	15	70,000	15	90,000	15	60,000	30,000			250,000	4	90kgBag	230,000	920,000	1	5	1,150,000	100	150			3	7
336	12	1209	Onion	50	33	59	37.5	130,000	50	200,000	50	150,000	35,000			515,000	10	90kgBag	270,000	2,700,000	1	11	2,970,000	50	100			2	4
337	12	1210	Green maize	50	50	48	43.6	50,000	50	200,000	50	150,000				400,000	20	Bag	100,000	2,000,000	1	21	2,100,000	250	400			80	85
338	12	1211	Onion	20.0	15.0	30.0	10.0	90,000	15	60,000	15.0	75,000	100,000			325,000	4	50kgBag	270,000	1,080,000	1	5	1,350,000	100	200			4	6
339	12	1212	Green maize	50	50	60	40	120,000	30	150,000	30	120,000	70,000	55,000		515,000	11	50kgBag	75,000	825,000	4	15	1,125,000	100	300			8	11
340	12	1212	Onion	25.0	25.0	20.0	18.6	120,000	50	200,000	50	180,000	65,000	50,000		615,000	8	50kgBag	270,000	2,160,000	1	9	2,430,000	100	300			8	11
341	12	1213	Onion	25	25	28.2	20	60,000	50	150,000	50	125,000	50,000			385,000	4	50kgBag	230,000	920,000	1	5	1,150,000	50	200			4	8
342	12	1214	Onion	50	50	56	47	455,000	100	400,000	100	380,000	80,000	120,000	50,000	1,485,000	6	50kgBag	270,000	1,620,000	1	7	1,890,000	100	200			80	100
343	13	1301	Onion	50	50	56	48	200,000	100	400,000	100	300,000	80,000	787,500	20,000	1,787,500	32	Bag	125,000	4,000,000	1	33	4,125,000	16	48			100	230
344	13	1301	Green maize	100	50	90	60	80,000	100	500,000	100	240,000		548,000	20,000	1,388,000	31	Bag	100,000	3,100,000	2	33	3,300,000						
345	13	1301	Tomato	50	50	61	46	35,000	100	400,000	100	300,000	880,000	1,000,000	20,000	2,635,000	90	Crate	35,000	3,150,000	3	93	3,255,000						
346	13	1302	Onion	50	50	65	48	280,000	100	480,000	100	400,000	160,000	150,000		1,470,000	37	Bag	260,000	9,620,000	1	38	9,880,000	4	16	1	0	35	50
347	13	1302	Green maize	50	50	48	40	140,000	100	460,000	100	360,000		120,000		1,080,000	26	Bag	120,000	3,120,000	1	27	3,240,000	4	16	1	0	35	50
348	13	1302	Pumpkin leaves	50	50	68	60									0	4	Bucket	26,000	104,000	1	5	130,000	4	16	1	0	35	50
349	13	1302	Egg Plants	25	25	21	19		10	70,000	10	60,000	20,000	70,000		220,000	80	Bucket	5,000	400,000	3	83	415,000						
350	13	1302	Okra	50	50	75	45	150,000	50	240,000	50	200,000	160,000	100,000		850,000	80	Dish	15,000	1,200,000	2	82	1,220,000						
351	13	1303	Tomato	50	50	55	48	100,000	50	240,000	50	200,000	500,000			1,040,000	78	Crate	35,000	2,730,000	1	79	2,765,000	2	8				
352	13	1304	Tomato	150	65	90	75	75,000	100	400,000	100	300,000	800,000	150,000		1,725,000	150	Crate	35,000	5,250,000	1	151	5,285,000	8	16			20	40
353	13	1305	Tomato	50	50	56	50	75,000	100	400,000	100	320,000	300,000	900,000		1,995,000	250	Crate	60,000	15,000,000	5	255	15,300,000	8	16			45	60
354	13	1305	Chinese Cabbage	60	10	50	15	10,000	10	60,000	10	40,000	20,000	100,000		230,000	18	Bucket	50,000	900,000	1	19	950,000	8	16			45	60
355	13	1305	Egg Plants	50	6	57	11		5	30,000	5	20,000	10,000	50,000		110,000	12	Bag	60,000	720,000	1	13	780,000	8	16			45	60
356	13	1306	Okra	50	50	70	30	150,000	50	210,000	100	340,000	430,000		150,000	1,280,000	100	Dish	20,000	2,000,000	1	101	2,020,000	3	16	0	1	20	40
357	13	1306	Tomato	70	50	75	49	84,000	50	53,000	100	300,000	580,000		150,000	1,167,000	100	Crate	45,000	4,500,000	3	103	4,635,000	3	16	0	1	20	40
358	13	1306	Rape	50	50	55	48	16,000	50	210,000	50	160,000	170,000		70,000	626,000	30	Bucket	80,000	2,400,000	1	31	2,480,000	3	16	0	1	20	40
359	13	1307	Onion	50	50	56	48	180,000	100	100,000	50	50,000	160,000	60,000		550,000	8	90kgBag	250,000	2,000,000	1	9	2,250,000	4	16			30	50
360	13	1308	Rape	50	25	52	20	10,000	20	120,000	20	80,000	70,000	50,000		330,000	16	Bucket	30	480,000	1	17	510	4	6			12	15
361	13	1308	Tomato	50	50	56	40	30,000	50	180,000	50	120,000	200,000	50,000		580,000	35	Crate	30,000	1,050,000	1	36	1,080,000	4	6			12	15
362	13	1309	Green maize	70	50	78	58	140,000	50	200,000	50	180,000			20,000	540,000	8	Bag	80,000	640,000	4	12	960,000	8	16	0	1	10	18
363	13	1309	Rape	25	25	20	19	25,000	50	200,000	50	180,000	70,000		60,000	535,000	19	90kgBag	50,000	900,000	1	19	950,000	8	16	0	1	10	18
364	13	1310	Onion	50	45	59	36	140,000	50	200,000	50	180,000	160,000	75,000		755,000	8	90kgBag	340,000	2,720,000	1	9	3,060,000	1	10			22	25
365	13	1310	Okra	15	15	20	10	82,500	10	70,000	15	60,000	75,000	60,000	180,000	527,500	50	Dish	15,000	750,000	1	51	765,000	1	10			22	25
366	13	1310	Rape	50	50	47	40	45,000	50	200,000	50	180,000	210,000	90,000	20,000	745,000	30	90kgBag	80,000	2,400,000	1	31	2,480,000	1	10			22	25
367	13	1311	Irish Potato	50	50	57	47	600,000	150	450,000			120,000	60,000	300,000	1,530,000	30	90kgBag	180,000	5,400,000	2	32	5,760,000	8	24			40	50
368	13	1311	Cabbage	80	60	75	50	100,000	200	720,000	150	450,000	350,000	250,000		1,870,000	150	110kgBag	50,000	7,500,000	2	152	7,600,000	8	24			40	50
369	13	1312	Onion	50	50	55	48	300,000	100	480,000	100	300,000	150,000			1,230,000	22	90kgBag	150,000	3,300,000	1	23	3,450,000	4	8			5	10
370	13	1313	Onion	75	15	70	20	90,000	50	50,000	50	50,000	20,000			210,000	15	Bag	250,000	3,750,000	1	16	4,000,000	4	8			20	50
371	13	1313	Egg Plants	50	50	57	52		50	100,000	50	100,000	10,000			210,000	360	Bucket	7,000	2,520,000	2	362	2,534,000	4	8			20	50
372	13	1313	Okra	100	50	95	47	50,000	50	100,000	50	50,000	20,000			220,000	80	Dish	20,000	1,600,000	2	82	1,640,000	4	8			20	50
373	13	1314	Onion	50	50	46	44	150,000	50	200,000	50	150,000	100,000	70,000	100,000	770,000	20	50kgBag	150,000	3,000,000	1	21	3,150,000	10	16			80	150
374	13	1314	Cabbage	50	50	53	52	250,000	150	550,000	100	160,000	200,000	100,000	100,000	1,360,000	30	50kgBag	50,000	1,500,000	1	31	1,550,000	10	16			80	150
375	13	1314	Tomato	70	70	65	60	70,000	150	300,000	150	210,000	1,000,000	100,000	500,000	2,180,000	250	Crate	50,000	12,500,000	10	260	13,000,000	10	16			80	150
376	13	1314	Egg Plants	20	20	25	23	10,000	100	200,000	100	160,000	70,000	50,000	100,000	590,000	35	90kgBag	100,000	3,500,000	2	37	3,700,000						
377	13	1314	Chinese Cabbage	50	50	55	40	50,000	150	300,000	100	160,000	70,000	50,000	200,000	830,000	50	90kgBag	100,000	5,000,000	2	52	5,200,000						
378	13	1314	Rape	20	20	22	21	20,000	50	100,000	50	80,000	70,000	50,000	100,000	420,000	25	90kgBag	50,000	1,250,000	1	26	1,300,000						
379	13	1315	Egg Plants	25	25	30	29	25,000	50	100,000	50	80,000	150,000	120,000	100,000	575,000	160	Bucket	6,000	960,000	1	161	966,000	2	4			5	8
380	13	1316	Rape	25	10	28	15	10,000	5	50,000	5	25,000	75,000			160,000	6	Bucket	50,000	300,000	5	11	550,000	4	8			20	40
381	13	1316	Egg Plants	25	25	30	20	20,000	10	75,000	10	50,000				145,000	50	Bag	50,000	2,500,000	3	53	2,650,000	4	8			20	40
382	13	1317	Onion	25	25	28	25	75,000	15	150,000	20	100,000	30,000	25,000	35,000	415,000	7	Bag	200,000	1,400,000	1	8	1,600,000	4	8			35	40
383	13	1317	Egg Plants	25	25	30	28	25,000	20	200,000	25	125,000	25,000		50,000	425,000	70	Bag	50,000	3,500,000	1	71	3,550,000	4	8			35	40
384	13	1317	Rape	25	25	27	26	20,000	15	150,000	20	120,000	100,000		105,000	495,000	50	Bag	50,000	2,500,000	1	51	2,550,000						
385	13	1318	Onion	25	10	35	9	50,000	15	150,000	20	120,000	50,000	25,000	160,000	555,000	5	Bag	300,000	1,500,000	1	6	1,800,000	8	10			75	100
386	13	1318	Tomato	10	10	16	15	25,000	10	120,000	15	75,000	85,000			305,000	24	Crate	60,000	1,440,000	2	26	1,560,000	8	10			75	100

No.	Scheme ID	Farmer ID	Crop	Area, m X (Declared)	Area, m Y (Declared)	Area, m X (Measured)	Area, m Y (Measured)	Input, ZMK Seeds ZMK	D Compound Kg	D Compound ZMK	Urea Kg	Urea ZMK	Pesticide ZMK	Labor ZMK	Transport ZMK	Total ZMK	Harvest Sold Volume	Unit	Unit Price (ZMK)	Cash Income (ZMK)	Consumed Volume	Total Production	Value of all production	Chemical Fertilizer Before (kg)	Chemical Fertilizer After (kg)	Chitemene Before (lima)	Chitemene After (lima)	Rainfed Maize Before (bag)	Rainfed Maize After (bag)
387	13	1318	Potato leaves	25	10	50	25		5	50,000	5	25,000				75,000	12	Bag	85,000	1,020,000	1	13	1,105,000	8	10			75	100
388	13	1319	Egg Plants	40	35	45	30		50	200,000	50	150,000	35,000	20,000		405,000	50	Bag	50,000	2,500,000	8	58	2,900,000	2	8			4	6
389	13	1319	Green maize	70	20	75	30		10	70,000	15	80,000				150,000	15	Bag	80,000	1,200,000	4	19	1,520,000	2	8			4	6
390	13	1319	Tomato	45	25	50	27	35,000	10	70,000	35	120,000	150,000	35,000		410,000	16	Crate	35,000	560,000	2	18	630,000						
391	13	1320	Egg Plants	25	25	29	19		25	125,000	25	90,000	25,000			240,000	15	Bag	25,000	375,000	1	16	400,000	16	12			40	50
392	13	1320	Okra	25	25	36	30	25,000	25	125,000	25	90,000	50,000	30,000		320,000	30	Bucket	15,000	450,000	2	32	480,000						
393	13	1321	Green maize	50	50	55	46.7		50	160,000	50	100,000				260,000	4	Bag	70,000	280,000	1	5	350,000	800	800			42	32
394	13	1322	Green maize	50	50	58	56.2		50	160,000	50	100,000				260,000	3	Bag	70,000	210,000	1	4	280,000	1,200	1,600			30	35
395	13	1323	Tomato	25	25	35	28	25,000	50	160,000	50	150,000	300,000			635,000	60	Crate	35,000	2,100,000	2	62	2,170,000	200	400			12	10
396	13	1323	Rape	39	30	54	28	10,000	10	70,000	10	50,000	60,000			190,000	8	Basket	40,000	320,000	1	9	360,000	200	400			12	10
397	13	1324	Green maize	25	25	32	31.2	15,000	15	105,000	15	75,000				195,000	4	Bag	120,000	480,000	1	5	600,000	200	200			10	8
398	13	1324	Onion	50	25	54	28	105,000	20	120,000	20	100,000				325,000	10	Bag	250,000	2,500,000	1	11	2,750,000	200	200			10	8
399	13	1324	Pumpkin leaves	20	15	50	10									0	3	Bag	15,000	45,000	1	4	60,000	200	200			10	8
400	13	1324	Okra	30	20	35	15.3	25,000	10	70,000	10	50,000	60,000			205,000	20	Bag	15,000	300,000	1	21	315,000	200	200			10	8
401	13	1325	Green maize	20	15	28	18	20,000	10	80,000	10	40,000		20,000		160,000	3	90kgBag	80,000	240,000		3	240,000	50	200			5	7
402	13	1326	Egg Plants	30	20	38.5	13.5		5	35,000	5	20,000	5,000	10,000	20,000	90,000	45	Bucket	5,000	225,000	1	46	230,000	50	100				
403	13	1326	Rape	35	18	28	10	5,000	10	70,000	10	40,000	15,000	5,000		135,000	5	Basket	35,000	175,000	1	6	210,000	50	100				
404	13	1327	Tomato	75	50	70	56	245,000	350	1,400,000	350	1,050,000	4,500,000	6,000,000	2,000,000	15,195,000	150	Crate	35,000	5,250,000	7	157	5,495,000	50	100				
405	13	1327	Egg Plants	25	25	27	23.6		20	160,000	20	120,000	35,000	300,000		615,000	250	Bucket	5,000	1,250,000	2	252	1,260,000	50	100				
406	13	1327	Onion	75	50	70	49.3	595,000	200	800,000	200	600,000	150,000	250,000		2,395,000	38	90kgBag	230,000	8,740,000	1	39	8,970,000	50	100				
407	14	1401	Green maize	50	50	58	51		20	100,000	20	72,000				172,000	6	Bag	35,000	210,000	2	8	280,000	300	400			100	70
408	14	1401	Onion	95	95	72	66.7	175,000	50	250,000	50	180,000		300,000	1,800,000	2,705,000	30	90kgBag	350,000	10,500,000	3	33	11,550,000	300	400			100	70
409	14	1401	Tomato	25	25	56	48	25,000	30	150,000	30	108,000	68,000			351,000	70	Crate	35,000	2,450,000	10	80	2,800,000	300	400			100	70
410	14	1402	Onion	50	25	57	44	180,000	50	180,000	50	175,000		60,000	1,500,000	2,095,000	10	90kgBag	350,000	3,500,000	1	11	3,850,000	500	800			76	90
411	14	1402	Tomato	25	25	44	27	25,000	20	100,000	20	72,000	120,000			317,000	70	Crate	35,000	2,450,000	5	75	2,625,000	500	800			76	90
412	14	1403	Tomato	70	50	39.7	23.7		20	40,000	15	75,000	50,000			165,000	12	Crate	20,000	240,000	2	14	280,000	100	200			10	17
413	14	1403	Onion	20	15	57	36.9		15	75,000	15	75,000	30,000	40,000	20,000	240,000	3	90kgBag	350,000	1,050,000	1	4	1,400,000	100	200			10	17
414	14	1404	Tomato	30	20	35	27	25,000	5	25,000	5	17,500	28,000			95,500	15	Crate	30,000	450,000	2	17	510,000	100	200			6	12
415	14	1405	Onion	25	25	40	31	120,000	50	172,000	45	80,000	37,000			409,000	12	90kgBag	350,000	4,200,000	2	14	4,900,000	600	800			100	85
416	14	1406	Onion	25	25	27.9	19.2	35,000	20	100,000	15	75,000		40,000		250,000	10	Bag	65,000	650,000	4	14	910,000	100	300			8	16
417	14	1407	Onion	30	25	28.3	20.5	375,000	75	370,000	50	180,000	160,000	200,000	1,500,000	2,785,000	10	90kgBag	350,000	3,500,000	4	14	4,900,000	400	800			60	80
418	14	1408	Onion	25	25	55	42	140,000	50	172,000	35	140,000	160,000	50,000	1,500,000	2,162,000	12	Bag	350,000	4,200,000	3	15	5,250,000	400	800			70	75
419	14	1408	Tomato	25	25	21	19	35,000	30	120,000	30	72,000	150,000	40,000		417,000	85	Crate	35,000	2,975,000	5	90	3,150,000	400	800			70	75
420	14	1409	Onion	75	50	70	35.3	210,000	150	270,000			60,000	110,000	1,750,000	2,400,000	33	Bag	300,000	9,900,000	2	35	10,500,000	500	500			60	30
421	14	1409	Green maize	25	25	30	20	90,000	50	175,000	50	165,000			40,000	470,000	20	Bag	50,000	1,000,000	6	26	1,300,000	500	500			60	30
422	14	1409	Tomato	30	20	33	18.5	35,000	30	150,000	40	160,000	80,000		150,000	575,000	30	Crate	40,000	1,200,000	4	34	1,360,000	500	500			60	30
423	14	1410	Tomato	25	25	32	26	50,000	30	120,000	30	102,000	120,000	65,000		457,000	60	Crate	35,000	2,100,000	5	65	2,275,000	400	800			15	120
424	14	1411	Onion	50	25	55	15	75,000	50	165,000	35	182,000	60,000		60,000	542,000	6	90kgBag	350,000	2,100,000	2	8	2,800,000	200	400			46	20
425	14	1411	Egg Plants	40	25	37	20	18,000	20	56,000	20	32,000	10,000			116,000	80	25kgBag	21,000	1,680,000	4	84	1,764,000	200	400			46	20
426	14	1411	Sugarcane	50	50	47	39	50,000	50	155,000					400,000	605,000	4,000	Sticks	500	2,000,000	500	4,500	2,250,000	200	400			46	20
427	14	1412	Onion	25	20	19	15.9	35,000	10	50,000	10	44,000				129,000	9	Bag	144,000	1,296,000	2	11	1,584,000	200	300	0.25	0	35	40
428	14	1413	Onion	25	20	30	15.6	70,000	35	175,000				12,000		257,000	12	Bag	80,000	960,000	1	13	1,040,000	20	100			20	25
429	14	1413	Tomato	10	6	12	7	3,500	5	25,000	2.5	7,000	7,000			42,500	5	Bucket	10,000	50,000	1	6	60,000	20	100			20	25
430	14	1414	Onion	30	25	28	24.5	20,000	5	25,000	5	22,000				67,000	2	Bag	50,000	100,000	1	3	150,000	200	300	12	15		
431	14	1415	Onion	25	20	20	15.6	30,000	10	50,000	10	50,000				130,000	8	Bag	150,000	1,200,000	1	9	1,350,000	200	400			30	50
432	14	1416	Green maize	25	25	20	18.6	60,000	10	50,000	10	40,000				150,000	10	Bag	65,000	650,000	1	11	715,000	200	200	0.25	0	30	25
433	14	1417	Onion	25	25	30	20	12,000	15	75,000	15	54,000				141,000	6	Bag	70,000	420,000	3	9	630,000	40	400	0.25	0.5	36	39
434	14	1418	Cabbage	25	25	28	18.7	6,000	20	100,000	15	60,000	12,000			178,000	10	Bag	30,000	300,000	2	12	360,000	200	400			25	30
435	14	1418	Egg Plants	50	50	60	55		30	150,000	30	96,000	7,000			253,000	32	Bag	20,000	640,000	4	36	720,000	200	400			25	30
436	14	1419	Onion	15	15	10	8.7	30,000	10	50,000	10	36,000	10,000			126,000	15	Bag	30,000	450,000	2	17	510,000	200	500			25	35
437	14	1420	Sugarcane	50	5	48	10		10	40,000						40,000	1,000	Sticks	500	500,000	300	1,300	650,000	20	50			4	8
438	14	1421	Onion	50	50	56	55	60,000	50	175,000	40	60,000	40,000			335,000	30	Bag	70,000	2,100,000	1	31	2,170,000	200	400			50	60
439	14	1422	Rape	50	50	58	49.4	10,000	20	200,000	10	30,000	20,000			260,000	15	Bag	50,000	750,000	2	17	850,000	50	100			2	4
440	14	1423	Onion	50	25	48	20.6	140,000	50	260,000	50	170,000	60,000	150,000	1,800,000	2,580,000	11	90kgBag	350,000	3,850,000	1	12	4,200,000	800	1,200			40	70
441	14	1423	Green maize	50	45	57	40.8	15,000	10	50,000	10	24,000				99,000	5	Bag	80,000	400,000	1	6	480,000	800	1,200			40	70
442	15	1501	Green maize	50	50	54	36		100	5,000	50	150,000			300,000	455,000	65	Bag	35,000	2,275,000	2	67	2,345,000	50	100			40	50
443	15	1502	Bean leaves	30	15	27.7	12									0	20	Heaps	500	10,000	5	25	12,500	10	15			40	50
444	15	1503	Groundnuts	100	100	78	75	120,000						200,000	560,000	880,000	70	Bag	70,000	4,900,000	4	74	5,180,000	100	200			11	15
445	15	1504	Groundnuts	90	80	100	75	40,000						300,000	350,000	690,000	48	Bag	84,000	4,032,000	3	51	4,284,000	150	100	0.5	0.5	8	10
446	15	1504	Cabbage	50	15	52	20	55,000	50	125,000	50	120,000	30,000	20,000	80,000	430,000	12	Bag	25,000	300,000	2	14	350,000	150	100	0.5	0.5	8	10
447	15	1505	Groundnuts	100	90	120	60	80,000						100,000	60,000	240,000	30	Bag	84,000	2,520,000	6	36	3,024,000	200	400	0.5	0.25	60	68
448	15	1505	Rape	60	15	56	10	5,000	25	80,000	25	72,000	15,000			172,000	60	Bag	8,000	480,000	8	68	544,000	200	400	0.5	0.25	60	68
449	15	1506	Groundnuts	79	15	79	5	40,000						30,000	176,000	246,000	4	Bag	112,000	448,000	2	6	672,000	50	100	0.25	0.25	12	13
450	15	1507	Groundnuts	50	10	79	30	50,000							160,000	210,000	16	Bag	112,000	1,792,000	1	17	1,904,000	50	100	0.25	0.5	4	4

No.	Scheme ID	Farmer ID	Crop	Area, m X (Declared)	Area, m Y (Declared)	Area, m X (Measured)	Area, m Y (Measured)	Input, ZMK Seeds ZMK	D Compound Kg	D Compound ZMK	Urea Kg	Urea ZMK	Pesticide ZMK	Labor ZMK	Transport ZMK	Total ZMK	Harvest Sold Volume	Unit	Unit Price (ZMK)	Cash Income (ZMK)	Consumed Volume	Total Production	Value of all production	Chemical Fertilizer Before (kg)	Chemical Fertilizer After (kg)	Chitemene Before (lima)	Chitemene After (lima)	Rainfed Maize Before (bag)	Rainfed Maize After (bag)
451	15	1508	Groundnuts	25	16	27	14.5	20,000								20,000	5	Bag	112,000	560,000	2	7	784,000	50	100	0.25	0.5	6	9
452	15	1509	Groundnuts	50	50	47.9	46	40,000							80,000	120,000	20	Bag	96,000	1,920,000	1	21	2,016,000	50	100	1.5	1	22	9
453	15	1510	Groundnuts	35	30	25	15							20,000		20,000	6	Bag	84,000	504,000	1	7	588,000	50	150	0.25	0	10	9
454	15	1510	Irish Potato	6	5	5	3	10,000	10	38,000						48,000	0.5	Bag	80,000	40,000	0.5	1	80,000	50	150	0.25	0	10	9
455	15	1510	Green maize	50	8	44	4		10	56,000	10	50,000		15,000		121,000	5	Bag	30,000	150,000	1	6	180,000	50	150			10	9
456	15	1511	Groundnuts	75	50	50	35	30,000							104,000	134,000	13	Bag	84,000	1,092,000	1	14	1,176,000	50	100			3	5
457	15	1512	Groundnuts	90	80	100	85	120,000							145,000	265,000	57	Bag	96,000	5,472,000	4	61	5,856,000	100	200	1	0.5	16	30
458	15	1512	Tomato	90	16	94	18	25,000	20	80,000	20	60,000		115,000		280,000	25	Crate	45,000	1,125,000	2	27	1,215,000	100	200	1	0.5		
459	15	1513	Groundnuts	65	50	56	35	45,000						20,000		65,000	8	Bag	96,000	768,000	2	10	960,000	0	50	0.5	0.25		
460	15	1513	Rape	65	8	70	5	10,000	5	25,000	5	10,000	6,000	15,000		66,000	12	Bag	8,000	96,000	4	16	128,000	0	50	0.5	0.25		
461	15	1514	Tomato	65	22	60	25	30,000	20	100,000			150,000		100,000	380,000	35	Crate	40,000	1,400,000	1	36	1,440,000	50	100			9	15
462	15	1515	Cabbage	50	35	47	30.6	120,000	25	125,000	5	18,000	45,000	30,000	310,000	648,000	85	Bag	50,000	4,250,000	3	88	4,400,000	400	600	0.25	0.5	60	100
463	15	1516	Groundnuts	90.0	32.0	100.0	18.0							40,000	30,000	70,000	30	Bag	84,000	2,520,000	3	33	2,772,000	400	800			50	60
464	15	1517	Groundnuts	60	30	57	45	30,000							32,000	62,000	12	Bag	84,000	1,008,000	1	13	1,092,000	0	100	0.5	0.25	7	12
465	15	1517	Green maize	30	15	35	10	5,000	10	30,000	10	22,000		20,000	24,000	101,000	6	Bag	30,000	180,000	1	7	210,000	0	100	0.5	0.25	7	12
466	15	1518	Green maize	25	15	22	10		75	25,000	5	18,000				43,000	4	Bag	35,000	140,000	1	5	175,000	50	100	0.5	0.25	8	10
467	15	1519	Green maize	50	50	47	38		50	220,000	50	180,000		250,000	200,000	850,000	40	Bag	50,000	2,000,000	2	42	2,100,000	400	800			30	16
468	15	1520	Rape	38	24	29.8	26.6	24,000	50	170,000	20	44,000	40,000			278,000	50	Bag	30,000	1,500,000	4	54	1,620,000	50	200	0.5	0.25	20	35
469	15	1520	Bean leaves	10	5	23	13.5	12,000	10	56,000	10	30,000				98,000	5	Bag	50,000	250,000	1	6	300,000	50	200	0.5	0.25	20	35
470	15	1521	Irish Potato	20	20	26	25	24,000	10	25,000	10	18,000				67,000	5	Bag	120,000	600,000	2	7	840,000	20	100			2	4
471	15	1522	Green maize	50	25	47	23.2	12,000	15	75,000	15	45,000			128,000	260,000	16	Bag	45,000	720,000	2	18	810,000	100	200			9	17
472	15	1523	Groundnuts	75	12	70	15	15,000						20,000	112,000	147,000	14	Bag	84,000	1,176,000	3	17	1,428,000	200	300			9	12
473	15	1524	Groundnuts	30	12	32	13.2	10,000								10,000	4	Bag	84,000	336,000	2	6	504,000	100	200	0.25	0	8	10
474	15	1525	Groundnuts	45	30	41	25	16,000							20,000	36,000	4	Bag	84,000	336,000	1	5	420,000	100	200			6	11
475	15	1526	Groundnuts	100	50	95	48.5	70,000							80,000	150,000	20	Bag	84,000	1,680,000	2	22	1,848,000	20	800	0.5	0.5	5	6
476	15	1527	Groundnuts	50	15	60	20	45,000								45,000	6	Bag	84,000	504,000	1	7	588,000	100	200			2	4
477	15	1528	Groundnuts	75	36	76	22	24,000								24,000	5	Bag	102,000	510,000	1	6	612,000			1	0.5		
478	15	1529	Groundnuts	75	60	77	50	24,000								24,000	6	Bag	84,000	504,000	1	7	588,000						
479	15	1530	Groundnuts	100	50	82.3	47.7	72,000						48,000	160,000	280,000	20	Bag	96,000	1,920,000	5	25	2,400,000	300	500			12	30
480	15	1531	Groundnuts	35	13	29	12.6	15,000						40,000		55,000	3	Bag	84,000	252,000	1	4	336,000						
481	15	1532	Groundnuts	50	25	46	22	48,000							100,000	148,000	15	Bag	84,000	1,260,000	2	17	1,428,000	300	400	0.5	0.25	25	36
482	15	1532	Green maize	78	15	75	17		50	120,000	50	85,000			150,000	355,000	50	Bag	30,000	1,500,000	6	56	1,680,000	300	400	0.5	0.25	25	36
483	16	1601	Green maize	50	25			40,000	10	40,000	10	30,000		50,000		160,000	5	Bags	50,000	250,000	1	6	300,000	100	200			14	15
484	16	1602	Green maize	50	25			50,000	10	40,000	10	40,000		100,000		230,000	15	Bags	50,000	750,000	2	17	850,000	15	200			7	17
485	16	1602	Beans	25	10			25,000						15,000		40,000	6	Gallons	20,000	120,000	2	8	160,000	15	200			7	17
486	16	1602	Rape	50	30			15,000	50	185,000			45,000	50,000		295,000	20	Bags	45,000	900,000	1	21	945,000	15	200			7	17
487	16	1602	Chinese cabbage	40	20			8,000	50	185,000	50	165,000	45,000	50,000		453,000	25	Bags	45,000	1,125,000	1	26	1,170,000						
488	16	1603	Green maize	50	50			40,000	50	170,000	50	150,000		100,000		460,000	10	Bags	70,000	700,000	4	14	980,000	50	200	0.3	0.25	40	60
489	16	1603	Rape	50	25			15,000	5	20,000	5	15,000	15,000			65,000	40	Bags	30,000	1,200,000	3	43	1,290,000	50	200	0.3	0.25	40	60
490	16	1604	Green maize	50	50			80,000	20	120,000	20	100,000		80,000	100,000	480,000	20	Bags	65,000	1,300,000	4	24	1,560,000		100			10	30
491	16	1605	Green maize	50	25									30,000	20,000	50,000	10	Bags	30,000	300,000	3	13	390,000	100	200		0.25	10	35
492	16	1605	Tomato	50	25			25,000	20	80,000	20	60,000	35,000	20,000	25,000	245,000	25	Buckets	10,000	250,000	2	27	270,000	100	200		0.25	10	35
493	16	1606	Tomato	30	10			25,000	10	50,000	10	50,000				125,000	12	Buckets	15,000	180,000	6	18	270,000		200			20	30
494	16	1606	Green maize	50	30											0	9	Bags	35,000	315,000	3	12	420,000		200			20	30
495	16	1607	Green maize	50	50											0	21	Bags	30,000	630,000	4	25	750,000	15	300			3	45
496	16	1607	Beans	50	50			15,000	10	40,000	10	40,000				95,000	2	Bags	65,000	130,000	1	3	195,000	15	300			3	45
497	16	1608	Green maize	50	50			90,000	50	180,000	50	150,000		100,000	200,000	720,000	20	Bags	100,000	2,000,000	4	24	2,400,000		2,500			3	50
498	16	1608	Tomato	50	50			58,000	100	260,000	50	150,000	100,000	150,000	200,000	918,000	100	Crates	20,000	2,000,000	20	120	2,400,000		2,500			3	50
499	16	1609	Green maize	50	50			90,000	50	200,000	50	200,000		60,000	100,000	650,000	15	Bags	50,000	750,000	5	20	1,000,000	200	300			10	30
500	16	1609	Tomato	50	25			30,000	20	80,000	20	100,000	50,000	30,000	50,000	340,000	30	Crates	15,000	450,000	20	50	750,000	200	300			10	30
501	16	1610	Green maize	50	25											0	5	Bags	45,000	225,000	1	6	270,000	100	200			3	15
502	16	1611	Green maize	50	25			40,000	25	125,000	25	100,000		30,000		295,000	10	Bags	50,000	500,000	2	12	600,000	30	200			5	10
503	16	1611	Rape	50	25			15,000	10	50,000	5	15,000	15,000	30,000		125,000	6	Bags	50,000	300,000	2	8	400,000						
504	16	1612	Green maize	50	50			100,000	10	60,000	10	60,000				220,000	4	Bags	65,000	260,000	1	5	325,000	200	300	0.3	0.25	62	150
505	16	1612	Rape	50	25			100,000	20	80,000	5	15,000	25,000			220,000	8	Bags	50,000	400,000	1	9	450,000	200	300	0.3	0.25	62	150
506	16	1612	Chinese cabbage	20	10			10,000	10	50,000	5	15,000	20,000			95,000	6	Bags	50,000	300,000	1	7	350,000	200	300	0.3	0.25	62	150
507	16	1613	Green maize	40	25			85,000	30	150,000	30	120,000				355,000	24	Bags	25,000	600,000	4	28	700,000		200	0.5	0.25	5	20
508	16	1613	Cabbage	40	25			165,000	15	90,000	15	60,000	50,000		600,000	965,000	35	Bags	30,000	1,050,000	5	40	1,200,000		200	0.5	0.25	5	20
509	16	1613	Okra	20	10			20,000	5	30,000	5	20,000	20,000			90,000	8	Bags	70,000	560,000	1	9	630,000		200	0.5	0.25	5	20
510	16	1614	Rape	50	50			40,000	50	150,000	50	98,000	50,000			338,000	30	Bags	20,000	600,000	5	35	700,000		200			7	15
511	16	1615	Green maize	50	50			150,000	50	150,000	50	135,000				435,000	20	Bags	65,000	1,300,000	3	23	1,495,000	10	200			5	30
512	16	1616	Onion	50	25			250,000	50	150,000	50	150,000			200,000	750,000	31	Bags	150,000	4,650,000	1	32	4,800,000		200			20	80
513	16	1617	Tomato	50	25			5,000	20	100,000	10	50,000				155,000	10	Buckets	15,000	150,000	2	12	180,000						15
514	16	1617	Chinese cabbage	50	25			10,000	5	25,000	5	25,000	15,000			75,000	15	Bags	15,000	225,000	1	16	240,000						16

No.	Scheme ID	Farmer ID	Crop	Area, m X (Declared)	Area, m Y (Declared)	Area, m X (Measured)	Area, m Y (Measured)	Input, ZMK Seeds ZMK	D Compound Kg	D Compound ZMK	Urea Kg	Urea ZMK	Pesticide ZMK	Labor ZMK	Transport ZMK	Total ZMK	Harvest Sold Volume	Unit	Unit Price (ZMK)	Cash Income (ZMK)	Consumed Volume	Total Production	Value of all production	Chemical Fertilizer Before (kg)	Chemical Fertilizer After (kg)	Chitemene Before (lima)	Chitemene After (lima)	Rainfed Maize Before (bag)	Rainfed Maize After (bag)
515	16	1617	Rape	50	25			5,000	5	25,000	5	25,000	15,000			70,000	30	Bags	70,000	2,100,000	1	31	2,170,000						17
516	16	1618	Green maize	50	50			23,500	50	218,000	50	200,000			60,000	501,500	24	Bags	60,500	1,452,000	7	31	1,875,500	200	400			40	60
517	16	1618	Beans	50	20			18,000	25	50,000	25	40,000			60,000	168,000	5	Bags	165,000	825,000	1	6	990,000	200	400			40	60
518	16	1619	Green maize	50	25											0	15	Bags	60,000	900,000	5	20	1,200,000	200	600			5	40
519	16	1620	Rape	25	25			25,000	20	100,000	15	60,000	50,000			235,000	17	Bags	15,000	255,000	1	18	270,000	5	200			7	10
520	16	1620	Chinese cabbage	25	25			25,000	20	100,000	15	60,000				185,000	25	Bags	10,000	250,000	4	29	290,000		400			5	60
521	16	1621	Egg plants	40	25				20	100,000	20	80,000	38,000			218,000	40	Bags	70,000	2,800,000	1	41	2,870,000		400			5	60
522	16	1621	Green maize	50	25			60,000	25	50,000	25	40,000				150,000	30	Bags	35,000	1,050,000	10	40	1,400,000						
523	16	1621	Cabbage	25	20			10,000	10	50,000	10	40,000	38,000		120,000	258,000	40	Bags	20,000	800,000	2	42	840,000						
524	16	1622	Green maize	30	25			50,000	20	100,000	15	60,000	150,000			360,000	15	Bags	30,000	450,000	2	17	510,000	10	100	0.3	0.25	12	25
525	16	1623	Tomato	50	25			25,000	15	90,000	5	25,000				140,000	50	Buckets	10,000	500,000	3	53	530,000	5	50			15	52
526	16	1623	Cabbage	50	25			25,000	10	60,000	10	50,000	25,000			160,000	3	Bags	100,000	300,000	1	4	400,000						
527	16	1623	Rape	25	25			10,000	20	120,000	20	100,000	25,000			255,000	15	Bags	30,000	450,000	1	16	480,000						
528	16	1623	Chinese cabbage	25	25			10,000	20	120,000	20	100,000	25,000			255,000	35	Bags	30,000	1,050,000	1	36	1,080,000						
529	16	1624	Green maize	50	50			50,000	50	150,000	50	150,000				350,000	20	Bags	60,000	1,200,000	1	21	1,260,000	200	400			50	100
530	16	1625	Green maize	50	25											0	6	Bags	60,000	360,000	4	10	600,000	400	600			50	70
531	16	1626	Green maize	50	20											0	4	Bags	60,000	240,000	1	5	300,000		300				50
532	16	1627	Green maize	50	25											0	20	Bags	60,000	1,200,000	1	21	1,260,000	100	200			5	10
533	16	1628	Green maize	50	50									20,000		20,000	42	Bags	60,000	2,520,000	4	46	2,760,000	20	150			25	600
534	16	1628	Tomato	50	25			50,000	15	90,000	10	50,000			320,000	510,000	300	Buckets	10,000	3,000,000	12	312	3,120,000	20	150			25	600
535	16	1629	Rape	50	20			45,000	50	160,000	20	60,000	25,000			290,000	30	Bags	12,500	375,000	2	32	400,000		300		0.25	8	28
536	17	1701	Onion	25	10			30,000	10	50,000					42,000	122,000	4	Bags	130,000	520,000	1	5	650,000			0.3	0.25		
537	17	1701	Cabbage	50	25			12,000	20	80,000	15	45,000	70,000		100,000	307,000	12	Bags	30,000	360,000	4	16	480,000			0.3	0.25		
538	17	1701	Tomato	50	50			30,000	5	25,000	5	20,000	150,000		200,000	425,000	20	Crates	40,000	800,000	6	26	1,040,000			0.3	0.25		
539	17	1702	Cabbage	25	20			30,000	20	80,000	20	60,000	20,000			190,000	22	Bags	50,000	1,100,000	5	27	1,350,000	4	8	1.0	0.25	15	25
540	17	1702	Green maize	25	20				15	60,000	15	45,000				105,000	5	Bags	130,000	650,000	2	7	910,000	4	8	1.0	0.25	15	25
541	17	1702	Groundnuts	20	20											0	4	Bags	92,000	368,000	1	5	460,000	4	8	1.0	0.25	15	25
542	17	1702	Rape	10	10			10,000	10	40,000	5	15,000	10,000			75,000	10	Bags	25,000	250,000	3	13	325,000	4	9	1.0	0.25	15	25
543	17	1703	Onion	50	10			60,000	50	200,000				50,000		310,000	10	Bags	65,000	650,000	1	11	715,000	10	4			40	20
544	17	1703	Tomato	25	25			35,000	15	75,000	15	60,000	70,000	100,000	40,000	380,000	18	Buckets	25,000	450,000	4	22	550,000	10	4			40	20
545	17	1703	Rape	15	10			5,000	5	25,000	5	20,000				50,000	6	Buckets	20,000	120,000	3	9	180,000	10	4			40	20
546	17	1704	Tomato	30	20			35,000	20	80,000	20	72,000	100,000	40,000		327,000	110	Buckets	15,000	1,650,000	3	113	1,695,000		2	0.3			8
547	17	1704	Green maize	50	25			35,000	30	120,000	30	120,000				275,000	12	Bags	32,000	384,000	1	13	416,000						
548	17	1704	Okra	25	25			8,000	10	50,000	5	20,000				78,000	7	Bags	18,000	126,000	1	8	144,000						
549	17	1704	Onion	15	10			15,000	5	20,000	5	18,000				53,000	2	Bags	40,000	80,000	1	3	120,000						
550	17	1705	Cabbage	70	20			35,000	20	100,000	20	60,000	120,000			335,000	25	Bags	45,000	1,125,000	1	26	1,170,000		6			17	
551	17	1705	Green maize	70	50			40,000	40	200,000	40	160,000		30,000	50,000	480,000	10	Bags	140,000	1,400,000	6	16	2,240,000						
552	17	1705	Tomato	25	25			20,000	5	25,000	5	20,000			210,000	275,000	26	Crates	45,000	1,170,000	4	30	1,350,000						
553	17	1706	Tomato	50	25			30,000	20	100,000	20	80,000	15,000		70,000	295,000	7	Crates	50,000	350,000	3	10	500,000	4	12	0.3	0.25	25	30
554	17	1706	Groundnuts	50	25			60,000							20,000	80,000	12	Bags	92,000	1,104,000	2	14	1,288,000	4	12	0.3	0.25	25	30
555	17	1707	Irish potato	40	50			9,000	10	50,000	10	28,000				87,000	4	Bags	150,000	600,000	1	5	750,000	20	50			3	5
556	17	1707	Groundnuts	40	40			45,000								45,000	6	Bags	92,000	552,000	1	7	644,000						
557	17	1708	Tomato	20	20			10,000	10	56,000	10	50,000	20,000			136,000	20	Buckets	10,000	200,000	5	25	250,000	4	6	0.3	0.25	15	20
558	17	1708	Rape	10	8			10,000	5	20,000	5	18,000	7,000			55,000	5	Bags	30,000	150,000	1	6	180,000					15	20
559	17	1709	Tomato	50	25			30,000	20	100,000	15	90,000	30,000			250,000	23	Buckets	12,000	276,000	5	28	336,000		2			8	20
560	17	1709	Egg plants	15	10				5	30,000	5	25,000				55,000	70	Plates	1,000	70,000	20	90	90,000						
561	17	1710	Onion	50	10				5	25,000						25,000	2	Bags	65,000	130,000	1	3	195,000			0.3	0.25	3	4
562	17	1710	Groundnuts	50	15											0	2	Bags	180,000	360,000	1	3	540,000			0.3	0.25	3	4
563	17	1711	Okra	30	25				2	15,000	2	10,000				25,000	50	Plates	1,000	50,000	15	65	65,000			0.3	0.25	2	4
564	17	1711	Pumpkin leaves	30	25				2	15,000						15,000	5	Buckets	15,000	75,000	2	7	105,000			0.3	0.25	2	4
565	17	1711	Egg plants	15	10				2	15,000	1	7,500				22,500	4	25kgbags	10,000	40,000	1	5	50,000						
566	17	1712	Tomato	20	15				5	28,000			20,000			48,000	20	Buckets	12,000	240,000	4	24	288,000		10	0.3	0.25	3	15
567	17	1713	Green maize	50	35				10	50,000	10	40,000				90,000	8	Bags	20,000	160,000	1	9	180,000		20				6
568	17	1713	Tomato	20	10				5	15,000	5	20,000				35,000	8	Buckets	12,000	96,000	3	11	132,000						
569	17	1714	Cabbage	30	10			50,000	15	45,000	15	35,000	240,000	65,000	95,000	530,000	13	Bags	60,000	780,000	3	16	960,000	50	200	1.0	1.00	15	20
570	17	1714	Onion	15	5			30,000	5	30,000	5	25,000	50,000		30,000	165,000	6	Bags	65,000	390,000	2	8	520,000	50	200	1.0	1.00	15	20
571	17	1714	Egg plants	25	5				5	30,000	5	25,000	25,000			80,000	32	Buckets	9,000	288,000	2	34	306,000	50	200	1.0	1.00	15	20
572	17	1715	Tomato	50	25				5	30,000	5	25,000	12,000			67,000	8	Buckets	10,000	80,000	2	10	100,000		100	1.0	0.25	2	3
573	17	1716	Green maize	50	50			80,000	50	200,000	50	175,000				455,000	10	Bags	80,000	800,000	2	12	960,000	100	150	0.3		3	10
574	17	1716	Groundnuts	50	50			50,000								50,000	4	Bags	120,000	480,000	1	5	600,000	100	150	0.3		3	10
575	17	1717	Rape	35	15			10,000	20	100,000	10	40,000	35,000			185,000	10	Bags	20,000	200,000	1	11	220,000	100					4
576	17	1717	Onion	45	30			45,000	10	60,000						105,000	10	Bags	75,000	750,000	1	11	825,000	100					4
577	17	1717	Tomato	50	50			35,000	50	18,000	25	125,000	200,000			378,000	14	Crates	50,000	700,000	5	19	950,000	100					4
578	17	1718	Green maize	25	10				5	25,000	5	20,000				45,000	3	Bags	80,000	240,000	2	5	400,000		100	0.3	0.25		3

No.	Scheme ID	Farmer ID	Crop	Area, m X (Declared)	Area, m Y (Declared)	Area, m X (Measured)	Area, m Y (Measured)	Input, ZMK Seeds ZMK	D Compound Kg	D Compound ZMK	Urea Kg	Urea ZMK	Pesticide ZMK	Labor ZMK	Transport ZMK	Total ZMK	Harvest Sold Volume	Unit	Unit Price (ZMK)	Cash Income (ZMK)	Consumed Volume	Total Production	Value of all production	Chemical Fertilizer Before (kg)	Chemical Fertilizer After (kg)	Chitemene Before (lima)	Chitemene After (lima)	Rainfed Maize Before (bag)	Rainfed Maize After (bag)
579	17	1719	Green maize	20	50			7,000	10	50,000	10	40,000			100,000	197,000	10	Bags	120,000	1,200,000	2	12	1,440,000					1	2
580	17	1720	Rape	20	10			20,000	10	30,000	10	30,000	50,000			130,000	10	Bags	25,000	250,000	1	11	275,000	200	200	0.3	0.25	5	20
581	17	1720	Green maize	30	25				10	50,000	10	50,000				100,000	10	Bags	25,000	250,000	1	11	275,000	200	200	0.3	0.25	5	20
582	17	1721	Onion	30	20			70,000	5	20,000	5	15,000			100,000	205,000	20	Bags	75,000	1,500,000	1	21	1,575,000		100	0.3	0.25		8
583	17	1721	Green maize	25	25				15	60,000	15	45,000				105,000	10	Bags	25,000	250,000	4	14	350,000		100	0.3	0.25		8
584	17	1722		30	20			30,000	10	50,000					30,000	110,000	6	Bags	65,000	390,000	1	7	455,000			0.3	0.25	3	6
585	17	1723	Cabbage	10	50			5,000	2	15,000	2	12,000				32,000	6	Bags	65,000	390,000	1	7	455,000		20	0.3	0.25	12	15
586	17	1723	Groundnuts	10	50			12,000								12,000	8	Bags	88,000	704,000	1	9	792,000		20	0.3	0.25	12	15
587	17	1724	Rape	25	25			4,000	5	10,000	5	10,000	10,000			34,000	12	Bags	25,000	300,000	2	14	350,000						12
588	17	1725	Onion	30	30			30,000	10	50,000						80,000	8	Bags	112,500	900,000	1	9	1,012,500	5	50			2	4
589	17	1726	Green maize	50	25				5	18,000	5	15,000				33,000	5	Bags	50,000	250,000	1	6	300,000	100	200	0.3	0.25	12	16
590	17	1727	Tomato	50	50			45,000	50	50,000	50	50,000	65,000		129,000	339,000	12	Buckets	65,000	780,000	1	13	845,000	100	200			8	20
591	17	1727	Green maize	50	50			45,000	50	50,000	50	50,000		50,000		195,000	12	Bags	65,000	780,000	1	13	845,000	100	200			8	20
592	17	1728	Onion	20	15			60,000	20	100,000	15	60,000				220,000	10	Bags	112,500	1,125,000	1	11	1,237,500	400	700			4	24
593	17	1728	Green maize	50	15				10	50,000	10	40,000				90,000	10	Bags	60,000	600,000	5	15	900,000	400	700			4	24
594	17	1729	Tomato	30	25			25,000	10	60,000	10	50,000	20,000			155,000	30	Buckets	12,000	360,000	3	33	396,000	100	200	0.3	0.25		12
595	17	1729	Rape	30	30			12,000	10	60,000	5	25,000	10,000			107,000	8	Bags	20,000	160,000	1	9	180,000	100	200	0.3	0.25		12
596	17	1729	Cabbage	25	10			2,000	2	15,000	2	4,500	4,000			25,500	4	Bags	10,000	40,000	1	5	50,000	100	200	0.3	0.25		12
597	18	1801	Groundnuts	50	25											0	2	Bags	150,000	300,000	3	5	750,000	15		2.0	1.00	3	5
598	18	1801	Beans	50	25			45,000								45,000	2	Bags	150,000	300,000	1	3	450,000	15		2.0	1.00	3	5
599	18	1801	Green maize	50	25				15	75,000	15	75,000				150,000	5	Bags	50,000	250,000	2	7	350,000						
600	18	1802	Green maize	50	25			40,000	50	200,000	50	170,000		50,000	30,000	490,000	10	Bags	120,000	1,200,000	4	14	1,680,000	15	8	1.0		2	10
601	18	1802	Rape	25	25			14,000	10	90,000	5	30,000	10,000	15,000		159,000	4	20kg bags	20,000	80,000	2	6	120,000	15	8	1.0		2	10
602	18	1802	Groundnuts	20	20			30,000							25,000	55,000	12	Bags	160,000	1,920,000	3	15	2,400,000						
603	18	1803	Green maize	50	35			40,000	20	120,000	20	80,000		100,000	150,000	490,000	25	Bags	45,000	1,125,000	7	32	1,440,000	2	5	0.3	1.00	12	20
604	18	1803	Onion	20	20			35,000	15	90,000			50,000	50,000	30,000	255,000	3	90kg bags	250,000	750,000	1	4	1,000,000	2	5	0.3	1.00	12	20
605	18	1803	Rape	10	10			5,000	5	30,000			10,000	5,000		50,000	5	90kg bags	15,000	75,000	1	6	90,000						
606	19	1804	Green maize	50	50			40,000	20	100,000	20	120,000		25,000	50,000	325,000	15	Bags	120,000	1,800,000	4	19	2,280,000	2	80			3	15
607	18	1804	Beans	25	25			45,000	5	25,000	5	30,000		20,000		120,000	2	Bags	500,000	1,000,000	1	3	1,500,000	2	80			3	15
608	18	1805	Irish potato	50	50			30,000	15	60,000	5	30,000	10,000	20,000	50,000	200,000	30	Gallons	10,000	300,000	5	35	350,000	15	2	0.3	0.25	2	10
609	18	1805	Chinese cabbage	10	10			5,000	5	25,000			10,000	10,000	3,000	53,000	2	Bags	40,000	80,000	1	3	120,000	15	2	0.3	0.25	2	10
610	18	1806	Irish potato	50	50			40,000	25	125,000	25	100,000		50,000	45,000	360,000	10	Bags	200,000	2,000,000	5	15	3,000,000	25	200			2	20
611	18	1806	Green maize	50	50			30,000	5	25,000	5	20,000		50,000		125,000	8	Bags	160,000	1,280,000	1	9	1,440,000	25	200			2	20
612	18	1807	Onion	15	15			30,000	5	30,000				25,000		85,000	3	Bags	300,000	900,000	1	4	1,200,000	80	200			2	25
613	18	1807	Green maize	25	25			40,000	10	55,000	5	30,000		25,000		150,000	8	Bags	140,000	1,120,000	3	11	1,540,000	80	200			2	25
614	18	1808	Irish potato	50	25			60,000	20	100,000	10	80,000	25,000	15,000		280,000	15	Bags	70,000	1,050,000	3	18	1,260,000	20	250			5	20
615	18	1809	Cabbage	30	15			6,000	10	50,000	5	20,000	15,000	25,000		116,000	7	Bags	75,000	525,000	1	8	600,000	20	300			5	25
616	18	1810	Green maize	20	20				5	30,000	5	20,000				50,000	3	Bags	20,000	60,000	1	4	80,000	100	200			20	20
617	18	1811	Green maize	30	25				10	50,000	10	40,000		25,000		115,000	5	Bags	120,000	600,000	2	7	840,000	80	200			5	15
618	18	1811	Beans	50	25			30,000						25,000		55,000	2	Bags	40,000	80,000	1	3	120,000						
619	19	1812	Beans	50	25			100,000						60,000		160,000	2	Bags	400,000	800,000	1	3	1,200,000		100				10
620	18	1813	Beans	50	50			40,000								40,000	2	Bags	200,000	400,000	1	3	600,000		200			5	15
621	18	1814	Green maize	70	30			20,000	80	240,000	20	80,000		25,000		365,000	5	90kg bags	140,000	700,000	5	10	1,400,000	10	80	0.3	0.25	5	12
622	18	1814	Irish potato	50	25			40,000	5	30,000	5	20,000				90,000	2	Bags	50,000	100,000	1	3	150,000	10	80	0.3	0.25	5	12
623	18	1815	Green maize	50	25				20	100,000	20	80,000		25,000		205,000	5	Bags	140,000	700,000	2	7	980,000	2	4			2	15
624	18	1815	Beans	25	25			60,000						25,000		85,000	1	Bags	500,000	500,000	1	2	1,000,000	2	4			2	15
625	18	1816	Green maize	50	25				20	100,000	20	80,000		25,000		205,000	4	Bags	140,000	560,000	1	5	700,000		4			2	4
626	18	1806	Beans	20	10			20,000						25,000		45,000	4	Bags	400,000	1,600,000	1	5	2,000,000		4			2	4
627	18	1817	Green maize	50	50			40,000	20	90,000	20	120,000		25,000		275,000	15	Bags	500,000	7,500,000	3	18	9,000,000	15	50			6	20
628	18	1817	Beans	50	50			75,000						25,000		100,000	3	Bags	500,000	1,500,000	1	4	2,000,000						
629	18	1818	Beans	30	20									25,000		25,000	3	Bags	500,000	1,500,000	1	4	2,000,000	15	50		0.25	5	20
630	18	1818	Green maize	20	20			25,000	20	100,000	10	40,000		25,000		190,000	8	Bags	140,000	1,120,000	4	12	1,680,000	15	50		0.25	5	20
631	18	1819	Green maize	50	50			7,000	20	100,000	10	40,000				147,000	4	Bags	140,000	560,000	2	6	840,000	15	20	0.3	0.25	10	15
632	18	1819	Tomato	50	25				10	50,000	5	35,000				85,000	4	Buckets	10,000	40,000	5	9	90,000						
633	19	1800														0				0		0	0						
634	18	1821	Green maize	100	100			250,000	200	840,000	200	720,000		180,000		1,990,000	25	90kg bags	176,000	4,400,000	6	31	5,456,000	1,200	1,800		3.00	50	98
635	18	1821	Onion	50	50			65,000	50	50,000				50,000	48,000	213,000	6	90kg bags	200,000	1,200,000	1	7	1,400,000						
636	18	1821	Tomato	100	100			70,000	100	360,000	100	300,000		100,000	200,000	1,030,000	30	Crates	100,000	3,000,000	1	31	3,100,000						
637	19	1901	Green maize	50	5			3,000	5	25,000	5	15,000				43,000	9	Bags	35,000	315,000	2	11	385,000	1	2	1.0	2.00	8	12
638	19	1901	Groundnuts	30	10											0	3	Bags	72,000	216,000	1	4	288,000	1	2	1.0	2.00	8	12
639	19	1902	Green maize	50	25				15	120,000	15	75,000				195,000	18	Bags	30,000	540,000	1	19	570,000	2	4				19
640	19	1902	Groundnuts	25	15											0	3	Bags	72,000	216,000	1	4	288,000	2	4				19
641	19	1903	Green maize	50	25			25,000	10	60,000	10	50,000		20,000		155,000	3	Bags	30,000	90,000	3	6	180,000						
642	19	1904	Groundnuts	20	10			30,000						20,000	30,000	80,000	2	Bags	60,000	120,000	1	3	180,000	2	4	1.0	1.00	12	20

No.	Scheme ID	Farmer ID	Crop	Area, m X (Declared)	Area, m Y (Declared)	Area, m X (Measured)	Area, m Y (Measured)	Input, ZMK Seeds ZMK	D Compound Kg	D Compound ZMK	Urea Kg	Urea ZMK	Pesticide ZMK	Labor ZMK	Transport ZMK	Total ZMK	Harvest Sold Volume	Unit	Unit Price (ZMK)	Cash Income (ZMK)	Consumed Volume	Total Production	Value of all production	Chemical Fertilizer Before (kg)	Chemical Fertilizer After (kg)	Chitemene Before (lima)	Chitemene After (lima)	Rainfed Maize Before (bag)	Rainfed Maize After (bag)
643	19	1905	Cabbage	25	15				15	75,000	5	20,000	36,000	55,000	50,000	236,000	4	Bags	40,000	160,000	1	5	200,000	4	6			12	20
644	19	1905	Pumpkin leaves	25	15				5	20,000	5	15,000				35,000	2	Bags	30,000	60,000	1	3	90,000	4	6			12	20
645	19	1906	Green maize	50	50			5,000	20	120,000	20	100,000				225,000	30	Bags	120,000	3,600,000	3	33	3,960,000	4	4	0.3		25	30
646	19	1906	Groundnuts	50	25			45,000								45,000	3	Bags	50,000	150,000	1	4	200,000	4	4	0.3		25	30
647	19	1907	Onion	50	25			160,000	15	90,000			12,000			262,000	4	Bags	150,000	600,000	1	5	750,000	4	8			30	60
648	19	1907	Green maize	50	25			110,000	50	194,000	50	184,000		30,000		518,000	25	Bags	40,000	1,000,000	2	27	1,080,000	4	8			30	60
649	19	1907	Cabbage	35	25			40,000	10	60,000	5	25,000	48,000			173,000	5	Bags	48,000	240,000	1	6	288,000	4	8			30	60
650	19	1908	Cabbage	50	15				20		20		25,000	50,000		75,000	20	Bags	30,000	600,000	5	25	750,000	5	200	0.3		2	20
651	19	1908	Okra	50	15			7,000	10	50,000	10	25,000				82,000	25	Gallons	4,000	100,000	4	29	116,000	5	200	0.3		2	20
652	19	1908	Green maize	60	20			75,000	15	90,000	10	50,000				215,000	15	Bags	25,000	375,000	3	18	450,000	5	200	0.3		2	20
653	19	1908	Tomato	25	10			7,000	5	30,000	5	25,000	70,000			132,000	16	Buckets	12,000	192,000	4	20	240,000	5	200	0.3		2	20
654	19	1908	Groundnuts	20	15			10,000								10,000	6	Bags	36,000	216,000	1	7	252,000						
655	19	1908	Rape	10	15			7,000	5	30,000	1	10,000	15,000			62,000	3	Bags	24,000	72,000	1	4	96,000						
656	19	1909	Onion	30	25			75,000	15	90,000	15	84,000	60,000	50,000		359,000	10	Bags	80,000	800,000	1	11	880,000	2	4			17	40
657	19	1910	Tomato	20	15			10,000	5	30,000	5	25,000	30,000			95,000	41	Buckets	12,000	492,000	4	45	540,000	4	8	1.0	0.25	10	60
658	19	1910	Cabbage	20	15			12,000	10	60,000	5	25,000	15,000			112,000	17	Bags	30,000	510,000	3	20	600,000	4	8	1.0	0.25	10	60
659	19	1911	Groundnuts	50	25											0	8	Bags	130,000	1,040,000	2	10	1,300,000	2	4	0.3			
660	19	1912	Groundnuts	25	25											0	2	Bags	72,000	144,000	1	3	216,000		4	0.3			
661	19	1912	Onion	25	5			20,000	5	25,000	5	20,000				65,000	9	Gallons	10,000	90,000	2	11	110,000		4	0.3			
662	19	1913	Groundnuts	25	10										90,000	90,000	3	Bags	72,000	216,000	2	5	360,000			0.3			
663	19	1914	Green maize	50	25			10,000	20	100,000	25	100,000		50,000	70,000	330,000	25	Bags	30,000	750,000	4	29	870,000		4	0.3	0.25		
664	19	1915	Green maize	50	25				20	175,000	20	100,000		150,000	175,000	600,000	35	Bags	35,000	1,225,000	2	37	1,295,000	50	200			8	20
665	19	1915	Groundnuts	25	25									50,000	20,000	70,000	4	Bags	54,000	216,000	1	5	270,000	50	200			8	20
666	19	1916	Groundnuts	25	25											0	2	Bags	96,000	192,000	1	3	288,000	2	4			10	25
667	19	1917	Green maize	50	50			40,000	50	150,000	50	140,000			600,000	930,000	60	Bags	40,000	2,400,000	1	61	2,440,000	1	4	0.3			40
668	19	1918	Green maize	50	50				20	60,000	20	60,000		32,000		152,000	8	Bags	35,000	280,000	3	11	385,000	2	4			4	12
669	19	1918	Groundnuts	50	25									4,000		4,000	1	Bags	72,000	72,000	5	6	432,000	2	4			4	12
670	19	1919	Pumpkin leaves	50	50				20	140,000		140,000		18,000		298,000	7	Bags	30,000	210,000	1	8	240,000	1	4	0.3			
671	19	1919	Green maize	50	50				15	105,000	15	105,000				210,000	6	Bags	35,000	210,000	2	8	280,000	1	4	0.3			
672	19	1919	Okra	15	10				5	35,000	5	35,000				70,000	2	Bags	20,000	40,000	1	3	60,000						
673	19	1919	Onion	20	10				5	35,000	5	35,000				70,000	2	Bags	50,000	100,000	1	3	150,000						
674	19	1920	Tomato	50	25				15	90,000	15	60,000		100,000	60,000	310,000	30	Buckets	12,000	360,000	10	40	480,000		2	0.3			8
675	19	1920	Groundnuts	50	25											0	4	Bags	120,000	480,000	1	5	600,000		2	0.3			8
676	19	1921	Groundnuts	20	15									50,000	20,000	70,000	2	Bags	60,000	120,000	1	3	180,000			0.3	0.25		
677	19	1921	Rape	10	5			10,000	5	35,000	5	30,000		10,000		85,000	2	Bags	10,000	20,000	1	3	30,000						
678	19	1922	Onion	15	5			12,000	5	25,000			25,000	20,000		82,000	7	Gallons	12,000	84,000	3	10	120,000		2				4
679	19	1922	Groundnuts	20	15			9,000								9,000	2	Bags	90,000	180,000	1	3	270,000		2				4
680	19	1922	Tomato	20	10			10,000	5	25,000	5	25,000	25,000			85,000	15	Buckets	12,000	180,000	3	18	216,000		2				4
681	19	1923	Rape	25	15			10,000	10	60,000	5	30,000	10,000			110,000	10	Bags	15,000	150,000	1	11	165,000	2	4	0.3		18	20
682	19	1923	Green maize	50	50				20		20					0	10	Bags	40,000	400,000	2	12	480,000	2	4	0.3		18	20
683	19	1924	Rape	25	10			10,000	15	90,000	5	25,000	10,000			135,000	6	Bags	30,000	180,000	1	7	210,000	2	4			20	60
684	19	1924	Pumpkin leaves	30	10											0	2	Bags	5,000	10,000	1	3	15,000	2	4			20	60
685	19	1924	Okra	25	15				1	15,000	15	75,000	15,000			105,000	3	Buckets	80,000	240,000	1	4	320,000						
686	19	1925	Groundnuts	50	25			15,000						35,000		50,000	3	Bags	60,000	180,000	3	6	360,000		2				8
687	19	1926	Green maize	50	50			22,000	15	75,000		80,000		20,000	32,000	229,000	32	Bags	25,000	800,000	4	36	900,000	1	4	0.3	0.25	30	50
688	19	1926	Pumpkin leaves	50	50											0	3	Bags	5,000	15,000	1	4	20,000	1	4	0.3	0.25	30	50
689	19	1926	Okra	50	50											0	6	Buckets	10,000	60,000	1	7	70,000	1	4	0.3	0.25	30	50
690	19	1926	Groundnuts	25	25			7,000						45,000		52,000	3	Bags	72,000	216,000	1	4	288,000	1	4	0.3	0.25	30	50
691	19	1927	Tomato	20	15				5	30,000	5	25,000	15,000			70,000	12	Buckets	12,000	144,000	10	22	264,000		4		0.50	6	16
692	19	1927	Groundnuts	30	25			20,000						15,000		35,000	5	Bags	54,000	270,000	1	6	324,000		4		0.50	6	16
693	19	1927	Rape	20	15			12,000	30	180,000	5	25,000	40,000			257,000	20	Bags	12,000	240,000	3	23	276,000		4		0.50	6	16
694	19	1928	Tomato	25	10			50,000	5	30,000	5	25,000		35,000		140,000	15	Buckets	12,000	180,000	3	18	216,000	5	4			75	90
695	19	1929	Rape	25	25			2,000	5	30,000						32,000	30	Bags	20,000	600,000	2	32	640,000	2	4	0.3		3	8
696	20	2001	Groundnuts	40	20			10,000								10,000	4	Bags	96,000	384,000	1	5	480,000	100	150	0.3		12	21
697	20	2001	Green maize	60	20				10	50,000	10	20,000				80,000	4	Bags	35,000	140,000	1	5	175,000	100	150	0.3		12	21
698	20	2002	Groundnuts	200	75			150,000						250,000	400,000	800,000	110	Bags	96,000	10,560,000	2	112	10,752,000	400	800			60	120
699	20	2003	Groundnuts	50	50			40,000						50,000	80,000	170,000	12	Bags	65,000	780,000	1	13	845,000	40	100			6	8
700	20	2003	Tomato	25	25				10	40,000	10	30,000	50,000			120,000	7	Buckets	10,000	70,000	2	9	90,000	40	100			6	8
701	20	2000														0				0		0	0						
702	20	2004	Green maize	50	50			75,000	50	50,000	5	50,000			200,000	375,000	80	Bags	25,000	2,000,000	4	84	2,100,000	3	4	1.0		25	40
703	20	2005	Irish Potato	40	35				20	100,000	20	60,000				180,000	15	Bags	90,000	1,350,000	4	19	1,710,000	20	100	0.3		8	20
704	20	2005	Groundnuts	40	35			15,000								15,000	3	Bags	75,000	225,000	1	4	300,000	20	100	0.3		8	20
705	20	2005	Green maize	20	9				5	15,000	5	12,000				27,000	4	Bags	30,000	120,000	1	5	150,000	20	100	0.3		8	20
706	20	2006	Onion	60	16			100,000	20	120,000	20	80,000		45,000	120,000	465,000	15	Bags	120,000	1,800,000	1	16	1,920,000	50	400	0.3		7	30

No.	Scheme ID	Farmer ID	Crop	Area, m X (Declared)	Area, m Y (Declared)	Area, m X (Measured)	Area, m Y (Measured)	Input, ZMK Seeds ZMK	D Compound Kg	D Compound ZMK	Urea Kg	Urea ZMK	Pesticide ZMK	Labor ZMK	Transport ZMK	Total ZMK	Harvest Sold Volume	Unit	Unit Price (ZMK)	Cash Income (ZMK)	Consumed Volume	Total Production	Value of all production	Chemical Fertilizer Before (kg)	Chemical Fertilizer After (kg)	Chitemene Before (lima)	Chitemene After (lima)	Rainfed Maize Before (bag)	Rainfed Maize After (bag)
707	20	2006	Groundnuts	96	64			105,000						200,000		305,000	25	Bags	96,000	2,400,000	4	29	2,784,000	50	400	0.3		7	30
708	20	2007	Green maize	50	25			25,000	15	75,000	15	60,000				160,000	16	Bags	35,000	560,000	2	18	630,000		300	0.3		20	50
709	20	2007	Amaranth	50	25				10	40,000	10	30,000		60,000		130,000	350	Bundles	500	175,000	50	400	200,000		300	0.3		20	50
710	20	2007	Irish Potato	25	25			10,000	5	25,000	5	20,000				55,000	10	Bags	40,000	400,000	1	11	440,000		300	0.3		20	50
711	20	2008	Groundnuts	50	50			24,000						10,000	24,000	58,000	10	Bags	70,000	700,000	1	11	770,000	20	40	0.3		3	5
712	20	2008	Green maize	50	15				15	75,000	5	20,000				95,000	4	Bags	25,000	100,000	1	5	125,000	20	40	0.3		3	5
713	20	2009	Groundnuts	35	15			12,000						20,000		32,000	3	Bags	84,000	252,000	1	4	336,000	50	100			4	10
714	20	2010	Cabbage	30	25			125,000	50	50,000	20	60,000	15,000		225,000	475,000	65	Bags	25,000	1,625,000	11	76	1,900,000	100	400			17	70
715	20	2011	Groundnuts	200	42			75,000						40,000	168,000	283,000	21	Bags	96,000	2,016,000	5	26	2,496,000	40	100	0.3	0.25	4	8
716	20	2012	Cabbage	30	15			100,000	20	140,000	15	60,000	150,000		200,000	650,000	40	Bags	20,000	800,000	2	42	840,000	20	300	0.3	0.25	10	35
717	20	2012	Tomato	30	15				10	40,000	5	20,000	70,000		30,000	160,000	6	Crates	40,000	240,000	2	8	320,000	20	300	0.3	0.25		
718	20	2012	Irish Potato	50	8				5	25,000	5	20,000				45,000	8	Bags	120,000	960,000	1	9	1,080,000	20	300	0.3	0.25		
719	20	2013	Groundnuts	50	50			45,000						50,000	100,000	195,000	15	Bags	70,000	1,050,000	4	19	1,330,000	100	150	1.0		6	10
720	20	2013	Rape	20	13			2,000	5	25,000						27,000	7	Bags	15,000	105,000	1	8	120,000	100	150	1.0		6	10
721	20	2014	Groundnuts	50	50			40,000						30,000	60,000	130,000	15	Bags	64,000	960,000	2	17	1,088,000	20	50	1.0	2.00	4	8
722	20	2015	Groundnuts	180	60			40,000						130,000	200,000	370,000	9	Bags	96,000	864,000	1	10	960,000	100	350			8	36
723	20	2016	Rape	20	15			25,000	5	27,000	5	15,000	14,000		12,000	93,000	7	Bags	15,000	105,000	3	10	150,000	60	100	0.3	1.00	8	20
724	20	2016	Tomato	20	15			25,000	20	160,000	15	45,000	60,000		88,000	378,000	18	Crates	45,000	810,000	4	22	990,000	60	100	0.3	1.00	8	20
725	20	2016	Groundnuts	30	18			20,000						15,000	35,000	70,000	12	Bags	96,000	1,152,000	1	13	1,248,000	60	100	0.3	1.00	8	20
726	20	2017	Groundnuts	50	50			60,000							500,000	560,000	50	Bags	96,000	4,800,000	2	52	4,992,000	400	800	0.3	0.25	30	50
727	20	2018	Green maize	50	25				50	50,000	50	50,000			300,000	400,000	30	Bags	30,000	900,000	3	33	990,000	200	800	0.3	0.25	70	100
728	20	2018	Groundnuts	100	50			120,000							200,000	320,000	30	Bags	80,000	2,400,000	5	35	2,800,000	200	800	0.3	0.25	70	100
729	20	2018	Cabbage	50	25			165,000	50	230,000	40	160,000	80,000		250,000	885,000	110	Bags	25,000	2,750,000	2	112	2,800,000	200	800	0.3	0.25	70	100
730	20	2019	Cabbage	50	50			135,000	50	180,000	15	45,000	55,000		270,000	685,000	70	Bags	30,000	2,100,000	2	72	2,160,000	15	100	0.3	0.25	2	3
731	20	2019	Green maize	75	5				10	40,000	10	30,000				70,000	8	Bags	50,000	400,000	3	11	550,000						
732	20	2020	Groundnuts	75	6			48,000							140,000	188,000	14	Bags	96,000	1,344,000	1	15	1,440,000	15	50	0.3	0.25	1	2
733	20	2020	Tomato	45	20				5	25,000						25,000	5	Crates	30,000	150,000	1	6	180,000			0.3	0.25		
734	20	2021	Rape	20	5			5,000	5	25,000	5	20,000	15,000			65,000	200	Bundles	500	100,000	50	250	125,000	20	100	0.3		2	5
735	20	2021	Groundnuts	60	25			75,000								75,000	6	Bags	112,000	672,000	1	7	784,000	20	100	0.3		2	5
736	20	2021	Irish potato	30	10			10,000	5	25,000	5	20,000				55,000	2	Bags	100,000	200,000	1	3	300,000	20	100	0.3	0.25	2	5
737	20	2022	Groundnuts	50	8			30,000								30,000	5	Bags	98,000	490,000	1	6	588,000	20	30	0.3	0.25	4	30
738	20	2023	Green maize	65	25				50	190,000	50	140,000			200,000	530,000	40	Bags	50,000	2,000,000	1	41	2,050,000		200				30
739	20	2023	Cabbage	25	10			80,000	20	100,000	20	60,000	30,000	35,000	200,000	505,000	40	Bags	25,000	1,000,000	1	41	1,025,000		200				30
740	20	2024	Green maize	50	20			45,000	30	150,000	30	102,000			60,000	357,000	9	Bags	25,000	225,000	2	11	275,000	35	400	0.3	0.25	5	10
741	20	2025	Groundnuts	65	5			24,000							24,000	48,000	6	Bags	96,000	576,000	1	7	672,000		20				8
742	20	2025	Green maize	70	5				15	45,000	10	24,000			36,000	105,000	6	Bags	18,000	108,000	1	7	126,000		20				8
743	20	2026	Irish potato	50	10			30,000	10	40,000	10	30,000			48,000	148,000	6	Bags	120,000	720,000	1	7	840,000		20			10	12
744	20	2026	Groundnuts	100	10			36,000							40,000	76,000	5	Bags	96,000	480,000	2	7	672,000		20			10	12
745	20	2027	Groundnuts	50	5			15,000							32,000	47,000	4	Bags	84,000	336,000	1	5	420,000	5	15				5
746	20	2028	Groundnuts	50	6			10,000							40,000	50,000	5	Bags	120,000	600,000	1	6	720,000	5	100			5	12
747	21	2101	Rape	35	15			40,000	15	75,000	20	80,000	80,000			275,000	6	90kg bags	65,000	390,000	1	7	455,000		100	0.3		2	
748	21	2101	Green maize	50	25				10	80,000	10	40,000				120,000	5	Bags	45,000	225,000	2	7	315,000		100	0.3		2	
749	21	2102	Green maize	50	42			55,000	20	100,000	20	80,000		50,000	60,000	345,000	7	Bags	50,000	350,000	2	9	450,000	10	20	0.3		20	
750	21	2102	Rape	30	30			20,000	10	80,000	10	40,000	40,000	30,000	58,000	268,000	6	90kg bags	150,000	900,000	1	7	1,050,000	10	20	0.3		20	
751	21	2103	Tomato	30	20			35,000	15	75,000	10	40,000	165,000			315,000	35	Crates	40,000	1,400,000	3	38	1,520,000	6	26			50	100
752	21	2103	Rape	30	20			70,000	20	100,000	20	80,000				250,000	15	90kg bags	60,000	900,000	2	17	1,020,000	6	26			50	100
753	21	2103	Chinese Cabbage	20	10			5,000	10	80,000	10	40,000				125,000	8	90kg bags	50,000	400,000	1	9	450,000	6	26			50	100
754	21	2104	Green maize	30	30			45,000	20	100,000	20	60,000				225,000	3	90kg bags	100,000	300,000	1	4	400,000	4	8	0.3		3	7
755	22	2201	Tomato	30	30			10,000	10	60,000	5	20,000				90,000	5	Baskets	12,000	60,000	1	6	72,000	2	4	0.3		6	10
756	22	2201	Rape	20	10			5,000	5	30,000	1	10,000				45,000	10	Baskets	15,000	150,000	2	12	180,000	2	4	0.3		6	10
757	22	2202	Tomato	15	20			9,000	1	15,000	1	15,000				39,000	4	Baskets	20,000	80,000	1	5	100,000		4	0.3	0.25		20
758	22	2202	Rape	20	10			8,000	1	12,000	1	12,000				32,000	6	Bags	28,000	168,000	1	7	196,000		4	0.3	0.25		20
759	22	2203	Green maize	25	25			10,000	10	60,000	10	10,000				80,000	15	Bags	15,000	225,000	2	17	255,000	2	8	0.5	0.25	10	50
760	22	2203	Groundnuts	25	25			20,000								20,000	5	Bags	30,000	150,000	1	6	180,000	2	8	0.5	0.25	10	50
761	22	2204	Green maize	50	50			5,000								5,000	2	Bags	15,000	30,000	1	3	45,000			1.0		6	10
762	22	2205	Rape	25	25			10,000	5	30,000	1	15,000				55,000	6	Baskets	15,000	90,000	1	7	105,000		25	0.5	0.50		5
763	22	2206	Egg plants	25	25			15,000	1	15,000	1	10,000				40,000	6	Baskets	22,000	132,000	1	7	154,000	20	2	0.3	0.25	3	6
764	22	2207	Tomato	25	25			15,000	5	25,000	5	20,000	15,000			75,000	10	Baskets	20,000	200,000	2	12	240,000	5	10	1.0	1.00		
765	22	2207	Rape	25	25			15,000	5	25,000	5	20,000	30,000			90,000	10	Baskets	28,000	280,000	2	12	336,000	5	10	1.0	1.00		
766	22	2208	Cabbage	50	25			20,000	10	50,000	10	40,000	20,000			130,000	11	Bags	30,000	330,000	1	12	360,000	2	4	1.0	1.00	5	12
767	22	2208	Tomato	25	15			15,000	5	25,000	5	20,000	20,000			80,000	15	Baskets	25,000	375,000	2	17	425,000	2	4	1.0	1.00	5	12
768	22	2209	Green maize	25	25				1					10,000		10,000	3	Bags	10,000	30,000	1	4	40,000						
769	22	2210	Irish Potato	30	10			10,000	5	25,000	5	20,000				55,000	8	Gallons	10,000	80,000	2	10	100,000		15	1.0	1.00		15
770	22	2210	Rape	10	5			3,000	1	10,000						13,000	5	Baskets	10,000	50,000	2	7	70,000		15	1.0	1.00		15

No.	Scheme ID	Farmer ID	Crop	Area, m: X (Declared)	Area, m: Y (Declared)	Area, m: X (Measured)	Area, m: Y (Measured)	Input, ZMK: Seeds ZMK	D Compound Kg	D Compound ZMK	Urea Kg	Urea ZMK	Pesticide ZMK	Labor ZMK	Transport ZMK	Total ZMK	Harvest Sold: Volume	Unit	Unit Price (ZMK)	Cash Income (ZMK)	Consumed Volume	Total Production	Value of all production	Chemical Fertilizer: Before (kg)	Chemical Fertilizer: After (kg)	Chitemene: Before (lima)	Chitemene: After (lima)	Rainfed Maize: Before (bag)	Rainfed Maize: After (bag)
771	22	2211	Green maize	100	100			120,000	100	400,000	100	300,000		200,000		1,020,000	90	Bags	50,000	4,500,000	1	91	4,550,000	16	28			100	200
772	22	2211	Tomato	100	100			50,000	50	200,000	10	30,000	500,000	200,000		980,000	400	Baskets	30,000	12,000,000	6	406	12,180,000	16	28			100	200
773	22	2211	Irish Potato	50	25			60,000	10	40,000	5	15,000	65,000	60,000		240,000	100	Gallons	10,000	1,000,000	10	110	1,100,000	16	28			100	200
774	22	2212	Green maize	50	25			30,000	20	120,000	15	75,000				225,000	8	Bags	50,000	400,000	2	10	500,000	2	6	1.0	3.00	12	19
775	22	2213	Tomato	12	12			5,000	10	60,000	5	25,000	18,000			108,000	5	Baskets	24,000	120,000	1	6	144,000	6	8			11	15
776	22	2213	Rape	12	12			5,000	5	30,000	5	25,000	18,000			78,000	7	Baskets	12,000	84,000	2	9	108,000	6	8			11	15
777	23	2301	Rape	30	20			10,000	30	45,000	10	40,000	25,000			120,000	25	Baskets	25,000	625,000	4	29	725,000	20	30	1.0	1.50	3	5
778	23	2301	Tomato	30	20			10,000	30	45,000	10	40,000	45,000			140,000	15	Baskets	20,000	300,000	3	18	360,000	20	30	1.0	1.50	3	5
779	23	2302	Cabbage	30	25			50,000	15	75,000	15	75,000	50,000	50,000		300,000	10	Bags	35,000	350,000	2	12	420,000	4	12	0.3	0.50	10	30
780	23	2302	Tomato	30	25			50,000	15	75,000	15	75,000	75,000	20,000		295,000	20	Baskets	90,000	1,800,000	2	22	1,980,000	4	12	0.3	0.50	10	30
781	23	2302	Green maize	50	50			130,000	50	150,000	50	50,000		100,000		430,000	30	Bags	250,000	7,500,000	2	32	8,000,000	4	12	0.3	0.50	10	30
782	23	2303	Green maize	50	50			65,700	50	55,000	50	55,000		100,000		275,700	20	Bags	90,000	1,800,000	2	22	1,980,000	4	12	0.3	0.25	10	45
783	23	2303	Tomato	50	50			25,000	15	75,000	15	75,000	120,000	120,000	20,000	435,000	50	Bags	80,000	4,000,000	2	52	4,160,000	4	12	0.3	0.25	10	45
784	23	2303	Cabbage	25	25			10,000	1	12,500	5	25,000	12,500	10,000	5,000	75,000	12	Bags	25,000	300,000	1	13	325,000	4	12	0.3	0.25	10	45
785	23	2303	Rape	25	25			25,000	10	50,000	10	50,000	35,000	45,000	15,000	220,000	35	Bags	35,000	1,225,000	2	37	1,295,000	4	12	0.3	0.25	10	45
786	23	2303	Onion	25	25			150,000	20	100,000	20	100,000		75,000	50,000	475,000	200	Gallons	10,000	2,000,000	4	204	2,040,000	4	12	0.3	0.25	10	45
787	23	2303	Chinese Cabbage	25	25			25,000	10	50,000	10	50,000	45,000	25,000	25,000	220,000	40	Bags	45,000	1,800,000	3	43	1,935,000						
788	23	2304	Rape	50	25			3,000	15	75,000	5	35,000	70,000	80,000	15,000	278,000	20	Bags	15,000	300,000	5	25	375,000		6				30
789	23	2305	Rape	30	30			70,000	30	120,000	15	105,000	120,000	40,000	50,000	505,000	40	Baskets	80,000	3,200,000	15	55	4,400,000	6	20	1.0	0.25	10	20
790	23	2305	Green maize	30	30				30	120,000	15	105,000		105,000	150,000	480,000	30	Bags	90,000	2,700,000	2	32	2,880,000	6	20	1.0	0.25	10	20
791	23	2305	Cabbage	50	25			100,000	30	120,000	20	80,000	50,000	80,000	100,000	530,000	20	Bags	20,000	400,000	2	22	440,000	6	20	1.0	0.25	10	20
792	23	2305	Tomato	20	20			50,000	10	80,000	5	35,000	35,000			200,000	13	Baskets	20,000	260,000	1	14	280,000	6	20	1.0	0.25	10	20
793	23	2305	Onion	20	15				5	40,000	10	70,000		20,000		130,000	15	Gallons	10,000	150,000	2	17	170,000	6	20	1.0	0.25	10	20
794	23	2306	Cabbage	50	50			25,000	20	140,000	15	102,000	75,000	100,000		442,000	22	Bags	28,000	616,000	1	23	644,000	2	4			12	28
795	23	2306	Tomato	50	25			25,000	20	140,000	10	70,000	50,000			285,000	53	Baskets	15,000	795,000	5	58	870,000	2	4			12	28
796	23	2307	Rape	50	25			20,000	15	90,000	30	150,000	40,000	100,000	30,000	430,000	30	Baskets	25,000	750,000	3	33	825,000	4	8	2.0		10	50
797	23	2307	Green maize	50	25										40,000	40,000	20	Bags	90,000	1,800,000	3	23	2,070,000	4	8	2.0			
798	23	2307	Tomato	40	20			5,000	10	60,000	10	50,000				115,000	25	Baskets	15,000	375,000	3	28	420,000	4	8	2.0			
799	23	2307	Cabbage	40	20			5,000	10	60,000	10	50,000	40,000	15,000		170,000	15	Bags	20,000	300,000	1	16	320,000						
800	24	2401	Tomato	75	30	62	36	25,000	20	80,000	15	60,000	120,000		200,000	485,000	20	Crate	20,000	400,000	2	22	440,000	2	100	2.0	1.00	5	15
801	24	2401	Okra	15	10	30	28	15,000	5	15,000	5	10,000				40,000	20	Baskets	8,000	160,000	2	22	176,000	2	100	2.0	1.00	5	15
802	24	2402	Tomato	50	25	37	31	30,000	100	100,000	100	90,000	30,000			250,000	21	Crates	15,000	315,000	3	24	360,000	100	400	3.0	1.50	15	18
803	24	2402	Irish Potato	25	20	26	25	30,000	10	50,000	5	18,000	15,000		30,000	143,000	3	Bags	60,000	180,000	1	4	240,000	100	400	3.0	1.50	15	18
804	24	2403	Irish Potato	50	50	41	33	20,000					8,000			28,000	2	Bags	90,000	180,000	1	3	270,000		100	2.0	2.00	9	12
805	24	2403	Beans	50	50	50	43	30,000								30,000	2	Bags	12,000	24,000	1	3	36,000		100	2.0	2.00	9	12
806	24	2404	Egg plants	50	25	44	40		10	40,000	10	34,000				74,000	6	Bags	30,000	180,000	1	7	210,000	100	100	2.0	1.50		4
807	24	2404	Groundnuts	25	25	28	13		10	40,000	10	34,000				74,000	3	Bags	72,000	216,000	1	4	288,000	50	100	2.0	1.00	4	
808	24	2405	Groundnuts	25	25	28	13									0	3	Bags	72,000	216,000	1	4	288,000	50	100	2.0	1.00	2	4
809	25	2501	Tomato	56	50	67	49	58,000	100	500,000	100	400,000	660,000	65,000	1,900,000	3,583,000	148	Crates	40,000	5,920,000	15	163	6,520,000		3				40
810	25	2501	Green maize	50	50	67	49	65,000			100	400,000		65,000		530,000	10	Bags	70,000	700,000	2	12	840,000		3				
811	25	2502	Tomato	50	50	92	22	45,000	100	400,000	50	325,000	530,000	180,000	400,000	1,980,000	65	Crates	25,000	1,625,000	20	85	2,125,000	8	12			45	100
812	25	2502	Cabbage	25	25	92	11	110,000	50	250,000	50	190,000	215,000	60,000	150,000	975,000	29	Bags	50,000	1,450,000	10	39	1,950,000	8	12				
813	25	2503	Tomato	50	25	50	25	90,000	50	130,000	50	115,000	140,000	100,000		575,000	65	Crates	35,000	2,275,000	1	66	2,310,000	2	5	0.3			30
814	25	2504	Tomato	25	25	67	12	25,000	15	75,000	10	40,000	85,000	50,000		275,000	70	Crates	35,000	2,450,000	5	75	2,625,000	6	8			30	26
815	25	2505	Tomato	50	50	50	50	35,000	50	280,000	50	150,000	305,000	90,000	250,000	1,110,000	50	Crates	20,000	1,000,000	4	54	1,080,000	2	2			25	15
816	25	2506	Tomato	50	25	50	25	25,000	20	100,000	10	40,000	60,000	25,000	165,000	415,000	55	Crates	25,000	1,375,000	4	59	1,475,000	4	8			30	55
817	25	2507	Cabbage	50	25	48	34	120,000	20	100,000	25	125,000	50,000	30,000	240,000	665,000	60	Bags	25,000	1,500,000	4	64	1,600,000	8	4			30	18
818	25	2507	Tomato	25	25	30	20	40,000	20	100,000	20	80,000	70,000	25,000	75,000	390,000	25	Crates	25,000	625,000	3	28	700,000	8	4			30	18
819	25	2508	Cabbage	30	20	22	13	15,000	10	50,000	10	40,000	37,500		72,000	214,500	18	Bags	25,000	450,000	1	19	475,000		2				15
820	25	2509	Tomato	25	25	50	25	50,000	50	180,000	50	165,000	120,000		296,000	811,000	45	Crates	40,000	1,800,000	3	48	1,920,000	3	2			15	12
821	25	2509	Rape	50	25	47	10	16,000	20	120,000	10	30,000	35,000			201,000	10	Bags	30,000	300,000	2	12	360,000	3	2			15	12
822	25	2510	Egg plants	50	15	55	20	15,000	35	175,000		80,000	70,000	40,000		380,000	12	Bags	97,500	1,170,000	3	15	1,462,500	2	1			18	10
823	25	2510	Onion	50	25			135,000	100	270,000	100	240,000	35,000	70,000	190,000	940,000	18	Bags	280,000	5,040,000	6	24	6,720,000	2	1			18	10
824	25	2510	Tomato	25	25	25	25	35,000	50	145,000	30		150,000	40,000		370,000	18	Crates	15,000	270,000	20	38	570,000	2	1			18	10
825	25	2510	Green maize	50	25	58	19		50	145,000	50	150,000		50,000		345,000	12	Bags	38,000	456,000	2	14	532,000	2	1			19	10
826	25	2511	Tomato	50	25	56	19	35,000	20	80,000	10	50,000	100,000	60,000		325,000	80	Crates	30,000	2,400,000	2	82	2,460,000	4	8				12
827	25	2512	Tomato	50	25	65	20	50,000	100	300,000	100	260,000	180,000	60,000	270,000	1,120,000	80	Crates	25,000	2,000,000	3	83	2,075,000	20	6			6	60
828	26	2601	Cabbage	19	14	18	17	11,000	5	30,000	5	25,000	10,000			76,000	3	Bags	35,000	105,000	1	4	140,000	4	8	1.0	1.00	10	20
829	26	2601	Green maize	69	48	55	17	45,000	20	120,000	25	125,000		70,000		380,000	17	Bags	45,000	765,000	2	19	855,000	4	8	1.0	1.00	10	20
830	26	2602	Rape	30	9	25	6	5,000	5		5		12,000			17,000	30	Bags	10,000	300,000	2	32	320,000		4				
831	26	2602	Green maize	60	41	44	20	60,000	25		25				50,000	110,000	20	Bags	20,000	400,000	8	28	560,000		4				
832	26	2603	Green maize	33	24	42	20		25		25			20,000	50,000	70,000	5	Bags	45,000	225,000	2	7	315,000	8	10	1.0	1.00	36	45
833	26	2603	Groundnuts	42	20	33	18							12,000		12,000	2	Bags	72,000	144,000	1	3	216,000	8	10	1.0	1.00	36	45
834	26	2604	Green maize	50	30	47	21	40,000	20	120,000	25	125,000			50,000	335,000	10	Bags	30,000	300,000	2	12	360,000		4	1.0	0.25		7

No.	Scheme ID	Farmer ID	Crop	Area, m X (Declared)	Area, m Y (Declared)	Area, m X (Measured)	Area, m Y (Measured)	Input, ZMK Seeds ZMK	D Compound Kg	D Compound ZMK	Urea Kg	Urea ZMK	Pesticide ZMK	Labor ZMK	Transport ZMK	Total ZMK	Harvest Sold Volume	Unit	Unit Price (ZMK)	Cash Income (ZMK)	Consumed Volume	Total Production	Value of all production	Chemical Fertilizer Before (kg)	Chemical Fertilizer After (kg)	Chitemene Before (lima)	Chitemene After (lima)	Rainfed Maize Before (bag)	Rainfed Maize After (bag)
935	26	2604	Tomato	60	8	47	4	6,000	30							6,000	5	Buckets	20,000	100,000	1	6	120,000		4	1.0	0.25		7
936	26	2605	Green maize	49	30	38	23	45,000	20	120,000	25	125,000		40,000		330,000	9	Bags	35,000	315,000	3	12	420,000	4	6	2.0	1.00	15	20
937	26	2605	Groundnuts	50	27	41	9							15,000		15,000	3	Bags	72,000	216,000	1	4	288,000	4	6	2.0	1.00	15	20
938	26	2606	Groundnuts	36	10	34	11									0	4	Buckets	12,000	48,000	1	5	60,000		4	0.3			10
939	26	2607	Green maize	50	20	58	21	57,500	20	100,000	20	80,000			55,000	292,500	5	Bags	30,000	150,000	2	7	210,000		4				11
940	26	2607	Tomato	50	4	50	4		5	25,000	5	20,000				45,000	4	Buckets	15,000	60,000	1	5	75,000		4				11
941	26	2607	Bean leaves	20	4	20	4	15,000	1	5,000	1	5,000				25,000	10	Plates	500	5,000	3	13	6,500		4				11
942	26	2607	Groundnuts	49	8	56	16	16,000						4,000		20,000	1	Bag	72,000	72,000	1	2	144,000		4				11
943	26	2608	Green maize	50	27	33	31	57,500	20	100,000	20	88,000			30,000	275,500	12	Bags	30,000	360,000	1	13	390,000	2	4	0.3		30	
944	26	2608	Beans	50	27	33	31	15,000								15,000	3	Gallons	20,000	60,000	1	4	80,000	2	4	0.3		30	
945	26	2609	Groundnuts	60	8	50	6	15,000								15,000	1	90kg bag	144,000	144,000	1	2	288,000	2	4	0.3	0.25	15	30
946	26	2609	Green maize	48	15	50	18		15		15					0	12	90kg bag	35,000	420,000	1	13	455,000	2	4	0.3	0.25	15	30
947	26	2610	Groundnuts	38	7	42	12	15,000	15		15			60,000		75,000	1	Bag	72,000	72,000	1	2	144,000		4	0.3	0.25		30
948	27	2701	Rape	39	6	42	6	3,000	20	100,000	10	30,000	32,000			165,000	12	Bags	40,000	480,000	2	14	560,000	1	8	3.0	1.00	16	36
949	27	2701	Chinese cabbage	50	8	47	6	3,000	20	100,000			16,000			119,000	11	Bags	40,000	440,000	3	14	560,000	1	8	3.0	1.00	16	36
950	27	2702	Tomato	70	15	64	14	30,000	50	175,000	50	140,000	285,000			630,000	50	Buckets	20,000	1,000,000	5	55	1,100,000	2	4			43	60
951	27	2702	Green maize	70	8	64	9		20	60,000	20	55,000				115,000	3	50kg bags	35,000	105,000	17	20	700,000	2	4			43	60
952	27	2703	Tomato	50	30	66	14	35,000	5	25,000			100,000			160,000	115	Buckets	20,000	2,300,000	5	120	2,400,000	2	6	1.0	1.00	20	40
953	27	2704	Green maize	50	50	65	18		50	250,000	50	150,000				400,000	20	Bags	45,000	900,000	2	22	990,000	8	16	0.5		45	80
954	27	2705	Green maize	40	30	35	20		15	75,000	25	65,000		30,000		190,000	10	Bags	40,000	400,000	6	16	640,000	2	4			10	15
955	27	2706	Green maize	50	50	76	45	88,000	50	180,000	50	172,000		80,000	60,000	580,000	24	Bags	65,000	1,560,000	5	29	1,885,000	20	2	0.5		8	26
956	27	2707	Tomato	25	25	30	20	15,000	30	180,000			90,000			285,000	12	Buckets	20,000	240,000	5	17	340,000	4	6			30	50
957	27	2707	Green maize	25	25	28	23		10	50,000	10	30,000				80,000	7	Bags	45,000	315,000	2	9	405,000	4	6			30	50
958	27	2707	Rape	25	25	20	15	25,000	15	90,000			12,000	15,000		142,000	500	Bundles	500	250,000	20	520	260,000						
959	27	2708	Green maize	100	50	80	45		100	330,000	100	290,000		150,000	50,000	820,000	74	Bags	45,000	3,330,000	10	84	3,780,000	20	10	0.5		1	50
960	27	2708	Rape	10	10	15	9	5,000	30	180,000			45,000			230,000	600	Bundles	500	300,000	100	700	350,000	20	10	0.5		1	50
961	27	2708	Tomato	25	25	30	20	60,000	20	120,000			180,000			360,000	80	Buckets	20,000	1,600,000	15	95	1,900,000	20	10	0.5		1	50
962	27	2709	Green maize	100	50	90	30		40	240,000	30	120,000		70,000		430,000	20	Bags	45,000	900,000	3	23	1,035,000	2	6	1.0	0.25	16	60
963	27	2709	Egg Plants	15	10	11	7	5,000			10	40,000	9,000			54,000	150	Fruits	1,000	150,000	70	220	220,000	2	6	1.0	0.25	16	60
964	27	2710	Green maize	30	15	25	20		5	25,000	5	20,000				45,000	6	Bags	35,000	210,000	1	7	245,000	25	1	0.3		6	10
965	27	2711	Green maize	50	15	38	22		5	30,000	5	20,000				50,000	3	Bags	35,000	105,000	1	4	140,000	2	4				7
966	27	2711	Rape	20	15	14	12	3,000		5,000	2	5,000	3,500			16,500	300	Bundles	500	150,000	20	320	160,000						
967	27	2712	Green maize	20	15	60	25		10	50,000	10	50,000				100,000	8	Bags	50,000	400,000	1	9	450,000	1	2	0.5		39	45

No.	Scheme ID	Farmer ID	Crop	Area Declared (Lima)	Area Measured (Lima)	Cultivated Area Amended (ZMK/Lima)				Ratio Sold	Increase (%)			Composition of the Cost						Labor Use (1: use)	Fertilizer per lima				Where to Sell
						Area (92.6%)	Cost	Income	Profit		Fertilizer	Chitemene	Rainfed Maize	Seeds	D Compound	Urea	Pesticide	Labor	Transport		D Compound		Urea		
																					Kg	ZMK	Kg	ZMK	
1	1	101	Groundnuts	1.00	0.00	0.93	93,000	241,900	158,000	89%	-	-	-	62%	0%	0%	0%	38%	0%	1	0	0	0	0	1
2	1	101	Tomato	0.25	0.00	0.23	306,500	1,108,700	802,200	76%	-	-	-	11%	35%	17%	9%	28%	0%	1	22	108,696	13	52,174	1
3	1	101	Egg Plants	0.04	0.00	0.04	230,000	1,750,000	1,520,000	71%	-	-	-	13%	38%	27%	22%	0%	0%	0	25	87,500	25	62,500	1
4	1	102	Groundnuts	3.00	0.00	2.78	151,100	3,263,300	3,112,200	7%	-	-	-	29%	0%	0%	0%	48%	24%	1	0	0	0	0	1
5	1	102	Tomato	0.12	0.00	0.11	2,045,500	3,927,300	1,881,800	83%	-	-	-	16%	44%	0%	18%	22%	0%	1	0	909,091	0	0	1
6	1	102	Rape	0.02	0.00	0.02	4,500,000	3,750,000	-750,000	67%	-	-	-	6%	67%	0%	11%	17%	0%	1	500	3,000,000	0	0	1
7	1	102	Pumpkin leaves	0.04	0.00	0.04	250,000	1,250,000	1,000,000	80%	-	-	-	0%	0%	0%	0%	100%	0%	1	0	0	0	0	1
8	1	102	Cucumber	0.01	0.00	0.01	500,000	12,000,000	11,500,000	75%	-	-	-	0%	0%	0%	0%	100%	0%	1	0	0	0	0	1
9	1	103	Green maize	0.50	0.00	0.46	907,600	2,358,700	1,451,100	97%	-	-	-	8%	22%	17%	0%	30%	24%	1	54	195,652	54	152,174	1
10	1	104	Green maize	0.32	0.00	0.30	1,141,700	4,800,000	3,658,300	97%	-	-	-	9%	26%	20%	0%	29%	15%	1	83	300,000	83	233,333	1
11	1	104	Beans	0.50	0.00	0.46	271,700	1,095,700	824,000	67%	-	-	-	4%	48%	0%	0%	48%	0%	1	0	130,435	0	0	1
12	1	104	Pumpkin leaves	0.12	0.00	0.11	0	636,400	636,400	71%	-	-	-							0	0	0	0	0	1
13	1	104	Groundnuts	0.08	0.00	0.07	0	685,700	685,700	75%	-	-	-							0	0	0	0	0	1
14	1	105	Green maize	0.50	0.00	0.46	271,700	912,000	641,300	90%	-	-	-	4%	49%	48%	0%	0%	0%	0	22	130,435	22	130,435	1
15	1	105	Pumpkin leaves	0.06	0.00	0.06	0	1,000,000	1,000,000	58%	-	-	-							0	0	0	0	0	1
16	1	105	Groundnuts	0.48	0.00	0.44	125,000	602,300	477,300	85%	-	-	-	45%	0%	0%	0%	55%	0%	1	0	0	0	0	1
17	1	106	Green maize	0.25	0.00	0.23	673,900	543,500	-130,400	80%	-	-	-	10%	58%	32%	0%	0%	0%	0	65	391,304	43	217,391	3
18	1	107	Green maize	0.15	0.00	0.14	1,000,000	892,900	-107,100	80%	-	-	-	0%	64%	36%	0%	0%	0%	0	107	642,857	71	357,143	3
19	1	108	Onion	0.25	0.00	0.23	739,100	3,608,700	2,869,600	96%	-	-	-	47%	53%	0%	0%	0%	0%	0	65	391,304	0	0	1
20	1	109	Green maize	0.25	0.00	0.23	673,900	434,800	-239,100	75%	-	-	-	10%	58%	32%	0%	0%	0%	0	65	391,304	43	217,391	1
21	1	109	Beans	0.25	0.00	0.23	0	217,400	217,400	50%	-	-	-							0	0	0	0	0	1
22	1	110	Groundnuts	1.00	0.00	0.93	53,800	989,200	935,400	98%	-	-	-	60%	0%	0%	0%	40%	0%	1	0	0	0	0	2
23	1	111	Groundnuts	0.25	0.00	0.23	82,600	1,265,200	1,182,600	93%	-	-	-	0%	0%	0%	0%	0%	100%	0	0	0	0	0	2
24	1	112	Green maize	0.12	0.00	0.11	563,600	2,454,500	1,890,900	83%	-	-	-	0%	73%	27%	0%	0%	0%	0	91	409,091	45	154,545	2
25	1	113	Green maize	0.06	0.00	0.06	1,000,000	2,333,300	1,333,300	75%	-	-	-	0%	58%	42%	0%	0%	0%	0	0	583,333	0	416,667	2
26	2	201	Green maize	0.25	0.00	0.23	1,552,200	1,434,800	-117,400	91%	-	-	-	0%	48%	42%	10%	0%	0%	0	217	747,826	217	652,174	2
27	2	201	Tomato	0.25	0.00	0.23	1,347,800	2,717,400	1,369,600	80%	-	-	-	8%	0%	0%	81%	11%	0%	1	0	0	0	0	3
28	2	202	Tomato	0.50	0.00	0.46	615,200	2,237,000	1,721,800	81%	-	-	-	11%	35%	14%	26%	14%	0%	1	43	217,391	22	96,957	3
29	2	202	Rape	0.04	0.00	0.04	3,300,000	5,750,000	2,450,000	87%	-	-	-	2%	57%	15%	11%	15%	0%	1	375	1,875,000	125	500,000	3
30	2	203	Tomato	1.00	0.00	0.93	150,500	1,182,800	1,032,300	91%	-	-	-	21%	36%	43%	0%	0%	0%	0	54	53,763	16	64,516	3
31	2	204	Green maize	2.25	0.00	2.08	262,500	232,700	-29,800	82%	-	-	-	3%	45%	29%	0%	15%	8%	1	36	118,750	24	76,923	3
32	2	204	Onion	0.10	0.00	0.09	966,700	2,933,300	1,966,600	67%	-	-	-	17%	29%	17%	14%	23%	0%	1	56	277,778	56	166,667	3
33	2	204	Tomato	0.24	0.00	0.22	540,900	763,600	222,700	76%	-	-	-	21%	21%	13%	28%	17%	0%	1	23	113,636	23	68,182	3
34	2	204	Rape	0.10	0.00	0.09	1,222,200	2,933,300	1,711,100	70%	-	-	-	11%	23%	14%	35%	16%	0%	1	56	277,778	56	166,667	3
36	2	205	Green maize	2.25	0.00	2.08	202,400	706,700	504,300	90%	-	-	-	3%	41%	36%	0%	20%	0%	1	24	82,692	24	72,115	2
37	2	206	Green maize	1.00	0.00	0.93	439,800	1,430,100	990,300	87%	-	-	-	2%	42%	37%	0%	20%	0%	1	54	184,946	54	161,290	2
38	2	207	Green maize	0.25	0.00	0.23	1,456,500	1,826,100	369,600	79%	-	-	-	2%	51%	45%	0%	2%	0%	1	217	747,826	217	652,174	2
39	2	208	Tomato	0.10	0.00	0.09	2,077,800	6,666,700	4,588,900	83%	-	-	-	8%	40%	0%	36%	16%	0%	1	167	833,333	0	0	3
40	2	208	Rape	0.08	0.00	0.07	957,100	400,000	-557,100	64%	-	-	-	7%	75%	0%	18%	0%	0%	0	143	714,286	0	0	3
41	2	209	Tomato	0.25	0.00	0.23	652,200	2,282,600	1,630,400	86%	-	-	-	17%	33%	13%	13%	23%	0%	1	43	217,391	22	86,957	3
42	2	209	Green maize	0.25	0.00	0.23	487,000	1,065,200	578,200	86%	-	-	-	6%	45%	27%	0%	22%	0%	1	43	217,391	43	130,435	2
43	2	210	Green maize	1.00	0.00	0.93	405,400	715,100	309,700	95%	-	-	-	2%	45%	40%	0%	13%	0%	1	54	182,796	54	161,290	2
44	2	211	Green maize	1.00	0.00	0.93	518,800	615,100	96,300	92%	-	-	-	2%	35%	31%	0%	17%	16%	1	54	182,796	54	161,290	2
45	2	211	Okra	0.30	0.00	0.28	500,000	942,900	442,900	91%	-	-	-	0%	71%	29%	0%	0%	0%	0	71	357,143	36	142,857	2
47	2	212	Green maize	0.50	0.00	0.46	776,100	869,600	93,500	94%	-	-	-	2%	49%	42%	0%	8%	0%	1	109	369,565	109	326,087	2
48	2	212	Onion	0.30	0.00	0.28	307,100	1,157,100	850,000	93%	-	-	-	24%	58%	0%	0%	17%	0%	1	36	178,571	0	0	2
49	2	213	Green maize	0.25	0.00	0.23	1,452,200	3,521,700	2,069,500	89%	-	-	-	4%	51%	45%	0%	0%	0%	0	217	739,130	217	652,174	2
50	2	213	Tomato	0.25	0.00	0.23	1,143,500	3,000,000	1,856,500	57%	-	-	-	10%	0%	57%	33%	0%	0%	0	0	0	217	652,174	2
51	3	301	Tomato	4.00	0.00	3.70	789,200	817,600	28,400	95%	-	-	-	4%	26%	31%	10%	14%	15%	1	41	202,703	47	243,243	2
52	3	301	Onion	0.25	0.00	0.23	5,152,200	9,391,300	4,239,100	83%	-	-	-	13%	63%	0%	5%	11%	8%	1	652	3,260,870	0	0	2
53	3	301	Irish Potato	0.54	0.00	0.50	1,590,000	3,300,000	1,710,000	91%	-	-	-	19%	31%	31%	11%	8%	0%	1	300	500,000	100	500,000	1
54	3	301	Green maize	0.92	0.00	0.85	1,063,500	1,482,400	418,900	83%	-	-	-	16%	28%	28%	0%	29%	0%	1	59	294,118	59	294,118	1
55	3	301	Okra	0.12	0.00	0.11	1,254,500	1,418,200	163,700	77%	-	-	-	9%	91%	0%	0%	0%	0%	0	182	1,136,364	0	0	1
56	3	301	Rape	0.28	0.00	0.26	1,961,500	2,115,400	153,900	91%	-	-	-	2%	49%	49%	0%	0%	0%	0	192	961,538	192	961,538	2
57	3	302	Green maize	1.00	0.00	0.93	145,200	537,600	392,400	80%	-	-	-	4%	44%	37%	0%	0%	15%	0	11	64,516	11	53,763	1
58	3	302	Tomato	0.08	0.00	0.07	1,964,300	2,142,900	178,600	80%	-	-	-	4%	33%	27%	22%	15%	0%	1	79	642,857	79	535,714	1
59	3	302	Onion	1.00	0.00	0.93	419,400	1,075,300	655,900	80%	-	-	-	15%	31%	26%	8%	8%	13%	1	54	129,032	54	107,527	2
60	3	302	Rape	0.06	0.00	0.06	1,783,300	1,000,000	-783,300	83%	-	-	-	2%	84%	0%	14%	0%	0%	0	250	1,500,000	0	0	1
61	3	302	Chinese Cabbage	0.01	0.00	0.01	600,000	5,000,000	4,400,000	80%	-	-	-	17%	0%	0%	83%	0%	0%	0	0	0	0	0	1
62	3	303	Green maize	0.50	0.00	0.46	510,900	4,000,000	3,489,100	65%	-	-	-	15%	51%	4%	0%	30%	0%	1	54	260,870	54	21,739	1
63	3	303	Rape	0.30	0.00	0.28	625,000	196,400	-428,600	91%	-	-	-	3%	29%	23%	6%	40%	0%	1	36	178,571	36	142,857	1
64	3	304	Green maize	0.28	0.00	0.26	1,134,600	5,846,200	4,711,600	84%	-	-	-	2%	41%	34%	0%	24%	0%	1	96	461,538	96	384,615	1
65	3	304	Rape	0.54	0.00	0.50	620,000	480,000	-140,000	83%	-	-	-	2%	39%	32%	5%	23%	0%	1	50	240,000	50	200,000	2
66	3	305	Green maize	0.26	0.00	0.24	3,250,000	9,333,300	6,083,300	86%	-	-	-	21%	32%	32%	0%	15%	0%	1	208	1,041,667	208	1,041,667	1

No.	Scheme ID	Farmer ID	Crop	Area Declared (Lima)	Area Measured (Lima)	Cultivated Area Amended (ZMK/Lima): Area (92.6%)	Cultivated Area Amended (ZMK/Lima): Cost	Cultivated Area Amended (ZMK/Lima): Income	Cultivated Area Amended (ZMK/Lima): Profit	Ratio Sold	Increase (%): Fertilizier	Increase (%): Chitemene	Increase (%): Rainfed Maize	Composition of the Cost: Seeds	Composition of the Cost: D Compound	Composition of the Cost: Urea	Composition of the Cost: Pesticide	Composition of the Cost: Labor	Composition of the Cost: Transport	Labor Use (1: use)	Fertilizer per lima: D Compound Kg	Fertilizer per lima: D Compound ZMK	Fertilizer per lima: Urea Kg	Fertilizer per lima: Urea ZMK	Where to Sell
67	3	305	Beans	0.25	0.00	0.23	391,300	3,913,000	3,521,700	67%	-	-	-	17%	33%	28%	0%	22%	0%	1	22	130,435	22	108,696	1
68	3	306	Irish Potato	0.96	0.00	0.89	476,400	1,550,600	1,074,200	78%	-	-	-	15%	28%	24%	0%	12%	21%	1	22	134,831	22	112,360	2
69	3	307	Green maize	0.29	0.00	0.27	1,166,700	4,444,400	3,277,700	80%	-	-	-	2%	38%	32%	0%	13%	16%	1	74	444,444	74	370,370	2
70	3	307	Irish Potato	0.25	0.00	0.23	878,300	1,304,300	426,000	67%	-	-	-	6%	59%	0%	2%	12%	20%	1	87	521,739	0	0	2
71	3	307	Rape	0.06	0.00	0.06	1,300,000	1,666,700	366,700	80%	-	-	-	4%	77%	0%	19%	0%	0%	0	167	1,000,000	0	0	2
72	3	308	Green maize	1.40	0.00	1.30	234,600	1,169,200	934,600	84%	-	-	-	0%	49%	41%	0%	10%	0%	1	19	115,385	19	96,154	1
73	3	308	Tomato	0.20	0.00	0.19	868,400	2,447,400	1,579,000	81%	-	-	-	9%	36%	30%	24%	0%	0%	0	53	315,789	53	263,158	1
74	3	309	Irish Potato	0.60	0.00	0.56	535,700	1,285,700	750,000	83%	-	-	-	23%	30%	25%	5%	0%	17%	0	27	160,714	27	133,929	2
75	3	310	Onion	1.00	0.00	0.93	433,300	1,048,400	615,100	85%	-	-	-	25%	30%	19%	4%	0%	22%	0	22	129,032	5	80,645	2
76	3	311	Green maize	0.46	0.00	0.43	1,837,200	3,348,800	1,511,600	83%	-	-	-	20%	32%	32%	0%	5%	11%	1	116	581,395	116	581,395	2
77	3	311	Irish Potato	0.20	0.00	0.19	1,689,500	2,210,500	521,000	86%	-	-	-	11%	37%	31%	5%	6%	9%	1	105	631,579	105	526,316	2
78	3	312	Green maize	0.25	0.00	0.23	1,478,300	4,869,600	3,391,300	71%	-	-	-	24%	35%	29%	0%	12%	0%	1	87	521,739	87	434,783	2
79	3	313	Green maize	4.00	0.00	3.70	294,600	1,254,100	959,500	86%	-	-	-	15%	28%	28%	0%	23%	7%	1	27	81,081	27	81,081	3
80	3	313	Groundnuts	0.25	0.00	0.23	391,300	2,130,400	1,739,100	86%	-	-	-	33%	0%	0%	0%	56%	11%	1	0	0	0	0	2
81	3	314	Beans	0.25	0.00	0.23	217,400	1,304,300	1,086,900	50%	-	-	-	60%	0%	0%	0%	40%	0%	1	0	0	0	0	1
82	3	315	Green maize	1.00	0.00	0.93	284,900	860,200	575,300	80%	-	-	-	2%	45%	38%	0%	15%	0%	1	22	129,032	22	107,527	1
83	3	316	Groundnuts	1.00	0.00	0.93	107,500	1,354,800	1,247,300	89%	-	-	-	60%	0%	0%	0%	40%	0%	1	0	0	0	0	2
84	3	316	Green maize	0.25	0.00	0.23	804,300	2,087,000	1,282,700	67%	-	-	-	3%	49%	41%	0%	8%	0%	1	65	391,304	65	326,087	1
85	3	317	Beans	0.50	0.00	0.46	369,600	1,630,400	1,260,800	80%	-	-	-	35%	18%	18%	0%	29%	0%	1	11	65,217	11	65,217	1
86	3	318	Groundnuts	0.54	0.00	0.50	220,000	980,000	760,000	86%	-	-	-	55%	0%	0%	0%	45%	0%	1	0	0	0	0	1
87	3	319	Green maize	1.00	0.00	0.93	295,700	1,204,300	908,600	86%	-	-	-	2%	44%	36%	0%	18%	0%	1	22	129,032	22	107,527	1
88	3	319	Tomato	0.25	0.00	0.23	1,217,400	3,043,500	1,826,100	91%	-	-	-	5%	32%	27%	21%	14%	0%	1	65	391,304	65	326,087	3
89	3	320	Green maize	1.00	0.00	0.93	623,700	1,806,500	1,182,800	86%	-	-	-	2%	43%	43%	0%	12%	0%	1	54	268,817	54	268,817	1
90	3	321	Tomato	0.25	0.00	0.23	847,800	1,760,900	913,100	74%	-	-	-	8%	31%	26%	21%	15%	0%	1	43	260,870	43	217,391	3
91	3	321	Rape	0.25	0.00	0.23	891,300	782,600	-108,700	83%	-	-	-	2%	44%	37%	2%	15%	0%	1	65	391,304	65	326,087	3
92	4	401	Cabbage	0.50	0.21	0.21	7,452,400	8,333,300	880,900	86%	-	100%	25%	13%	38%	11%	6%	6%	26%	1	714	2,857,143	238	833,333	4
93	4	401	Onion	0.50	0.27	0.27	3,370,400	5,333,300	1,962,900	94%	167%	100%	25%	23%	44%	0%	0%	11%	22%	1	370	1,481,481	0	0	2
94	4	402	Cabbage	0.12	0.06	0.06	6,916,700	8,333,300	1,416,600	90%	-	100%	-17%	19%	39%	34%	4%	5%	0%	1	333	2,666,667	333	2,333,333	4
95	4	402	Rape	0.06	0.06	0.06	683,300	1,000,000	316,700	67%	-	-100%	-17%	12%	73%	0%	15%	0%	0%	0	83	500,000	0	0	2
96	4	403	Rape	0.06	0.06	0.06	1,516,700	1,000,000	-516,700	67%	-	100%	20%	5%	66%	0%	7%	22%	0%	1	167	1,000,000	0	0	2
97	4	404	Cabbage	0.12	0.12	0.12	3,008,300	2,083,300	-925,000	80%	-	-50%	50%	15%	61%	16%	8%	0%	0%	0	417	1,833,333	83	466,667	2
98	4	404	Rape	0.08	0.12	0.12	375,000	500,000	125,000	75%	-	-50%	50%	11%	67%	0%	22%	0%	0%	0	42	250,000	0	0	2
99	4	405	Chinese Cabbage	0.06	0.07	0.07	1,257,100	1,714,300	457,200	75%	100%	-50%	50%	3%	40%	34%	6%	17%	0%	1	71	500,000	71	428,571	2
100	4	405	Bean leaves	0.04	0.07	0.07	535,700	1,142,900	607,200	75%	-	-50%	50%	13%	47%	40%	0%	0%	0%	0	36	250,000	36	214,286	2
101	4	406	Cabbage	0.25	0.11	0.11	10,636,400	10,909,100	272,700	83%	-	33%	33%	9%	43%	34%	6%	4%	4%	1	909	4,545,455	18	3,636,364	2
102	4	406	Onion	0.25	0.34	0.34	1,823,500	4,897,100	3,073,600	95%	-	33%	33%	15%	40%	23%	0%	8%	15%	1	147	735,294	59	411,765	2
103	4	407	Amaranth	0.12	0.05	0.05	300,000	4,800,000	4,500,000	67%	-	-50%	17%	0%	100%	0%	0%	0%	0%	0	50	300,000	0	0	3
104	4	407	Chinese Cabbage	0.12	0.05	0.05	1,580,000	7,700,000	6,120,000	71%	-	-50%	17%	5%	44%	44%	6%	0%	0%	0	100	700,000	100	700,000	
105	4	408	Rape	0.12	0.11	0.11	800,000	1,909,100	1,109,100	83%	-	-33%	-25%	11%	40%	17%	9%	23%	0%	1	45	318,182	23	136,364	
106	4	409	Rape	0.12	0.22	0.22	636,400	1,363,600	727,200	83%	-	300%	67%	7%	25%	21%	11%	14%	21%	1	23	159,091	23	136,364	
107	4	409	Cabbage	0.25	0.21	0.21	3,904,800	12,381,000	8,476,200	96%	186%	300%	67%	10%	21%	16%	2%	2%	49%	1	238	809,524	5	619,048	
108	4	410	Rape	0.08	0.04	0.04	3,750,000	4,375,000	625,000	86%	-	300%	100%	3%	20%	23%	3%	50%	0%	1	125	750,000	125	875,000	
109	4	410	Bean leaves	0.25	0.04	0.04	1,750,000	2,000,000	250,000	75%	-	300%	100%	29%	21%	21%	0%	21%	7%	1	63	375,000	63	375,000	
110	5	501	Cabbage	0.25	0.33	0.33	1,772,700	5,181,800	3,409,100	92%	-	0%	25%	15%	34%	14%	5%	7%	26%	1	152	606,061	61	242,424	2
111	5	501	Tomato	0.50	0.23	0.23	1,347,800	6,543,500	5,195,700	93%	900%	0%	25%	15%	39%	0%	10%	8%	29%	1	109	521,739	0	0	2
112	5	501	Pumpkin leaves	0.12	0.11	0.11	863,600	2,727,300	1,863,700	80%	-	0%	25%	0%	32%	0%	0%	42%	26%	1	45	272,727	0	0	2
113	5	502	Cabbage	0.25	0.28	0.28	2,575,000	4,982,100	2,407,100	97%	100%	100%	114%	12%	28%	27%	4%	0%	29%	0	179	714,286	179	700,000	2
114	5	502	Chinese Cabbage	0.03	0.28	0.28	357,100	892,900	535,800	80%	-	100%	114%	10%	50%	25%	15%	0%	0%	0	36	178,571	18	89,286	
115	5	503	Cabbage	1.00	0.34	0.34	2,661,800	12,058,800	9,397,000	98%	33%	100%	100%	9%	23%	22%	7%	6%	33%	1	147	617,647	147	588,235	2
116	5	503	Rape	0.12	0.10	0.10	2,320,000	4,400,000	2,080,000	91%	-	100%	100%	4%	17%	30%	5%	0%	43%	0	200	400,000	100	700,000	2
117	5	504	Tomato	0.08	0.17	0.17	664,700	1,176,500	511,800	80%	-	0%	33%	9%	53%	25%	13%	0%	0%	0	59	352,941	29	164,706	2
118	5	505	Rape	0.12	0.15	0.15	826,700	2,400,000	1,573,300	89%	-	-	100%	8%	48%	20%	6%	12%	6%	1	67	400,000	33	166,667	2
119	5	506	Rape	0.12	0.09	0.09	777,800	2,777,800	2,000,000	80%	-	-50%	33%	14%	36%	36%	14%	0%	0%	0	56	277,778	56	277,778	2
120	5	507	Rape	0.25	0.15	0.15	900,000	600,000	-300,000	83%	-	100%	40%	11%	67%	0%	22%	0%	0%	0	100	600,000	0	0	3
121	5	508	Rape	0.25	0.13	0.13	200,000	769,200	569,200	80%	-	-50%	50%	12%	77%	0%	12%	0%	0%	0	15	153,846	0	0	3
122	5	509	Cabbage	0.75	0.98	0.98	3,280,600	6,224,500	2,943,900	98%	-	0%	39%	3%	19%	19%	2%	2%	56%	1	153	612,245	153	612,245	2
123	5	509	Chinese Cabbage	0.12	0.10	0.10	800,000	2,400,000	1,600,000	88%	-	0%	39%	6%	38%	38%	19%	0%	0%	0	50	300,000	25	300,000	2
124	5	510	Tomato	0.12	0.30	0.30	343,300	1,050,000	706,700	89%	-	100%	400%	29%	29%	27%	15%	0%	0%	0	17	100,000	17	93,333	2
125	5	510	Rape	0.08	0.21	0.21	371,400	2,142,900	1,771,500	80%	-	100%	400%	10%	38%	36%	15%	0%	0%	0	24	142,857	24	133,333	2
126	5	511	Cabbage	0.25	0.27	0.27	3,629,600	11,296,300	7,666,700	98%	900%	100%	50%	9%	26%	26%	5%	15%	20%	1	185	925,926	185	925,926	2
127	5	511	Tomato	0.25	0.19	0.19	4,684,200	14,736,800	10,052,600	94%	-	100%	50%	8%	28%	28%	11%	9%	16%	1	263	1,315,789	263	1,315,789	2
128	6	601	Cabbage	0.36	0.32	0.32	6,187,500	13,593,800	7,406,300	97%	-	100%	50%	13%	33%	18%	5%	3%	28%	1	469	2,062,500	313	1,125,000	2
129	6	601	Okra	0.03	0.09	0.09	777,800	3,000,000	2,222,200	83%	-	100%	50%	0%	43%	36%	0%	21%	0%	1	56	333,333	56	277,778	2
130	6	601	Egg Plants	0.08	0.16	0.16	1,500,000	3,000,000	1,500,000	94%	-	100%	50%	4%	50%	38%	0%	8%	0%	1	156	750,000	156	562,500	2

No.	Scheme ID	Farmer ID	Crop	Area Declared (Lima)	Area Measured (Lima)	Cultivated Area Amended (ZMK/Lima) Area (92.6%)	Cost	Income	Profit	Ratio Sold	Increase (%) Fertilizer	Chitemene	Rainfed Maize	Composition of the Cost Seeds	D Compound	Urea	Pesticide	Labor	Transport	Labor Use (1: use)	Fertilizer per lima D Compound Kg	ZMK	Urea Kg	ZMK	Where to Sell
131	6	602	Cabbage	0.50	0.34	0.34	5,323,500	8,205,900	2,882,400	97%	-	100%	14%	9%	55%	19%	3%	2%	11%	1	588	2,941,176	294	1,029,412	2
132	6	602	Onion	0.06	0.09	0.09	1,338,900	10,111,100	8,772,200	29%	-	100%	14%	21%	50%	21%	0%	8%	0%	1	111	666,667	56	277,778	2
133	6	603	Cabbage	0.25	0.04	0.04	16,375,000	15,125,000	-1,250,000	91%	-	100%	100%	13%	31%	27%	2%	4%	23%	1	1,250	5,000,000	1,250	4,500,000	2
134	6	603	Chinese Cabbage	0.08	0.04	0.04	4,250,000	4,500,000	250,000	83%	-	-60%	100%	6%	41%	35%	3%	9%	6%	1	250	1,750,000	250	1,500,000	2
135	6	604	Chinese Cabbage	0.06	0.13	0.13	969,200	692,300	-276,900	67%	-	-75%	-20%	4%	48%	44%	4%	0%	0%	0	77	461,538	77	430,769	6
136	6	604	Rape	0.08	0.13	0.13	969,200	692,300	-276,900	67%	-	-75%	-20%	4%	48%	44%	4%	0%	0%	0	77	461,538	77	430,769	6
137	6	605	Cabbage	0.25	0.15	0.15	2,060,000	3,300,000	1,240,000	89%	-	300%	20%	18%	39%	27%	5%	6%	5%	1	133	800,000	100	560,000	2
138	6	605	Chinese Cabbage	0.06	0.15	0.15	486,700	1,166,700	680,000	80%	-	300%	20%	14%	41%	38%	7%	0%	0%	0	33	200,000	33	186,667	2
139	6	606	Cabbage	0.12	0.25	0.25	1,600,000	3,200,000	1,600,000	94%	900%	50%	400%	13%	44%	25%	4%	0%	15%	0	200	700,000	80	400,000	2
140	6	606	Tomato	0.25	0.31	0.31	806,500	677,400	-129,100	86%	-	50%	400%	14%	24%	20%	10%	8%	24%	1	32	193,548	32	161,290	2
141	6	607	Cabbage	0.50	0.43	0.43	5,000,000	9,418,600	4,418,600	99%	-	-50%	50%	8%	47%	19%	4%	5%	19%	1	465	2,325,581	233	930,233	2
142	6	607	Tomato	0.25	0.38	0.38	1,473,700	5,394,700	3,921,000	98%	-	-50%	50%	6%	36%	18%	13%	9%	18%	1	132	526,316	66	263,158	2
143	6	608	Cabbage	0.75	0.48	0.48	5,468,800	12,708,300	7,239,500	98%	67%	300%	33%	9%	38%	23%	3%	11%	15%	1	417	2,083,333	313	1,250,000	2
144	6	609	Cabbage	0.25	0.43	0.43	1,290,700	4,186,000	2,895,300	97%	-	-50%	567%	15%	38%	14%	5%	7%	22%	1	116	465,116	47	186,047	2
145	6	610	Cabbage	0.75	0.45	0.45	966,700	4,555,600	3,588,900	98%	-	-	100%	20%	34%	16%	2%	9%	18%	1	111	333,333	44	155,556	2
146	6	610	Chinese Cabbage	0.25	0.45	0.45	311,100	266,700	-44,400	88%	-	-	100%	4%	50%	21%	4%	14%	7%	1	22	155,556	11	66,667	2
147	6	611	Tomato	1.00	1.27	1.27	2,448,800	4,330,700	1,881,900	91%	1900%	100%	27%	5%	24%	16%	16%	29%	10%	1	118	590,551	79	393,701	2
148	6	611	Cabbage	0.75	0.87	0.87	3,632,200	11,379,300	7,747,100	91%	1150%	100%	27%	5%	32%	24%	9%	19%	11%	1	230	1,149,425	172	862,069	2
149	7	701	Green maize	0.40	0.21	0.21	1,457,100	2,785,700	1,328,600	78%	-	0%	50%	18%	16%	16%	0%	49%	0%	1	238	238,095	238	238,095	2
150	7	701	Tomato	0.25	0.09	0.09	5,500,000	3,111,100	-2,388,900	93%	-	0%	50%	10%	30%	30%	13%	16%	0%	1	278	1,666,667	278	1,666,667	2
151	7	702	Rape	0.25	0.18	0.18	388,900	777,800	388,900	71%	-	0%	67%	14%	43%	0%	43%	0%	0%	0	28	166,667	0	0	5
152	7	702	Tomato	0.25	0.18	0.18	861,100	2,222,200	1,361,100	70%	-	0%	67%	23%	39%	39%	0%	0%	0%	0	56	333,333	56	333,333	2
153	7	703	Cabbage	0.30	0.30	0.30	466,700	360,000	-106,700	67%	-	-50%	200%	25%	21%	21%	25%	0%	7%	0	17	100,000	17	100,000	5
154	7	703	Rape	0.30	0.29	0.29	279,300	948,300	669,000	91%	-	50%	200%	20%	37%	0%	43%	0%	0%	0	17	103,448	0	0	1
155	7	704	Green maize	0.25	0.38	0.38	631,600	789,500	157,900	67%	-	0%	20%	0%	50%	50%	0%	0%	0%	0	53	315,789	53	315,789	5
156	7	705	Tomato	0.25	0.40	0.40	380,000	600,000	220,000	83%	-	-	50%	16%	39%	39%	5%	0%	0%	0	25	150,000	25	150,000	1
157	7	706	Rape	0.50	0.17	0.17	1,088,200	4,117,600	3,029,400	89%	-	-100%	-33%	11%	49%	32%	8%	0%	0%	0	88	529,412	59	352,941	1
158	7	706	Tomato	0.02	0.04	0.04	2,625,000	6,500,000	3,875,000	77%	-	-100%	-33%	5%	29%	29%	24%	14%	0%	1	125	750,000	125	750,000	1
159	7	707	Chinese Cabbage	0.25	0.29	0.29	1,310,300	1,586,200	275,900	95%	-	50%	143%	12%	32%	20%	18%	18%	0%	1	69	413,793	52	258,621	1
160	7	707	Rape	0.30	0.29	0.29	965,500	7,655,200	6,689,700	92%	-	50%	143%	18%	59%	18%	5%	0%	0%	0	86	568,966	34	172,414	1
161	7	708	Tomato	0.50	0.24	0.24	1,520,800	10,937,500	9,416,700	93%	445%	0%	4900%	11%	19%	19%	18%	33%	0%	1	42	291,667	42	291,667	1
162	7	708	Cabbage	0.50	0.37	0.37	594,600	1,783,800	1,189,200	83%	-	0%	4900%	11%	32%	32%	9%	16%	0%	1	27	189,189	27	189,189	1
163	7	708	Carrot	0.25	0.07	0.07	1,642,900	5,714,300	4,071,400	75%	-	0%	4900%	39%	30%	30%	0%	0%	0%	0	71	500,000	71	500,000	1
164	7	709	Tomato	0.25	0.17	0.17	523,500	2,611,800	2,088,300	92%	900%	-	59%	28%	36%	36%	0%	0%	0%	0	29	188,235	29	188,235	5
165	7	709	Rape	0.25	0.02	0.02	6,950,000	6,000,000	-950,000	83%	-	-	59%	11%	46%	23%	20%	0%	0%	0	500	3,200,000	250	1,600,000	1
166	7	710	Green maize	0.25	0.11	0.11	818,200	3,863,600	3,045,400	71%	-	100%	33%	0%	67%	33%	0%	0%	0%	0	91	545,455	45	272,727	1
167	7	711	Tomato	0.15	0.35	0.35	78,600	57,100	-21,500	50%	-	0%	31%	36%	27%	27%	9%	0%	0%	0	7	21,429	7	21,429	1
168	7	712	Green maize	0.50	0.38	0.38	526,300	723,700	197,400	82%	-	-33%	67%	0%	25%	25%	0%	35%	15%	1	132	131,579	132	131,579	3
169	7	713	Irish Potato	0.50	0.25	0.25	680,000	780,000	100,000	77%	-	-	108%	29%	0%	0%	0%	71%	0%	1	0	0	0	0	1
170	7	713	Tomato	0.25	0.15	0.15	1,400,000	500,000	-900,000	80%	-	-	108%	7%	29%	29%	12%	24%	0%	1	67	400,000	67	400,000	1
171	7	714	Tomato	0.25	0.94	0.94	234,000	1,702,100	1,468,100	94%	-	-	150%	23%	27%	27%	22%	0%	0%	0	11	63,830	11	63,830	
172	7	715	Green maize	1.00	0.40	0.40	875,000	4,500,000	3,625,000	67%	-	-	0%	0%	43%	43%	0%	14%	0%	1	125	375,000	125	375,000	
173	7	715	Tomato	0.75	0.38	0.38	2,631,600	3,947,400	1,315,800	67%	-	-	0%	10%	30%	30%	20%	10%	0%	1	132	789,474	132	789,474	1
174	7	716	Tomato	0.25	0.49	0.49	244,900	122,400	-122,500	67%	-	-	33%	21%	25%	25%	17%	13%	0%	1	10	61,224	10	61,224	1
175	7	716	Chinese Cabbage	0.40	0.11	0.11	1,045,500	2,727,300	1,681,800	83%	-	-	0%	9%	26%	26%	22%	17%	0%	1	45	272,727	45	272,727	1
176	7	717	Tomato	0.25	0.02	0.02	2,750,000	1,250,000	-1,500,000	80%	-	0%	100%	0%	27%	27%	45%	0%	0%	0	125	750,000	125	750,000	1
177	7	718	Cabbage	0.50	0.00	0.46	239,100	880,400	641,300	78%	-	0%	-50%	23%	27%	27%	23%	0%	0%	0	11	65,217	11	65,217	2
178	7	718	Rape	0.25	0.00	0.23	478,300	2,434,800	1,956,500	79%	-	0%	-50%	23%	27%	27%	23%	0%	0%	0	22	130,435	22	130,435	2
179	7	718	Sweet Potato	1.00	0.00	0.93	0	306,500	306,500	79%	-	0%	-50%							0	0	0	0	0	2
180	7	719	Tomato	0.08	0.00	0.07	857,100	428,600	-428,500	83%	-	-	17%	0%	50%	50%	0%	0%	0%	0	71	428,571	71	428,571	2
181	7	720	Chinese Cabbage	1.00	0.00	0.93	177,400	80,600	-96,800	67%	-	0%	20%	30%	36%	18%	15%	0%	0%	0	11	64,516	5	32,258	2
182	7	720	Tomato	0.25	0.00	0.23	347,800	652,200	304,400	67%	-	0%	20%	31%	38%	0%	31%	0%	0%	0	43	130,435	0	0	2
183	7	721	Onion	4.00	0.00	3.70	264,900	2,162,200	1,897,300	94%	-	-	-73%	18%	31%	31%	0%	20%	0%	1	27	81,081	27	81,081	2
184	7	721	Irish Potato	1.00	0.00	0.93	645,200	4,838,700	4,193,500	80%	-	-	-73%	25%	25%	25%	0%	25%	0%	1	54	161,290	54	161,290	2
185	8	801	Onion	0.20	0.26	0.26	615,400	4,576,900	3,961,500	98%	300%	-	29%	30%	63%	0%	8%	0%	0%	0	77	384,615	0	0	3
186	8	801	Tomato	0.50	0.45	0.45	326,700	1,733,300	1,406,600	90%	-	-	29%	25%	34%	0%	41%	0%	0%	0	22	111,111	0	0	5
187	8	801	Green maize	0.50	0.45	0.45	200,000	506,700	306,700	67%	-	-	29%	0%	56%	44%	0%	0%	0%	0	22	111,111	22	88,889	5
188	8	802	Onion	0.25	0.44	0.44	443,200	909,100	465,900	88%	400%	-	67%	23%	31%	10%	8%	15%	13%	1	23	136,364	11	45,455	3
189	8	802	Egg Plants	0.26	0.27	0.27	407,400	518,500	111,100	75%	100%	-	67%	9%	27%	23%	14%	27%	0%	1	19	111,111	19	92,593	3
190	8	802	Green maize	0.42	0.50	0.50	270,000	684,000	414,000	89%	-	-	67%	0%	44%	19%	0%	37%	0%	1	20	120,000	10	50,000	3
191	8	803	Tomato	1.00	0.00	0.93	136,000	774,200	638,200	83%	-	-	71%	13%	40%	0%	47%	0%	0%	0	11	53,763	0	0	7
192	8	803	Green maize	0.54	0.75	0.75	120,000	506,700	386,700	90%	-	-	71%	0%	56%	44%	0%	0%	0%	0	13	66,667	13	53,333	2
193	8	803	Onion	0.54	0.00	0.50	70,000	4,620,000	4,550,000	97%	-	-	71%	100%	0%	0%	0%	0%	0%	0	0	0	0	0	3
194	8	804	Onion	0.18	0.13	0.13	523,100	2,923,100	2,400,000	95%	-	-	200%	37%	37%	26%	0%	0%	0%	0	38	192,308	19	138,462	3

No.	Scheme ID	Farmer ID	Crop	Area Declared (Lima)	Area Measured (Lima)	Cultivated Area Amended (ZMK/Lima)				Ratio Sold	Increase (%)			Composition of the Cost						Labor Use (1: use)	Fertilizer per lima				Where to Sell
						Area (92.6%)	Cost	Income	Profit		Fertilizer	Chitemene	Rainfed Maize	Seeds	D Compound	Urea	Pesticide	Labor	Transport		D Compound Kg	D Compound ZMK	Urea Kg	Urea ZMK	
195	8	804	Green maize	0.25	0.33	0.33	272,700	633,300	360,600	91%	-	-	200%	0%	56%	44%	0%	0%	0%	0	30	151,515	30	121,212	3
196	8	805	Onion	0.25	0.00	0.23	500,000	9,739,100	9,239,100	97%	-	-	300%	39%	22%	0%	39%	0%	0%	0	22	108,696	0	0	3
197	8	805	Cabbage	0.25	0.00	0.23	1,826,100	4,565,200	2,739,100	95%	-	-	300%	15%	45%	24%	15%	0%	0%	0	217	826,087	109	434,783	7
198	8	805	Egg Plants	0.45	0.45	0.45	402,200	1,333,300	931,100	83%	-	-	310%	6%	41%	44%	9%	0%	0%	0	33	166,667	44	177,778	7
199	8	806	Tomato	0.25	0.43	0.43	818,600	2,267,400	1,448,800	90%	-	-75%	100%	8%	51%	28%	13%	0%	0%	0	70	418,605	47	232,558	7
200	8	807	Onion	0.90	0.63	0.63	427,000	1,047,600	620,600	91%	400%	100%	17%	3%	67%	30%	0%	0%	0%	0	79	285,714	32	126,984	2
201	8	807	Tomato	0.35	0.63	0.63	98,400	628,600	530,200	91%	-	100%	17%	40%	32%	27%	0%	0%	0%	0	8	31,746	8	26,984	2
202	8	807	Green maize	0.35	0.63	0.63	204,800	482,500	277,700	94%	-	100%	17%	30%	39%	31%	0%	0%	0%	0	16	79,365	16	63,492	2
203	8	808	Onion	0.54	0.60	0.60	281,700	1,400,000	1,118,300	92%	100%	-	50%	27%	38%	15%	9%	0%	14%	0	17	100,000	8	41,667	7
204	8	809	Cabbage	0.41	0.26	0.26	2,653,800	3,692,300	1,038,500	97%	67%	-	67%	17%	28%	22%	20%	14%	0%	1	192	692,308	192	576,923	2
205	8	809	Onion	0.34	0.21	0.21	2,714,300	6,285,700	3,571,400	91%	-	-	67%	16%	32%	14%	12%	26%	0%	1	238	857,143	95	380,952	7
206	8	810	Tomato	0.30	0.18	0.18	1,666,700	6,500,000	4,833,300	90%	50%	-	50%	5%	40%	7%	43%	5%	0%	1	111	666,667	28	111,111	2
207	8	810	Rape	0.16	0.07	0.07	4,507,100	4,214,300	-292,800	92%	-	-	50%	3%	57%	25%	14%	0%	0%	0	714	2,571,429	286	1,142,857	2
208	8	811	Cabbage	0.22	0.08	0.08	2,812,500	7,500,000	4,687,500	96%	-	-	42%	24%	31%	11%	29%	4%	0%	1	125	675,000	63	312,500	2
209	8	812	Cabbage	1.16	0.68	0.68	892,400	3,051,500	2,159,100	96%	-	0%	-50%	25%	33%	13%	17%	12%	0%	1	74	294,118	29	117,647	2
210	8	812	Rape	0.30	0.18	0.18	2,027,800	3,055,600	1,027,800	91%	100%	0%	-50%	7%	55%	25%	14%	0%	0%	0	278	1,111,111	83	500,000	2
211	8	813	Rape	0.92	0.23	0.23	1,326,100	1,521,700	195,600	86%	-	-	50%	5%	66%	20%	10%	0%	0%	0	217	869,565	65	260,870	2
212	8	813	Onion	0.67	0.48	0.48	531,300	2,843,800	2,312,500	95%	-	-	50%	37%	39%	24%	0%	0%	0%	0	42	208,333	31	125,000	7
213	8	813	Chinese Cabbage	0.20	0.13	0.13	1,269,200	1,938,500	669,300	99%	-	-	50%	6%	61%	24%	9%	0%	0%	0	154	769,231	77	307,692	2
214	8	814	Green maize	1.00	0.40	0.40	625,000	2,300,000	1,675,000	94%	-	-	-8%	0%	52%	48%	0%	0%	0%	0	125	325,000	125	300,000	7
215	8	815	Tomato	0.08	0.42	0.42	488,100	714,300	226,200	83%	400%	-100%	65%	5%	29%	24%	7%	34%	0%	1	24	142,857	24	119,048	7
216	8	815	Rape	0.18	0.33	0.33	469,700	697,000	227,300	87%	-	-100%	65%	16%	19%	16%	10%	39%	0%	1	15	90,909	15	75,758	7
217	8	815	Green maize	0.48	0.33	0.33	1,242,400	2,090,900	848,500	83%	-	-100%	65%	37%	29%	24%	0%	10%	0%	1	61	363,636	61	303,030	7
218	8	816	Green maize	2.00	0.95	0.95	1,094,700	4,115,800	3,021,100	94%	-	-	25%	14%	34%	29%	0%	12%	12%	1	105	368,421	105	315,789	7
219	8	816	Onion	0.72	0.18	0.18	3,527,800	12,444,400	8,916,600	94%	-	-	25%	20%	28%	24%	14%	8%	6%	1	278	972,222	278	833,333	7
220	8	816	Cabbage	0.40	0.33	0.33	1,878,800	10,363,600	8,484,800	96%	-	-	25%	23%	28%	24%	19%	5%	0%	1	152	530,303	152	454,545	7
221	8	816	Tomato	0.84	0.19	0.19	4,526,300	16,973,700	12,447,400	97%	-	-	25%	13%	20%	35%	17%	6%	9%	1	263	921,053	526	1,578,947	2
222	8	816	Groundnuts	0.16	0.13	0.13	1,192,300	4,523,100	3,330,800	86%	-	-	25%	42%	0%	0%	0%	32%	26%	1	0	0	0	0	2
223	8	816	Rape	0.40	0.25	0.25	1,820,000	2,200,000	380,000	91%	-	-	25%	11%	28%	34%	16%	12%	0%	1	80	480,000	100	620,000	2
224	8	816	Chinese Cabbage	0.48	0.33	0.33	1,181,800	2,575,800	1,394,000	88%	-	-	25%	9%	46%	26%	12%	8%	0%	1	91	545,455	61	303,030	2
225	8	816	Beans	0.48	0.16	0.16	1,468,800	2,000,000	531,200	94%	-	-	25%	23%	51%	0%	13%	13%	0%	1	125	750,000	0	0	2
226	8	817	Onion	0.12	0.22	0.22	636,400	1,363,600	727,200	50%	150%	-100%	40%	32%	57%	0%	0%	11%	0%	1	91	363,636	0	0	7
227	8	817	Cabbage	0.45	0.28	0.28	1,500,000	1,821,400	321,400	88%	100%	-100%	40%	15%	50%	17%	11%	0%	7%	0	107	750,000	36	250,000	2
228	8	818	Onion	0.32	0.17	0.17	717,600	2,117,600	1,400,000	83%	67%	-100%	40%	30%	33%	12%	0%	25%	0%	1	59	235,294	29	88,235	7
229	8	818	Rape	0.08	0.08	0.08	950,000	3,500,000	2,550,000	89%	-	-100%	40%	8%	53%	20%	20%	0%	0%	0	125	500,000	63	187,500	2
230	8	818	Chinese Cabbage	0.06	0.14	0.14	685,700	1,107,100	421,400	81%	-	-100%	40%	6%	42%	16%	16%	21%	0%	1	71	285,714	36	107,143	2
231	8	819	Green maize	1.00	0.17	0.17	1,052,900	4,941,200	3,888,300	67%	-	-	50%	25%	45%	30%	0%	0%	0%	0	118	470,588	88	317,647	2
232	8	819	Rape	0.08	0.07	0.07	1,142,900	3,357,100	2,214,200	85%	-	-	50%	13%	50%	19%	19%	0%	0%	0	143	571,429	71	214,286	2
233	8	819	Onion	0.24	0.11	0.11	863,600	1,818,200	954,600	50%	-	-	50%	47%	21%	16%	16%	0%	0%	0	45	181,818	45	136,364	2
234	8	820	Rape	0.16	0.13	0.13	748,200	2,848,200	2,100,000	86%	300%	-	-83%	12%	52%	21%	15%	0%	0%	0	77	384,615	38	153,846	2
235	8	820	Green maize	0.40	0.14	0.14	1,142,900	5,571,400	4,428,500	67%	-	-	-93%	28%	47%	25%	0%	0%	0%	0	107	535,714	71	285,714	2
236	8	821	Rape	0.20	0.27	0.27	259,300	2,240,700	1,981,400	99%	-	-	133%	21%	29%	36%	14%	0%	0%	0	19	74,074	19	92,593	2
237	8	822	Onion	0.32	0.22	0.22	1,045,500	3,636,400	2,590,900	94%	100%	-	100%	20%	52%	0%	11%	9%	9%	1	91	545,455	0	0	7
238	8	822	Cabbage	0.35	0.22	0.22	1,590,900	3,181,800	1,590,900	89%	-	-	100%	24%	34%	11%	10%	11%	9%	1	91	545,455	45	181,818	2
239	8	823	Cabbage	0.40	0.26	0.26	1,273,100	5,884,600	4,611,500	98%	-	-	13%	3%	45%	18%	33%	0%	0%	0	96	576,923	58	230,769	2
240	8	823	Tomato	0.80	0.55	0.55	681,800	2,545,500	1,863,700	93%	114%	-	13%	9%	32%	21%	37%	0%	0%	0	36	218,182	36	145,455	2
241	8	824	Cabbage	0.16	0.15	0.15	1,300,000	9,566,700	8,266,700	85%	-	-	15%	28%	31%	26%	15%	0%	0%	0	67	400,000	67	333,333	2
242	8	824	Chinese Cabbage	0.24	0.20	0.20	1,550,000	1,850,000	300,000	86%	400%	-	15%	3%	48%	40%	8%	0%	0%	0	125	750,000	125	625,000	2
243	8	825	Green maize	1.00	1.06	1.06	617,900	2,535,800	1,917,900	84%	-	-100%	20%	20%	27%	23%	0%	31%	0%	1	47	165,094	47	141,509	2
244	8	825	Onion	0.32	0.51	0.51	456,900	2,235,300	1,778,400	84%	-	-100%	20%	19%	52%	0%	12%	17%	0%	1	39	235,294	0	0	5
245	8	825	Okra	0.25	0.68	0.68	669,100	5,698,500	5,029,400	97%	-	-100%	20%	18%	26%	33%	10%	13%	0%	1	29	176,471	74	220,588	2
246	9	901	Tomato	0.20	0.00	0.19	700,000	3,815,800	3,115,800	45%	-	-	-	19%	14%	0%	53%	15%	0%	1	263	94,737	0	0	2
247	9	902	Green maize	0.48	0.00	0.44	295,500	1,022,700	727,200	44%	-	-	-	15%	46%	38%	0%	0%	0%	0	23	136,364	23	113,636	1
248	9	902	Tomato	0.12	0.00	0.11	863,600	5,227,300	4,363,700	87%	-	-	-	5%	63%	0%	32%	0%	0%	0	91	545,455	0	0	2
249	9	903	Onion	0.20	0.00	0.19	369,400	1,157,900	788,500	75%	-	-	-	57%	43%	0%	0%	0%	0%	0	263	157,895	0	0	2
250	9	904	Green maize	0.27	0.00	0.25	0	600,000	600,000	67%	-	-	-							0	0	0	0	0	1
251	9	905	Tomato	0.12	0.00	0.11	727,300	5,000,000	4,272,700	82%	-	-	-	0%	75%	25%	0%	0%	0%	0	91	545,455	45	181,818	2
252	9	906	Green maize	0.12	0.00	0.11	727,300	1,181,800	454,500	50%	-	-	-	0%	63%	38%	0%	0%	0%	0	91	454,545	91	272,727	1
253	9	907	Green maize	0.18	0.00	0.17	323,500	882,400	558,900	67%	-	-	-	0%	55%	45%	0%	0%	0%	0	29	176,471	29	147,059	1
254	9	908	Tomato	0.12	0.00	0.11	218,200	2,727,300	2,509,100	83%	-	-	-	38%	63%	0%	0%	0%	0%	0	45	136,364	0	0	2
255	9	909	Tomato	0.12	0.00	0.11	300,000	1,636,400	1,336,400	89%	-	-	-	24%	76%	0%	0%	0%	0%	0	45	227,273	0	0	2
256	9	910	Tomato	0.20	0.00	0.19	284,200	1,052,600	768,400	63%	-	-	-	17%	46%	37%	0%	0%	0%	0	26	131,579	26	105,263	2
257	9	910	Green maize	0.20	0.00	0.19	684,200	1,315,800	631,600	80%	-	-	-	0%	69%	31%	0%	0%	0%	0	79	473,684	53	210,526	1
258	9	911	Green maize	0.12	0.00	0.11	818,200	3,181,800	2,363,600	71%	-	-	-	0%	56%	44%	0%	0%	0%	0	91	454,545	91	363,636	1

No.	Scheme ID	Farmer ID	Crop	Area Declared (Lima)	Area Measured (Lima)	Cultivated Area Amended (ZMK/Lima)				Ratio Sold	Increase (%)			Composition of the Cost						Labor Use (1: use)	Fertilizer per lima				Where to Sell
						Area (92.6%)	Cost	Income	Profit		Fertilizer	Chitemene	Rainfed Maize	Seeds	D Compound	Urea	Pesticide	Labor	Transport		D Compound Kg	D Compound ZMK	Urea Kg	Urea ZMK	
259	9	912	Tomato	0.20	0.00	0.19	236,800	921,100	684,300	71%	-	-	-	0%	56%	44%	0%	0%	0%	0	26	131,579	26	105,263	1
260	9	913	Tomato	0.12	0.00	0.11	409,100	909,100	500,000	75%	-	-	-	0%	56%	44%	0%	0%	0%	0	45	227,273	45	181,818	2
261	9	914	Green maize	0.20	0.00	0.19	0	789,500	789,500	67%	-	-	-							0	0	0	0	0	1
262	9	915	Green maize	0.12	0.00	0.11	0	681,800	681,800	67%	-	-	-							0	0	0	0	0	1
263	9	916	Rape	0.12	0.00	0.11	136,400	181,800	45,400	75%	-	-	-	0%	0%	0%	100%	0%	0%	0	0	0	0	0	2
264	9	917	Tomato	0.18	0.00	0.17	735,300	2,058,800	1,323,500	86%	-	-	-	40%	60%	0%	0%	0%	0%	0	88	441,176	0	0	2
265	9	918	Irish Potato	0.10	0.00	0.09	777,800	1,166,700	388,900	67%	-	-	-	0%	36%	0%	50%	14%	0%	1	56	277,778	0	0	2
266	9	918	Tomato	0.12	0.00	0.11	454,500	1,136,400	681,900	80%	-	-	-	0%	100%	0%	0%	0%	0%	0	91	454,545	0	0	2
267	10	1001	Cabbage	1.00	0.00	0.93	541,900	223,700	-318,200	63%	-	-	-	3%	50%	36%	12%	0%	0%	0	54	268,817	54	193,548	2
268	10	1002	Tomato	1.00	0.00	0.93	204,300	4,365,600	4,161,300	95%	-	-	-	4%	68%	24%	4%	0%	0%	0	54	139,785	54	48,387	5
269	10	1002	Rape	1.00	0.00	0.93	281,700	3,048,400	2,766,700	99%	-	-	-	2%	95%	0%	2%	0%	0%	0	54	268,817	0	0	5
270	10	1003	Tomato	0.10	0.00	0.09	644,400	1,666,700	1,022,300	80%	-	-	-	26%	43%	0%	31%	0%	0%	0	56	277,778	0	0	3
271	10	1003	Rape	0.06	0.00	0.06	566,700	2,750,000	2,183,300	91%	-	-	-	12%	44%	0%	44%	0%	0%	0	167	250,000	0	0	3
272	10	1004	Tomato	0.25	0.00	0.23	565,200	1,173,900	608,700	93%	-	-	-	15%	77%	0%	8%	0%	0%	0	87	434,783	0	0	2
273	10	1004	Rape	0.06	0.00	0.06	975,000	1,083,300	108,300	62%	-	-	-	9%	85%	0%	6%	0%	0%	0	167	833,333	0	0	2
274	10	1005	Tomato	0.12	0.00	0.11	3,636,400	8,181,800	4,545,400	93%	-	-	-	11%	45%	19%	25%	0%	0%	0	455	1,636,364	91	681,818	2
275	10	1006	Tomato	0.12	0.00	0.11	1,190,900	7,454,500	6,263,600	98%	-	-	-	0%	39%	27%	34%	0%	0%	0	91	454,545	91	327,273	2
276	10	1007	Rape	0.18	0.00	0.17	429,400	1,647,100	1,217,700	89%	-	-	-	7%	69%	25%	0%	0%	0%	0	59	294,118	29	105,882	3
277	10	1007	Tomato	0.06	0.00	0.06	716,700	4,250,000	3,533,300	88%	-	-	-	0%	58%	42%	0%	0%	0%	0	83	416,667	83	300,000	2
278	10	1008	Tomato	0.08	0.00	0.07	1,328,600	5,757,100	4,428,500	90%	-	-	-	27%	54%	19%	0%	0%	0%	0	143	714,286	71	257,143	2
279	10	1009	Tomato	0.10	0.00	0.09	1,366,700	7,166,700	5,800,000	93%	-	-	-	8%	41%	15%	37%	0%	0%	0	111	555,556	56	200,000	2
280	10	1010	Tomato	0.06	0.00	0.06	1,466,700	9,166,700	7,700,000	91%	-	-	-	0%	28%	20%	51%	0%	0%	0	83	416,667	83	300,000	5
281	10	1011	Tomato	0.10	0.00	0.09	1,200,000	2,533,300	1,333,300	79%	-	-	-	13%	56%	23%	8%	0%	0%	0	111	666,667	56	277,778	5
282	10	1011	Rape	0.08	0.00	0.07	1,400,000	1,214,300	-185,700	88%	-	-	-	6%	61%	26%	7%	0%	0%	0	143	857,143	71	357,143	5
283	10	1012	Tomato	0.16	0.00	0.15	466,700	2,866,700	2,400,000	93%	-	-	-	21%	43%	36%	0%	0%	0%	0	33	200,000	33	166,667	2
284	10	1013	Tomato	2.00	0.00	1.85	100,000	275,700	175,700	88%	-	-	-	8%	65%	0%	27%	0%	0%	0	11	64,865	0	0	2
285	10	1013	Onion	0.12	0.00	0.11	54,500	2,000,000	1,945,500	91%	-	-	-	100%	0%	0%	0%	0%	0%	0	0	0	0	0	5
286	11	1101	Carrot	0.25	0.22	0.22	1,000,000	3,522,700	2,522,700	97%	2400%	-	20%	7%	69%	0%	0%	0%	16%	1	136	681,818	0	0	2
287	11	1101	Cabbage	0.30	0.30	0.30	2,966,700	5,600,000	2,633,300	98%	2400%	-	20%	17%	20%	20%	10%	2%	31%	1	167	600,000	167	583,333	2
288	11	1101	Green maize	0.27	0.71	0.71	1,831,000	2,323,900	492,900	91%	2400%	-	20%	8%	31%	31%	0%	15%	15%	1	141	563,380	141	563,380	2
289	11	1102	Cabbage	0.10	0.14	0.14	8,428,600	10,928,600	2,500,000	98%	14%	-	33%	13%	31%	25%	2%	8%	21%	1	714	2,571,429	714	2,142,857	2
290	11	1103	Cabbage	0.20	0.09	0.09	3,416,700	5,333,300	1,916,600	94%	100%	-	200%	2%	33%	26%	5%	34%	0%	1	222	1,111,111	222	888,889	5
291	11	1103	Rape	0.16	0.08	0.08	2,062,500	3,937,500	1,875,000	95%	100%	-	200%	3%	15%	12%	9%	0%	61%	0	63	312,500	63	250,000	5
292	11	1104	Green maize	0.30	0.19	0.19	1,721,100	789,500	-931,600	67%	-50%	-	50%	0%	23%	18%	0%	0%	59%	0	79	394,737	79	315,789	2
293	11	1105	Pumpkin leaves	0.15	0.10	0.10	450,000	800,000	350,000	80%	100%	-50%	-33%	0%	56%	44%	0%	0%	0%	0	50	250,000	50	200,000	5
294	11	1105	Tomato	0.56	0.60	0.60	266,700	1,700,000	1,433,300	88%	100%	-50%	-33%	31%	31%	25%	13%	0%	0%	0	17	83,333	17	66,667	5
295	11	1106	Cabbage	0.60	0.24	0.24	1,875,000	6,625,000	4,750,000	94%	-50%	-50%	11%	2%	22%	9%	11%	0%	56%	0	83	416,667	42	166,667	5
296	11	1106	Tomato	0.40	0.24	0.24	1,416,700	5,500,000	4,083,300	91%	-50%	-50%	11%	7%	22%	12%	29%	0%	29%	0	63	312,500	42	166,667	2
297	11	1106	Sweet Potato	0.25	0.24	0.24	0	1,354,200	1,354,200	92%	-50%	-50%	11%							0	0	0	0	0	2
298	11	1107	Cabbage	0.25	0.22	0.22	1,806,800	5,590,900	3,784,100	98%	100%	-50%	50%	2%	25%	20%	3%	0%	50%	0	91	454,545	91	363,636	2
299	11	1108	Green maize	0.25	0.17	0.17	2,529,400	6,529,400	4,000,000	97%	100%	-50%	50%	0%	35%	14%	0%	9%	42%	1	176	882,353	88	352,941	2
300	11	1109	Green maize	0.08	0.12	0.12	350,000	1,000,000	650,000	93%	1233%	-	-50%	0%	60%	40%	0%	0%	0%	0	42	208,333	42	141,667	2
301	11	1110	Tomato	1.00	1.02	1.02	1,196,100	3,039,200	1,843,100	97%	700%	-	0%	5%	30%	29%	8%	20%	8%	1	98	352,941	98	343,137	5
302	11	1110	Rape	0.20	0.17	0.17	570,600	3,235,300	2,664,700	91%	700%	-	0%	31%	26%	19%	25%	0%	0%	0	29	147,059	29	105,882	2
303	11	1111	Onion	0.25	0.15	0.15	1,100,000	4,166,700	3,066,700	80%	100%	-	167%	30%	61%	0%	9%	0%	0%	0	133	666,667	0	0	2
304	11	1111	Cabbage	0.30	0.17	0.17	3,500,000	4,558,800	1,058,800	97%	100%	-	167%	9%	29%	28%	8%	0%	25%	0	294	1,029,412	294	970,588	2
305	11	1111	Green maize	1.00	1.32	1.32	257,600	871,200	613,600	87%	100%	-	167%	0%	51%	49%	0%	0%	0%	0	38	132,576	38	125,000	2
306	11	1111	Pumpkin leaves	0.08	0.05	0.05	840,000	1,440,000	600,000	89%	100%	-	167%	0%	60%	40%	0%	0%	0%	0	100	500,000	100	340,000	2
307	11	1112	Green maize	1.00	0.90	0.90	433,300	866,700	433,400	83%	1900%	-	71%	0%	45%	42%	0%	0%	13%	0	56	194,444	56	183,333	2
308	11	1113	Groundnuts	0.59	0.41	0.41	0	585,400	585,400	75%	100%	-	17%							0	0	0	0	0	2
309	11	1113	Green maize	0.66	0.53	0.53	301,900	528,300	226,400	86%	100%	-	17%	0%	63%	38%	0%	0%	0%	0	38	188,679	28	113,208	2
310	11	1114	Green maize	1.00	0.76	0.76	177,600	1,243,400	1,065,800	95%	100%	0%	-29%	0%	56%	44%	0%	0%	0%	0	20	98,684	20	78,947	5
311	11	1115	Green maize	1.00	1.08	1.08	208,300	583,300	375,000	95%	1900%	-	100%	0%	56%	44%	0%	0%	0%	0	23	115,741	23	92,593	5
312	11	1116	Irish Potato	0.25	0.34	0.34	1,470,600	9,176,500	7,705,900	96%	100%	-	15%	12%	36%	0%	12%	0%	40%	0	147	529,412	0	0	2
313	11	1117	Green maize	0.16	0.16	0.16	1,625,000	3,500,000	1,875,000	94%	100%	-	11%	0%	39%	31%	19%	12%	0%	1	125	625,000	125	500,000	2
314	11	1118	Cabbage	0.50	0.38	0.38	2,131,600	6,473,700	4,342,100	98%	100%	-	17%	10%	22%	20%	10%	12%	25%	1	132	473,684	132	434,211	2
315	11	1118	Egg Plants	0.25	0.43	0.43	511,600	2,093,000	1,581,400	96%	100%	-	17%	11%	36%	7%	23%	23%	0%	1	47	186,047	12	34,884	2
316	11	1119	Cabbage	0.25	0.30	0.30	1,700,000	6,100,000	4,400,000	98%	-33%	-100%	33%	17%	35%	32%	16%	0%	0%	0	167	600,000	167	550,000	2
317	11	1120	Cabbage	0.26	0.25	0.25	3,640,000	6,120,000	2,480,000	98%	100%	-	50%	7%	20%	18%	5%	22%	27%	1	200	720,000	200	660,000	2
318	11	1120	Irish Potato	0.12	0.13	0.13	4,192,300	8,000,000	3,807,700	92%	100%	-	50%	28%	33%	30%	0%	9%	0%	1	385	1,384,615	385	1,269,231	2
319	12	1201	Egg Plants	0.60	0.57	0.57	508,800	2,982,500	2,473,700	94%	0%	-	-18%	0%	29%	21%	7%	26%	17%	1	18	140,351	18	105,263	2
320	12	1201	Green maize	1.96	2.06	2.06	206,300	407,800	201,500	83%	0%	-	-18%	2%	39%	28%	0%	24%	8%	1	10	77,670	10	58,252	2
321	12	1202	Onion	1.00	1.15	1.15	556,500	1,391,300	834,800	88%	25%	-	-33%	23%	34%	23%	3%	11%	5%	1	43	191,304	43	130,435	3
322	12	1202	Tomato	1.00	1.16	1.16	2,017,200	2,405,200	388,000	97%	50%	-	-33%	3%	9%	6%	30%	51%	0%	1	43	189,655	43	129,310	3

No.	Scheme ID	Farmer ID	Crop	Area Declared (Lima)	Area Measured (Lima)	Cultivated Area Amended (ZMK/Lima)				Ratio Sold	Increase (%)			Composition of the Cost						Labor Use (1: use)	Fertilizer per lma				Where to Sell
						Area (92.6%)	Cost	Income	Profit		Fertilzier	Chite-mene	Rainfed Maize	Seeds	D Compound	Urea	Pesticide	Labor	Transport		D Compound Kg	D Compound ZMK	Urea Kg	Urea ZMK	
323	12	1203	Green maize	2.00	2.16	2.16	269,700	354,200	84,500	89%	50%	-	20%	2%	39%	26%	0%	34%	0%	1	23	101,852	23	69,444	3
324	12	1203	Onion	1.00	1.15	1.15	617,400	3,991,300	3,373,900	94%	50%	-	20%	28%	25%	20%	0%	15%	11%	1	43	156,522	43	121,739	3
325	12	1204	Onion	0.60	0.64	0.64	3,062,500	5,484,400	2,421,900	85%	100%	-	50%	13%	26%	20%	0%	8%	34%	1	156	781,250	156	625,000	3
326	12	1204	Chinese Cabbage	0.12	0.07	0.07	3,214,300	6,071,400	2,857,100	88%	100%	-	50%	4%	47%	33%	16%	0%	0%	0	214	1,500,000	214	1,071,429	7
327	12	1204	Tomato	1.00	1.09	1.09	3,000,000	4,036,700	1,036,700	91%	100%	-	50%	4%	15%	12%	58%	0%	10%	0	92	458,716	92	366,972	7
328	12	1205	Onion	0.25	0.27	0.27	2,648,100	12,000,000	9,351,900	83%	900%	-	25%	14%	35%	28%	9%	14%	0%	1	185	925,926	185	740,741	3
329	12	1205	Chinese Cabbage	0.06	0.04	0.04	5,000,000	7,500,000	2,500,000	83%	900%	-	25%	10%	35%	20%	16%	18%	0%	1	250	1,750,000	250	1,000,000	6
330	12	1205	Egg Plants	1.00	0.74	0.74	1,506,800	3,513,500	2,006,700	96%	900%	-	25%	22%	22%	36%	6%	13%	0%	1	68	337,838	135	540,541	5
331	12	1206	Onion	2.52	1.95	1.95	1,005,100	11,769,200	10,764,100	99%	700%	-	25%	18%	31%	26%	11%	15%	0%	1	77	307,692	90	256,410	2
332	12	1207	Onion	0.64	0.37	0.37	3,067,600	7,432,400	4,364,800	91%	200%	-	160%	19%	35%	26%	9%	11%	0%	1	270	1,081,081	270	810,811	3
333	12	1207	Tomato	0.25	0.28	0.28	1,660,700	9,214,300	7,553,600	98%	200%	-	160%	14%	30%	26%	30%	0%	0%	0	71	500,000	107	428,571	3
334	12	1208	Okra	0.07	0.03	0.03	7,166,700	9,166,700	2,000,000	91%	50%	-	133%	14%	33%	47%	1%	6%	0%	1	333	2,333,333	667	3,333,333	1
335	12	1208	Onion	0.19	0.19	0.19	1,315,800	6,052,600	4,736,800	80%	50%	-	133%	28%	36%	24%	12%	0%	0%	0	79	473,684	79	315,789	3
336	12	1209	Onion	0.66	0.89	0.89	578,700	3,337,100	2,758,400	91%	100%	-	100%	25%	39%	29%	7%	0%	0%	0	56	224,719	56	168,539	3
337	12	1210	Green maize	1.00	0.84	0.84	476,200	2,500,000	2,023,800	95%	60%	-	6%	13%	50%	38%	0%	0%	0%	0	60	238,095	60	178,571	2
338	12	1211	Onion	0.12	0.12	0.12	2,708,300	11,250,000	8,541,700	80%	100%	-	50%	28%	18%	23%	31%	0%	0%	0	125	500,000	125	625,000	1
339	12	1212	Green maize	1.00	0.96	0.96	536,500	1,171,900	635,400	73%	200%	-	38%	23%	29%	23%	14%	11%	0%	1	31	156,250	31	125,000	2
340	12	1212	Onion	0.25	0.15	0.15	4,100,000	16,200,000	12,100,000	89%	200%	-	38%	20%	33%	29%	11%	8%	0%	1	333	1,333,333	333	1,200,000	3
341	12	1213	Onion	0.25	0.23	0.23	1,673,900	5,000,000	3,326,100	80%	300%	-	100%	16%	39%	32%	13%	0%	0%	0	217	652,174	217	543,478	3
342	12	1214	Onion	1.00	1.05	1.05	1,414,300	1,800,000	385,700	86%	100%	-	25%	31%	27%	26%	5%	8%	3%	1	95	380,952	95	361,905	3
343	13	1301	Onion	1.00	1.07	1.07	1,670,600	3,855,100	2,184,500	97%	200%	-	130%	11%	22%	17%	4%	44%	1%	1	93	373,832	93	280,374	3
344	13	1301	Green maize	2.00	2.15	2.15	645,600	1,534,900	889,300	94%	-	-	-	6%	38%	17%	0%	39%	1%	1	47	232,558	47	111,628	3
345	13	1301	Tomato	1.00	1.10	1.10	2,395,500	2,959,100	563,600	97%	-	-	-	1%	15%	11%	33%	38%	1%	1	91	363,636	91	272,727	3
346	13	1302	Onion	1.00	1.25	1.25	1,176,000	7,904,000	6,728,000	97%	300%	-75%	43%	19%	33%	27%	11%	10%	0%	1	80	384,000	80	320,000	3
347	13	1302	Green maize	1.00	0.76	0.76	1,421,100	4,263,200	2,842,100	96%	300%	-75%	43%	13%	43%	33%	0%	11%	0%	1	132	605,263	132	473,684	3
348	13	1302	Pumpkin leaves	1.00	1.63	1.63	0	79,800	79,800	80%	300%	-75%	43%							0	0	0	0	0	6
349	13	1302	Egg Plants	0.25	0.16	0.16	1,375,000	2,593,800	1,218,800	96%	-	-	-	0%	32%	27%	9%	32%	0%	1	63	437,500	63	375,000	3
350	13	1302	Okra	1.00	1.35	1.35	629,600	911,100	281,500	98%	-	-	-	19%	29%	24%	19%	12%	0%	1	37	177,778	37	148,149	3
351	13	1303	Tomato	1.00	1.06	1.06	981,100	2,608,500	1,627,400	99%	300%	-	-	10%	23%	19%	48%	0%	0%	0	47	226,415	47	188,679	3
352	13	1304	Tomato	3.90	2.72	2.72	634,200	1,943,000	1,308,800	99%	100%	-	100%	4%	23%	17%	46%	9%	0%	1	37	147,059	37	110,294	3
353	13	1305	Tomato	1.00	1.12	1.12	1,781,300	13,660,700	11,879,400	98%	100%	-	33%	4%	20%	16%	15%	45%	0%	1	89	357,143	89	285,714	3
354	13	1305	Chinese Cabbage	0.24	0.30	0.30	766,700	3,166,700	2,400,000	95%	100%	-	33%	4%	28%	17%	9%	43%	0%	1	33	200,000	33	133,333	3
355	13	1305	Egg Plants	0.12	0.24	0.24	458,300	3,250,000	2,791,700	92%	100%	-	33%	0%	27%	18%	9%	45%	0%	1	21	125,000	21	83,333	3
356	13	1306	Okra	1.00	0.84	0.84	1,523,800	2,404,800	881,000	99%	433%	100%	100%	12%	16%	27%	34%	0%	12%	0	60	250,000	119	404,762	3
357	13	1306	Tomato	1.40	1.47	1.47	793,900	3,153,100	2,359,200	97%	433%	100%	100%	7%	5%	26%	50%	0%	13%	0	34	36,054	68	204,082	3
358	13	1306	Rape	1.00	1.05	1.05	596,200	2,361,900	1,765,700	97%	433%	100%	100%	3%	34%	26%	27%	0%	11%	0	48	200,000	48	152,381	3
359	13	1307	Onion	1.00	1.07	1.07	514,000	2,102,800	1,588,800	89%	300%	-	67%	33%	18%	9%	29%	11%	0%	1	93	93,458	47	46,729	3
360	13	1308	Rape	0.50	0.42	0.42	785,700	1,200	-784,500	94%	50%	-	25%	3%	36%	24%	21%	15%	0%	1	48	285,714	48	190,476	3
361	13	1308	Tomato	1.00	0.90	0.90	644,400	1,200,000	555,600	97%	50%	-	25%	5%	31%	21%	34%	9%	0%	1	56	200,000	56	133,333	3
362	13	1309	Green maize	1.40	1.81	1.81	298,300	530,400	232,100	67%	100%	100%	80%	26%	37%	33%	0%	0%	4%	0	28	110,497	28	99,448	2
363	13	1309	Rape	0.25	0.15	0.15	3,566,700	6,333,300	2,766,600	95%	100%	100%	80%	5%	37%	34%	13%	0%	11%	0	333	1,333,333	333	1,200,000	2
364	13	1310	Onion	0.90	0.84	0.84	898,800	3,642,900	2,744,100	89%	900%	-	14%	19%	26%	24%	21%	10%	0%	1	60	238,095	60	214,286	2
365	13	1310	Okra	0.09	0.08	0.08	6,593,800	9,562,500	2,968,700	98%	900%	-	14%	16%	13%	11%	14%	11%	34%	1	125	875,000	188	750,000	2
366	13	1310	Rape	1.00	0.75	0.75	993,300	3,306,700	2,313,400	97%	900%	-	14%	6%	27%	24%	28%	12%	3%	1	67	266,667	67	240,000	2
367	13	1311	Irish Potato	1.00	1.07	1.07	1,429,900	5,383,200	3,953,300	94%	200%	-	25%	39%	29%	0%	8%	4%	20%	1	140	420,561	0	0	2
368	13	1311	Cabbage	1.92	1.50	1.50	1,246,700	5,066,700	3,820,000	99%	200%	-	25%	5%	39%	24%	19%	13%	0%	1	133	480,000	100	300,000	2
369	13	1312	Onion	1.00	1.06	1.06	1,160,400	3,254,700	2,094,300	96%	100%	-	100%	24%	39%	24%	12%	0%	0%	0	94	452,830	94	283,019	3
370	13	1313	Onion	0.45	0.56	0.56	375,000	7,142,900	6,767,900	94%	100%	-	150%	43%	24%	24%	10%	0%	0%	0	89	89,286	89	89,286	3
371	13	1313	Egg Plants	1.00	1.18	1.18	178,000	2,147,500	1,969,500	99%	100%	-	150%	0%	48%	48%	5%	0%	0%	0	42	84,746	42	84,746	3
372	13	1313	Okra	2.00	1.79	1.79	122,900	916,200	793,300	98%	100%	-	150%	23%	45%	23%	9%	0%	0%	0	28	55,866	28	27,933	3
373	13	1314	Onion	1.00	0.82	0.82	939,000	3,841,500	2,902,500	95%	60%	-	88%	19%	26%	19%	13%	9%	13%	1	61	243,902	61	182,927	3
374	13	1314	Cabbage	1.00	1.10	1.10	1,236,400	1,409,100	172,700	97%	60%	-	88%	18%	40%	12%	15%	7%	7%	1	136	500,000	91	145,455	3
375	13	1314	Tomato	1.96	1.56	1.56	1,397,400	8,333,300	6,935,900	96%	60%	-	88%	3%	14%	10%	46%	5%	23%	1	96	192,308	96	134,615	2
376	13	1314	Egg Plants	0.16	0.23	0.23	2,565,200	16,087,000	13,521,800	95%	-	-	-	2%	34%	27%	12%	8%	17%	1	435	869,565	435	695,652	2
377	13	1314	Chinese Cabbage	1.00	0.88	0.88	943,200	5,909,100	4,965,900	96%	-	-	-	8%	36%	19%	8%	6%	24%	1	170	340,909	114	191,818	2
378	13	1314	Rape	0.16	0.19	0.19	2,210,500	6,842,100	4,631,600	96%	-	-	-	5%	24%	19%	17%	12%	24%	1	263	526,316	263	421,053	2
379	13	1315	Egg Plants	0.25	0.35	0.35	1,642,900	2,760,000	1,117,100	99%	100%	-	60%	4%	17%	14%	26%	21%	17%	1	143	285,714	143	228,571	2
380	13	1316	Rape	0.10	0.17	0.17	941,200	3,235,300	2,294,100	55%	100%	-	100%	6%	31%	16%	47%	0%	0%	0	29	294,118	29	147,059	2
381	13	1316	Egg Plants	0.25	0.24	0.24	604,200	11,041,700	10,437,500	94%	100%	-	100%	14%	52%	34%	0%	0%	0%	0	42	312,500	42	208,333	2
382	13	1317	Onion	0.25	0.27	0.27	1,537,000	5,925,900	4,388,900	88%	100%	-	14%	18%	36%	24%	7%	6%	8%	1	56	555,556	74	370,370	2
383	13	1317	Egg Plants	0.25	0.33	0.33	1,287,900	10,757,600	9,469,700	99%	100%	-	14%	6%	47%	29%	6%	0%	12%	0	61	606,061	76	378,788	2
384	13	1317	Rape	0.25	0.28	0.28	1,767,900	9,107,100	7,339,200	98%	-	-	-	4%	30%	24%	20%	0%	21%	0	54	535,714	71	428,571	2
385	13	1318	Onion	0.10	0.12	0.12	4,625,000	15,000,000	10,375,000	83%	25%	-	33%	9%	27%	22%	9%	5%	29%	1	125	1,250,000	167	1,000,000	3
386	13	1318	Tomato	0.04	0.09	0.09	3,388,900	17,333,300	13,944,400	92%	25%	-	33%	8%	39%	25%	28%	0%	0%	0	111	1,333,333	167	833,333	3

No.	Scheme ID	Farmer ID	Crop	Area Declared (Lima)	Area Measured (Lima)	Cultivated Area Amended (ZMK/Lima)				Ratio Sold	Increase (%)			Composition of the Cost						Labor Use (1: use)	Fertilizer per lima				Where to Sell
						Area (92.6%)	Cost	Income	Profit		Fertilizer	Chitemene	Rainfed Maize	Seeds	D Compound	Urea	Pesticide	Labor	Transport		D Compound Kg	D Compound ZMK	Urea Kg	Urea ZMK	
387	13	1318	Potato leaves	0.10	0.50	0.50	150,000	2,210,000	2,060,000	92%	25%	-	33%	0%	67%	33%	0%	0%	0%	0	10	100,000	10	50,000	3
388	13	1319	Egg Plants	0.56	0.54	0.54	750,000	5,370,400	4,620,400	86%	300%	-	50%	0%	49%	37%	9%	5%	0%	1	93	370,370	93	277,778	3
389	13	1319	Green maize	0.56	0.90	0.90	166,700	1,688,900	1,522,200	79%	300%	-	50%	0%	47%	53%	0%	0%	0%	0	11	77,778	17	88,889	3
390	13	1319	Tomato	0.45	0.55	0.55	745,500	1,145,500	400,000	89%	-	-	-	9%	17%	29%	37%	9%	0%	1	18	127,273	64	218,182	3
391	13	1320	Egg Plants	0.25	0.22	0.22	1,090,900	1,818,200	727,300	94%	-25%	-	25%	0%	52%	38%	10%	0%	0%	0	114	568,182	114	409,091	1
392	13	1320	Okra	0.25	0.43	0.43	744,200	1,116,300	372,100	94%	-	-	-	8%	39%	28%	16%	9%	0%	1	58	290,698	58	209,302	1
393	13	1321	Green maize	1.00	1.03	1.03	252,400	339,800	87,400	80%	0%	-	-24%	0%	62%	38%	0%	0%	0%	0	49	155,340	49	97,087	3
394	13	1322	Green maize	1.00	1.30	1.30	200,000	215,400	15,400	75%	33%	-	17%	0%	62%	38%	0%	0%	0%	0	38	123,077	38	76,923	3
395	13	1323	Tomato	0.25	0.39	0.39	1,628,200	5,564,100	3,935,900	97%	100%	-	-17%	4%	25%	24%	47%	0%	0%	0	128	410,256	128	384,615	3
396	13	1323	Rape	0.47	0.60	0.60	316,700	600,000	283,300	89%	100%	-	-17%	5%	37%	26%	32%	0%	0%	0	17	116,667	17	83,333	3
397	13	1324	Green maize	0.25	0.40	0.40	487,500	1,500,000	1,012,500	80%	0%	-	-20%	8%	54%	38%	0%	0%	0%	0	38	262,500	38	187,500	3
398	13	1324	Onion	0.50	0.60	0.60	541,700	4,583,300	4,041,600	91%	0%	-	-20%	32%	37%	31%	0%	0%	0%	0	33	200,000	33	166,667	3
399	13	1324	Pumpkin leaves	0.12	0.20	0.20	0	300,000	300,000	75%	0%	-	-20%							0	0	0	0	0	3
400	13	1324	Okra	0.24	0.21	0.21	976,200	1,500,000	523,800	95%	0%	-	-20%	12%	34%	24%	29%	0%	0%	0	48	333,333	49	238,095	3
401	13	1325	Green maize	0.12	0.20	0.20	800,000	1,200,000	400,000	100%	200%	-	40%	13%	50%	25%	0%	13%	0%	1	50	400,000	50	200,000	3
402	13	1326	Egg Plants	0.24	0.21	0.21	428,600	1,095,200	666,600	98%	100%	-	-	0%	39%	22%	6%	11%	22%	1	24	166,667	24	95,238	2
403	13	1326	Rape	0.25	0.11	0.11	1,227,300	1,909,100	681,800	83%	100%	-	-	4%	52%	30%	11%	4%	0%	1	91	636,364	91	363,636	3
404	13	1327	Tomato	1.50	1.57	1.57	9,678,300	3,500,000	-6,178,300	96%	100%	-	-	2%	9%	7%	30%	39%	13%	1	223	891,720	223	668,790	6
405	13	1327	Egg Plants	0.25	0.25	0.25	2,460,000	5,040,000	2,580,000	99%	100%	-	-	0%	26%	20%	6%	49%	0%	1	80	640,000	80	480,000	6
406	13	1327	Onion	1.50	1.38	1.38	1,735,500	6,500,000	4,764,500	97%	100%	-	-	25%	33%	25%	6%	10%	0%	1	145	579,710	145	434,783	3
407	14	1401	Green maize	1.00	1.18	1.18	145,800	237,300	91,500	75%	33%	-	-30%	0%	58%	42%	0%	0%	0%	0	17	84,746	17	61,017	1
408	14	1401	Onion	3.61	1.92	1.92	1,408,900	6,015,600	4,606,700	91%	33%	-	-30%	6%	9%	7%	0%	11%	67%	1	26	130,208	26	93,750	4
409	14	1401	Tomato	0.25	1.08	1.08	325,000	2,592,600	2,267,600	88%	33%	-	-30%	7%	43%	31%	19%	0%	0%	0	28	138,889	28	100,000	2
410	14	1402	Onion	0.50	1.00	1.00	2,095,000	3,850,000	1,755,000	91%	60%	-	18%	9%	9%	6%	0%	3%	72%	1	50	180,000	50	175,000	4
411	14	1402	Tomato	0.25	0.48	0.48	660,400	5,468,800	4,808,400	93%	60%	-	18%	8%	32%	23%	38%	0%	0%	0	42	208,333	42	150,000	2
412	14	1403	Tomato	1.40	0.38	0.38	434,200	736,800	302,600	86%	100%	-	70%	0%	24%	45%	30%	0%	0%	0	53	105,263	39	197,368	2
413	14	1403	Onion	0.12	0.84	0.84	285,700	1,666,700	1,381,000	75%	100%	-	70%	0%	31%	31%	13%	17%	8%	1	18	89,286	18	89,286	4
414	14	1404	Tomato	0.24	0.38	0.38	251,300	1,342,100	1,090,800	98%	100%	-	100%	26%	26%	18%	29%	0%	0%	0	13	65,789	13	46,053	2
415	14	1405	Onion	0.25	0.50	0.50	818,000	9,800,000	8,982,000	86%	33%	-	-15%	29%	42%	20%	9%	0%	0%	0	100	344,000	90	160,000	4
416	14	1406	Onion	0.25	0.21	0.21	1,190,500	4,333,300	3,142,800	71%	200%	-	100%	14%	40%	30%	0%	16%	0%	1	95	476,190	71	357,143	2
417	14	1407	Onion	0.30	0.23	0.23	12,108,700	21,304,300	9,195,600	71%	100%	-	33%	13%	13%	6%	6%	7%	54%	1	326	1,608,696	217	782,609	4
418	14	1408	Onion	0.25	0.92	0.92	2,350,000	5,706,500	3,356,500	80%	100%	-	7%	6%	8%	6%	7%	2%	69%	1	54	186,957	38	152,174	4
419	14	1408	Tomato	0.25	0.16	0.16	2,606,300	19,687,500	17,081,200	94%	100%	-	7%	8%	29%	17%	36%	10%	0%	1	188	750,000	188	450,000	2
420	14	1409	Onion	1.50	0.99	0.99	2,424,200	10,606,100	8,181,900	94%	0%	-	-50%	9%	11%	0%	3%	5%	73%	1	152	272,727	0	0	2
421	14	1409	Green maize	0.25	0.24	0.24	1,958,300	5,416,700	3,458,400	77%	0%	-	-50%	19%	37%	35%	0%	0%	9%	0	208	729,167	208	687,500	2
422	14	1409	Tomato	0.24	0.24	0.24	2,395,800	5,666,700	3,270,900	88%	0%	-	-50%	6%	26%	28%	14%	0%	26%	0	125	625,000	167	666,667	2
423	14	1410	Tomato	0.25	0.33	0.33	1,384,800	6,893,900	5,509,100	92%	100%	-	700%	11%	26%	22%	26%	14%	0%	1	91	363,636	91	309,091	2
424	14	1411	Onion	0.50	0.33	0.33	1,642,400	8,484,800	6,842,400	75%	100%	-	-57%	14%	30%	34%	11%	0%	11%	0	152	500,000	106	551,515	2
425	14	1411	Egg Plants	0.40	0.30	0.30	386,700	5,880,000	5,493,300	95%	100%	-	-57%	16%	48%	28%	9%	0%	0%	0	67	186,667	67	106,667	2
426	14	1411	Sugarcane	1.00	0.73	0.73	828,800	3,082,200	2,253,400	89%	100%	-	-57%	8%	26%	0%	0%	0%	66%	0	68	212,329	0	0	2
427	14	1412	Onion	0.20	0.12	0.12	1,075,000	13,200,000	12,125,000	92%	50%	-100%	14%	27%	39%	34%	0%	0%	0%	0	83	416,667	83	366,667	5
428	14	1413	Onion	0.20	0.19	0.19	1,352,600	5,473,700	4,121,100	92%	400%	-	25%	27%	69%	0%	0%	5%	0%	1	184	921,053	0	0	2
429	14	1413	Tomato	0.02	0.03	0.03	1,416,700	2,000,000	583,300	83%	400%	-	25%	8%	59%	16%	16%	0%	0%	0	167	833,333	83	233,333	2
430	14	1414	Onion	0.30	0.27	0.27	248,100	555,600	307,500	67%	50%	25%	-	30%	37%	33%	0%	0%	0%	0	19	92,593	19	81,481	2
431	14	1415	Onion	0.20	0.12	0.12	1,083,300	11,250,000	10,166,700	89%	100%	-	67%	23%	38%	38%	0%	0%	0%	0	83	416,667	83	416,667	2
432	14	1416	Green maize	0.25	0.15	0.15	1,000,000	4,766,700	3,766,700	91%	0%	-100%	-17%	40%	33%	27%	0%	0%	0%	0	67	333,333	67	266,667	2
433	14	1417	Onion	0.25	0.24	0.24	587,500	2,625,000	2,037,500	67%	900%	100%	8%	9%	53%	38%	0%	0%	0%	0	63	312,500	63	225,000	2
434	14	1418	Cabbage	0.25	0.21	0.21	847,600	1,714,300	866,700	83%	100%	-	20%	3%	56%	34%	7%	0%	0%	0	95	476,190	71	285,714	2
435	14	1418	Egg Plants	1.00	1.32	1.32	191,700	545,500	353,800	89%	100%	-	20%	0%	59%	38%	3%	0%	0%	0	23	113,636	23	72,727	2
436	14	1419	Onion	0.09	0.03	0.03	4,200,000	17,000,000	12,800,000	88%	150%	-	40%	24%	40%	29%	8%	0%	0%	0	333	1,666,667	333	1,200,000	2
437	14	1420	Sugarcane	0.10	0.19	0.19	210,500	3,421,100	3,210,600	77%	150%	-	100%	0%	100%	0%	0%	0%	0%	0	53	210,526	0	0	1
438	14	1421	Onion	1.00	1.23	1.23	272,400	1,764,200	1,491,800	97%	100%	-	20%	18%	52%	18%	12%	0%	0%	0	41	142,276	33	48,780	2
439	14	1422	Rape	1.00	1.15	1.15	226,100	739,100	513,000	88%	100%	-	100%	4%	77%	12%	6%	0%	0%	0	17	173,913	9	26,087	2
440	14	1423	Onion	0.50	0.40	0.40	6,450,000	10,500,000	4,050,000	92%	50%	-	75%	5%	10%	7%	2%	6%	70%	1	125	650,000	125	425,000	2
441	14	1423	Green maize	0.90	0.93	0.93	106,500	516,100	409,600	93%	50%	-	75%	15%	51%	34%	0%	0%	0%	0	11	53,763	11	36,559	2
442	15	1501	Green maize	1.00	0.78	0.78	583,300	3,006,400	2,423,100	97%	100%	-	25%	0%	1%	33%	0%	0%	66%	0	128	6,410	64	192,308	2
443	15	1502	Bean leaves	0.18	0.13	0.13	0	96,200	96,200	80%	50%	-	25%							0	0	0	0	0	1
444	15	1503	Groundnuts	4.00	2.34	2.34	376,100	2,213,700	1,837,600	95%	100%	-	36%	14%	0%	0%	0%	23%	64%	1	0	0	0	0	2
445	15	1504	Groundnuts	2.88	3.00	3.00	230,000	1,428,000	1,198,000	94%	-33%	0%	25%	6%	0%	0%	0%	43%	51%	1	0	0	0	0	2
446	15	1504	Cabbage	0.30	0.42	0.42	1,023,800	833,300	-190,500	86%	-33%	0%	25%	13%	29%	28%	7%	5%	19%	1	119	297,619	119	285,714	2
447	15	1505	Groundnuts	3.60	2.88	2.88	83,300	1,050,000	966,700	83%	100%	-50%	13%	33%	0%	0%	0%	42%	25%	1	0	0	0	0	2
448	15	1505	Rape	0.36	0.22	0.22	781,800	2,472,700	1,690,900	88%	100%	-50%	13%	3%	47%	42%	9%	0%	0%	0	114	363,636	114	327,273	2
449	15	1506	Groundnuts	0.47	0.16	0.16	1,537,500	4,200,000	2,662,500	67%	100%	0%	8%	16%	0%	0%	0%	12%	72%	1	0	0	0	0	2
450	15	1507	Groundnuts	0.20	0.95	0.95	221,100	2,004,200	1,783,100	94%	100%	100%	0%	24%	0%	0%	0%	0%	76%	0	0	0	0	0	2

No.	Scheme ID	Farmer ID	Crop	Area Declared (Lima)	Area Measured (Lima)	Cultivated Area Amended (ZMK/Lima) Area (92.6%)	Cost	Income	Profit	Ratio Sold	Increase (%) Fertilizer	Chitemene	Rainfed Maize	Composition of the Cost Seeds	D Compound	Urea	Pesticide	Labor	Transport	Labor Use (1: use)	Fertilizer per lma D Compound Kg	D Compound ZMK	Urea Kg	Urea ZMK	Where to Sell
451	15	1508	Groundnuts	0.15	0.16	0.16	125,000	4,900,000	4,775,000	71%	100%	100%	33%	100%	0%	0%	0%	0%	0%	0	0	0	0	0	2
452	15	1509	Groundnuts	1.00	0.88	0.88	136,400	2,290,900	2,154,500	95%	100%	-33%	-59%	33%	0%	0%	0%	0%	67%	0	0	0	0	0	2
453	15	1510	Groundnuts	0.42	0.15	0.15	133,300	3,920,000	3,786,700	86%	200%	-100%	-10%	0%	0%	0%	0%	100%	0%	1	0	0	0	0	2
454	15	1510	Irish Potato	0.01	0.01	0.01	4,800,000	8,000,000	3,200,000	50%	200%	-100%	-10%	21%	79%	0%	0%	0%	0%	0	1,000	3,800,000	0	0	2
455	15	1510	Green maize	0.16	0.07	0.07	1,728,600	2,571,400	842,800	83%	200%	-	-10%	0%	46%	41%	0%	12%	0%	1	143	800,000	143	714,286	2
456	15	1511	Groundnuts	1.50	0.70	0.70	191,400	1,680,000	1,488,600	93%	100%	-	67%	22%	0%	0%	0%	0%	78%	0	0	0	0	0	2
457	15	1512	Groundnuts	2.88	3.40	3.40	77,900	1,722,400	1,644,500	93%	100%	-50%	88%	45%	0%	0%	0%	0%	55%	0	0	0	0	0	2
458	15	1512	Tomato	0.58	0.68	0.68	411,800	1,786,800	1,375,000	93%	100%	-50%	-	9%	29%	21%	0%	41%	0%	1	29	117,647	29	88,235	2
459	15	1513	Groundnuts	1.30	0.78	0.78	83,300	1,230,800	1,147,500	80%	-	-50%	-	69%	0%	0%	0%	31%	0%	1	0	0	0	0	2
460	15	1513	Rape	0.21	0.14	0.14	471,400	914,300	442,900	75%	-	-50%	-	15%	38%	15%	9%	23%	0%	1	36	178,571	36	71,429	2
461	15	1514	Tomato	0.57	0.60	0.60	633,300	2,400,000	1,766,700	97%	100%	-	67%	8%	26%	0%	39%	0%	26%	0	33	166,667	0	0	2
462	15	1515	Cabbage	0.70	0.58	0.58	1,117,200	7,586,200	6,469,000	97%	50%	100%	67%	19%	19%	3%	7%	5%	46%	1	43	215,517	9	31,034	2
463	15	1516	Groundnuts	1.15	0.72	0.72	97,200	3,850,000	3,752,800	91%	100%	-	20%	0%	0%	0%	0%	57%	43%	1	0	0	0	0	2
464	15	1517	Groundnuts	0.72	1.03	1.03	60,200	1,060,200	1,000,000	92%	-	-50%	71%	48%	0%	0%	0%	0%	52%	0	0	0	0	0	2
465	15	1517	Green maize	0.18	0.14	0.14	721,400	1,500,000	778,600	86%	-	-50%	71%	5%	30%	22%	0%	20%	24%	1	71	214,286	71	157,143	2
466	15	1518	Green maize	0.15	0.09	0.09	477,800	1,944,400	1,466,600	80%	100%	-50%	25%	0%	58%	42%	0%	0%	0%	0	833	277,778	56	200,000	2
467	15	1519	Green maize	1.00	0.71	0.71	1,197,200	2,957,700	1,760,500	95%	100%	-	-47%	0%	26%	21%	0%	29%	24%	1	70	309,859	70	253,521	2
468	15	1520	Rape	0.36	0.32	0.32	868,800	5,062,500	4,193,700	93%	300%	-50%	75%	9%	61%	16%	14%	0%	0%	0	156	531,250	63	137,500	2
469	15	1520	Bean leaves	0.02	0.12	0.12	816,700	2,500,000	1,683,300	83%	300%	-50%	75%	12%	57%	31%	0%	0%	0%	0	83	466,667	83	250,000	2
470	15	1521	Irish Potato	0.16	0.26	0.26	257,700	3,230,800	2,973,100	71%	400%	-	100%	36%	37%	27%	0%	0%	0%	0	38	96,154	38	69,231	2
471	15	1522	Green maize	0.50	0.44	0.44	590,900	1,840,900	1,250,000	89%	100%	-	89%	5%	29%	17%	0%	0%	49%	0	34	170,455	34	102,273	2
472	15	1523	Groundnuts	0.36	0.42	0.42	350,000	3,400,000	3,050,000	82%	50%	-	33%	10%	0%	0%	0%	14%	76%	1	0	0	0	0	2
473	15	1524	Groundnuts	0.14	0.17	0.17	58,800	2,964,700	2,905,900	67%	100%	-100%	25%	100%	0%	0%	0%	0%	0%	0	0	0	0	0	2
474	15	1525	Groundnuts	0.54	0.41	0.41	87,800	1,024,400	936,600	80%	100%	-	83%	44%	0%	0%	0%	0%	56%	0	0	0	0	0	2
475	15	1526	Groundnuts	2.00	1.84	1.84	81,500	1,004,300	922,800	91%	3900%	0%	20%	47%	0%	0%	0%	0%	53%	0	0	0	0	0	2
476	15	1527	Groundnuts	0.30	0.48	0.48	93,800	1,225,000	1,131,200	86%	100%	-	100%	100%	0%	0%	0%	0%	0%	0	0	0	0	0	2
477	15	1528	Groundnuts	1.06	0.67	0.67	35,800	913,400	877,600	83%	-	-50%	-	100%	0%	0%	0%	0%	0%	0	0	0	0	0	2
478	15	1529	Groundnuts	1.80	1.54	1.54	15,600	381,800	366,200	96%	-	-	-	100%	0%	0%	0%	0%	0%	0	0	0	0	0	2
479	15	1530	Groundnuts	2.00	1.57	1.57	178,300	1,528,700	1,350,400	80%	67%	-	150%	26%	0%	0%	0%	17%	57%	1	0	0	0	0	2
480	15	1531	Groundnuts	0.18	0.15	0.15	366,700	2,240,000	1,873,300	75%	-	-	-	27%	0%	0%	0%	73%	0%	1	0	0	0	0	2
481	15	1532	Groundnuts	0.50	0.40	0.40	370,000	3,570,000	3,200,000	88%	33%	-50%	44%	32%	0%	0%	0%	0%	68%	0	0	0	0	0	2
482	15	1532	Green maize	0.47	0.50	0.50	710,000	3,360,000	2,650,000	89%	33%	-50%	44%	0%	34%	24%	0%	0%	42%	0	100	240,000	100	170,000	2
483	16	1601	Green maize	0.50	0.00	0.46	347,800	652,200	304,400	83%	100%	-	7%	25%	25%	19%	0%	31%	0%	1	22	86,957	22	65,217	1
484	16	1602	Green maize	0.50	0.00	0.46	500,000	1,847,800	1,347,800	88%	1233%	-	143%	22%	17%	17%	0%	43%	0%	1	22	86,957	22	86,957	2
485	16	1602	Beans	0.10	0.00	0.09	444,400	1,777,800	1,333,400	75%	1233%	-	143%	63%	0%	0%	0%	38%	0%	1	0	0	0	0	2
486	16	1602	Rape	0.60	0.00	0.56	526,800	1,687,500	1,160,700	95%	1233%	-	143%	5%	63%	0%	15%	17%	0%	1	89	330,357	0	0	2
487	16	1602	Chinese cabbage	0.32	0.00	0.30	1,510,000	3,900,000	2,390,000	98%	-	-	-	2%	41%	36%	10%	11%	0%	1	167	616,667	167	550,000	2
488	16	1603	Green maize	1.00	0.00	0.93	494,600	1,053,800	559,200	71%	300%	0%	50%	9%	37%	33%	0%	22%	0%	1	54	182,796	54	161,290	1
489	16	1603	Rape	0.50	0.00	0.46	141,300	2,804,300	2,663,000	93%	300%	0%	50%	23%	31%	23%	23%	0%	0%	0	11	43,478	11	32,609	2
490	16	1604	Green maize	1.00	0.00	0.93	516,100	1,677,400	1,161,300	83%	-	-	200%	17%	25%	21%	0%	17%	21%	1	22	129,032	22	107,527	2
491	16	1605	Green maize	0.50	0.00	0.46	108,700	847,800	739,100	77%	100%	-	250%	0%	0%	0%	0%	60%	40%	1	0	0	0	0	2
492	16	1605	Tomato	0.50	0.00	0.46	532,600	587,000	54,400	93%	100%	-	250%	10%	33%	24%	14%	8%	10%	1	43	173,913	43	130,435	2
493	16	1606	Tomato	0.12	0.00	0.11	1,136,400	2,454,500	1,318,100	67%	-	-	50%	20%	40%	40%	0%	0%	0%	0	91	454,545	91	454,545	2
494	16	1606	Green maize	0.60	0.00	0.56	0	750,000	750,000	75%	-	-	50%							0	0	0	0	0	2
495	16	1607	Green maize	1.00	0.00	0.93	0	806,500	806,500	84%	1900%	-	1400%							0	0	0	0	0	2
496	16	1607	Beans	1.00	0.00	0.93	102,200	209,700	107,500	67%	1900%	-	1400%	16%	42%	42%	0%	0%	0%	0	11	43,011	11	43,011	2
497	16	1608	Green maize	1.00	0.00	0.93	774,200	2,580,600	1,806,400	83%	-	-	1567%	13%	25%	21%	0%	14%	26%	1	54	193,548	54	161,290	2
498	16	1608	Tomato	1.00	0.00	0.93	987,100	2,580,600	1,593,500	83%	-	-	1567%	6%	28%	16%	11%	16%	22%	1	108	279,570	54	161,290	2
499	16	1609	Green maize	1.00	0.00	0.93	698,900	1,075,300	376,400	75%	50%	-	200%	14%	31%	31%	0%	9%	15%	1	54	215,054	54	215,054	2
500	16	1609	Tomato	0.50	0.00	0.46	739,100	1,630,400	891,300	60%	50%	-	200%	9%	24%	29%	15%	9%	15%	1	43	173,913	43	217,391	2
501	16	1610	Green maize	0.50	0.00	0.46	0	587,000	587,000	83%	100%	-	400%							0	0	0	0	0	1
502	16	1611	Green maize	0.50	0.00	0.46	641,300	1,304,300	663,000	83%	567%	-	100%	14%	42%	34%	0%	10%	0%	1	54	271,739	54	217,391	1
503	16	1611	Rape	0.50	0.00	0.46	271,700	869,600	597,900	75%	-	-	-	12%	40%	12%	12%	24%	0%	1	22	108,696	11	32,609	1
504	16	1612	Green maize	1.00	0.00	0.93	236,600	349,500	112,900	80%	50%	0%	83%	45%	27%	27%	0%	0%	0%	0	11	64,516	11	64,516	1
505	16	1612	Rape	0.50	0.00	0.46	478,300	978,300	500,000	89%	50%	0%	83%	45%	38%	7%	11%	0%	0%	0	43	173,913	11	32,609	2
506	16	1612	Chinese cabbage	0.08	0.00	0.07	1,357,100	5,000,000	3,642,900	86%	50%	0%	83%	11%	53%	16%	21%	0%	0%	0	143	714,286	71	214,286	1
507	16	1613	Green maize	0.40	0.00	0.37	959,500	1,891,900	932,400	86%	-	-50%	300%	24%	42%	34%	0%	0%	0%	0	81	405,405	81	324,324	2
508	16	1613	Cabbage	0.40	0.00	0.37	2,608,100	3,243,200	635,100	88%	-	-50%	300%	17%	9%	6%	5%	0%	62%	0	41	243,243	41	162,162	2
509	16	1613	Okra	0.08	0.00	0.07	1,285,700	9,000,000	7,714,300	89%	-	-50%	300%	22%	33%	22%	22%	0%	0%	0	71	428,571	71	285,714	2
510	16	1614	Rape	1.00	0.00	0.93	383,400	752,700	369,300	86%	-	-	114%	12%	44%	29%	15%	0%	0%	0	54	161,290	54	105,376	1
511	16	1615	Green maize	1.00	0.00	0.93	467,700	1,607,500	1,139,800	87%	1900%	-	500%	34%	34%	31%	0%	0%	0%	0	54	161,290	54	145,161	2
512	16	1616	Onion	0.50	0.00	0.46	1,630,400	10,434,800	8,804,400	97%	-	-	300%	33%	20%	20%	0%	0%	27%	0	109	326,087	109	326,087	1
513	16	1617	Tomato	0.50	0.00	0.46	337,000	391,300	54,300	83%	-	-	-	3%	65%	32%	0%	0%	0%	0	43	217,391	22	108,696	2
514	16	1617	Chinese cabbage	0.50	0.00	0.46	163,000	521,700	358,700	94%	-	-	-	13%	33%	33%	20%	0%	0%	0	11	54,348	11	54,348	2

No.	Scheme ID	Farmer ID	Crop	Area Declared (Lima)	Area Measured (Lima)	Cultivated Area Amended (ZMK/Lima)				Ratio Sold	Increase (%)			Composition of the Cost						Labor Use (1: use)	Fertilizer per lima				Where to Sell
						Area (92.6%)	Cost	Income	Profit		Fertilizer	Chitemene	Rainfed Maize	Seeds	D Compound	Urea	Pesticide	Labor	Transport		D Compound Kg	D Compound ZMK	Urea Kg	Urea ZMK	
515	16	1617	Rape	0.50	0.00	0.46	152,200	4,717,400	4,565,200	97%	-	-	-	7%	36%	36%	21%	0%	0%	0	11	54,348	11	54,349	2
516	16	1618	Green maize	1.00	0.00	0.93	539,200	2,016,700	1,477,500	77%	100%	-	50%	5%	43%	40%	0%	0%	12%	0	54	234,409	54	215,054	2
517	16	1618	Beans	0.40	0.00	0.37	454,100	2,675,700	2,221,600	83%	100%	-	50%	11%	30%	24%	0%	0%	36%	0	68	135,135	68	108,108	2
518	16	1619	Green maize	0.50	0.00	0.46	0	2,608,700	2,608,700	75%	200%	-	700%							0	0	0	0	0	2
519	16	1620	Rape	0.25	0.00	0.23	1,021,700	1,173,900	152,200	94%	3900%	-	43%	11%	43%	26%	21%	0%	0%	0	87	434,783	65	260,870	2
520	16	1620	Chinese cabbage	0.25	0.00	0.23	804,300	1,260,900	456,600	86%	-	-	1100%	14%	54%	32%	0%	0%	0%	0	87	434,783	65	260,870	2
521	16	1621	Egg plants	0.40	0.00	0.37	589,200	7,756,800	7,167,600	98%	-	-	1100%	0%	46%	37%	17%	0%	0%	0	54	270,270	54	216,216	2
522	16	1621	Green maize	0.50	0.00	0.46	326,100	3,043,500	2,717,400	75%	-	-	-	40%	33%	27%	0%	0%	0%	0	54	108,696	54	86,957	2
523	16	1621	Cabbage	0.20	0.00	0.19	1,357,900	4,421,100	3,063,200	95%	-	-	-	4%	19%	16%	15%	0%	47%	0	53	263,158	53	210,526	2
524	16	1622	Green maize	0.30	0.00	0.28	1,285,700	1,821,400	535,700	88%	900%	0%	106%	14%	29%	17%	42%	0%	0%	0	71	357,143	54	214,286	2
525	16	1623	Tomato	0.50	0.00	0.46	304,300	1,152,200	847,900	94%	900%	-	247%	18%	64%	18%	0%	0%	0%	0	33	195,652	11	54,348	2
526	16	1623	Cabbage	0.50	0.00	0.46	347,800	869,600	521,800	75%	-	-	-	16%	38%	31%	16%	0%	0%	0	22	130,435	22	108,696	2
527	16	1623	Rape	0.25	0.00	0.23	1,108,700	2,087,000	978,300	94%	-	-	-	4%	47%	39%	10%	0%	0%	0	87	521,739	87	434,783	2
528	16	1623	Chinese cabbage	0.25	0.00	0.23	1,108,700	4,695,700	3,587,000	97%	-	-	-	4%	47%	39%	10%	0%	0%	0	87	521,739	87	434,783	2
529	16	1624	Green maize	1.00	0.00	0.93	376,300	1,354,800	978,500	95%	100%	-	100%	14%	43%	43%	0%	0%	0%	0	54	161,290	54	161,290	2
530	16	1625	Green maize	0.50	0.00	0.46	0	1,304,300	1,304,300	60%	50%	-	40%							0	0	0	0	0	2
531	16	1626	Green maize	0.40	0.00	0.37	0	810,800	810,800	80%	-	-	-							0	0	0	0	0	2
532	16	1627	Green maize	0.50	0.00	0.46	0	2,739,100	2,739,100	95%	100%	-	100%							0	0	0	0	0	2
533	16	1628	Green maize	1.00	0.00	0.93	21,500	2,967,700	2,946,200	91%	650%	-	2300%	0%	0%	0%	0%	100%	0%	1	0	0	0	0	2
534	16	1628	Tomato	0.50	0.00	0.46	1,108,700	6,782,600	5,673,900	96%	650%	-	2300%	10%	18%	10%	0%	0%	63%	0	33	195,652	22	108,696	2
535	16	1629	Rape	0.40	0.00	0.37	783,800	1,081,100	297,300	94%	-	-	250%	16%	55%	21%	9%	0%	0%	0	135	432,432	54	162,162	2
536	17	1701	Onion	0.10	0.00	0.09	1,355,600	7,222,200	5,866,600	80%	-	0%	-	25%	41%	0%	0%	0%	34%	0	111	555,556	0	0	2
537	17	1701	Cabbage	0.50	0.00	0.46	667,400	1,043,500	376,100	75%	-	0%	-	4%	26%	15%	23%	0%	33%	0	43	173,913	33	97,826	2
538	17	1701	Tomato	1.00	0.00	0.93	457,000	1,118,300	661,300	77%	-	0%	-	7%	6%	5%	35%	0%	47%	0	5	26,882	5	21,505	2
539	17	1702	Cabbage	0.20	0.00	0.19	1,000,000	7,105,300	6,105,300	81%	100%	-75%	67%	16%	42%	32%	11%	0%	0%	0	105	421,053	105	315,789	2
540	17	1702	Green maize	0.20	0.00	0.19	552,600	4,789,500	4,236,900	71%	100%	-75%	67%	0%	57%	43%	0%	0%	0%	0	79	315,789	79	236,842	2
541	17	1702	Groundnuts	0.16	0.00	0.15	0	3,066,700	3,066,700	80%	100%	-75%	67%							0	0	0	0	0	2
542	17	1702	Rape	0.04	0.00	0.04	1,875,000	8,125,000	6,250,000	77%	100%	-75%	67%	13%	53%	20%	13%	0%	0%	0	250	1,000,000	125	375,000	2
543	17	1703	Onion	0.20	0.00	0.19	1,631,600	3,763,200	2,131,600	91%	-60%	-	-50%	19%	65%	0%	0%	16%	0%	1	263	1,052,632	0	0	2
544	17	1703	Tomato	0.25	0.00	0.23	1,652,200	2,391,300	739,100	82%	-60%	-	-50%	9%	20%	16%	18%	26%	11%	1	65	326,087	65	260,870	2
545	17	1703	Rape	0.06	0.00	0.06	833,300	3,000,000	2,166,700	67%	-60%	-	-50%	10%	50%	40%	0%	0%	0%	0	83	416,667	83	333,333	2
546	17	1704	Tomato	0.24	0.00	0.22	1,496,400	7,704,500	6,218,100	97%	-	-100%	-	11%	24%	22%	31%	12%	0%	1	91	363,636	91	327,273	2
547	17	1704	Green maize	0.50	0.00	0.46	597,800	904,300	306,500	92%	-	-	-	13%	44%	44%	0%	0%	0%	0	65	260,870	65	260,870	2
548	17	1704	Okra	0.25	0.00	0.23	339,100	626,100	287,000	88%	-	-	-	10%	64%	26%	0%	0%	0%	0	43	217,391	22	86,957	2
549	17	1704	Onion	0.06	0.00	0.06	883,300	2,000,000	1,116,700	67%	-	-	-	28%	38%	34%	0%	0%	0%	0	83	333,333	83	300,000	2
550	17	1705	Cabbage	0.56	0.00	0.52	644,200	2,250,000	1,605,800	96%	-	-	-100%	10%	30%	24%	36%	0%	0%	0	38	192,308	38	153,846	2
551	17	1705	Green maize	1.40	0.00	1.30	369,200	1,723,100	1,353,900	63%	-	-	-	8%	42%	33%	0%	6%	10%	1	31	153,846	31	123,077	2
552	17	1705	Tomato	0.25	0.00	0.23	1,195,700	5,869,600	4,673,900	87%	-	-	-	7%	9%	7%	0%	0%	76%	0	22	108,696	22	86,957	3
553	17	1706	Tomato	0.50	0.00	0.46	641,300	1,087,000	445,700	70%	200%	0%	20%	10%	34%	27%	5%	0%	24%	0	43	217,391	43	173,913	2
554	17	1706	Groundnuts	0.50	0.00	0.46	173,900	2,800,000	2,626,100	86%	200%	0%	20%	75%	0%	0%	0%	0%	25%	0	0	0	0	0	2
555	17	1707	Irish potato	0.80	0.00	0.74	117,600	1,013,500	895,900	90%	150%	-	67%	10%	57%	32%	0%	0%	0%	0	14	67,568	14	37,838	2
556	17	1707	Groundnuts	0.64	0.00	0.59	76,300	1,091,500	1,015,200	86%	-	-	-	100%	0%	0%	0%	0%	0%	0	0	0	0	0	2
557	17	1708	Tomato	0.16	0.00	0.15	906,700	1,666,700	760,000	80%	50%	0%	33%	7%	41%	37%	15%	0%	0%	0	67	373,333	67	333,333	7
558	17	1708	Rape	0.03	0.00	0.03	1,833,300	6,000,000	4,166,700	83%	-	-	33%	18%	36%	33%	13%	0%	0%	0	167	666,667	167	600,000	7
559	17	1709	Tomato	0.50	0.00	0.46	543,500	730,400	186,900	82%	-	-	150%	12%	40%	36%	12%	0%	0%	0	43	217,391	33	195,652	2
560	17	1709	Egg plants	0.06	0.00	0.06	916,700	1,500,000	583,300	78%	-	-	-	0%	55%	45%	0%	0%	0%	0	83	500,000	83	416,667	2
561	17	1710	Onion	0.20	0.00	0.19	131,600	1,026,300	894,700	67%	-	0%	33%	0%	100%	0%	0%	0%	0%	0	26	131,579	0	0	2
562	17	1710	Groundnuts	0.30	0.00	0.28	0	1,928,600	1,928,600	67%	-	0%	33%							0	0	0	0	0	2
563	17	1711	Okra	0.30	0.00	0.28	89,300	232,100	142,800	77%	-	0%	100%	0%	60%	40%	0%	0%	0%	0	7	53,571	7	35,714	2
564	17	1711	Pumpkin leaves	0.30	0.00	0.28	53,600	375,000	321,400	71%	-	0%	100%	0%	100%	0%	0%	0%	0%	0	7	53,571	0	0	7
565	17	1711	Egg plants	0.06	0.00	0.06	375,000	833,300	458,300	80%	-	-	-	0%	67%	33%	0%	0%	0%	0	33	250,000	17	125,000	2
566	17	1712	Tomato	0.12	0.00	0.11	436,400	2,618,200	2,181,800	83%	-	0%	400%	0%	58%	0%	42%	0%	0%	0	45	254,545	0	0	7
567	17	1713	Green maize	0.70	0.00	0.65	138,500	276,900	138,400	89%	-	-	-	0%	56%	44%	0%	0%	0%	0	15	76,923	15	61,538	7
568	17	1713	Tomato	0.08	0.00	0.07	500,000	1,885,700	1,385,700	73%	-	-	-	0%	43%	57%	0%	0%	0%	0	71	214,286	71	285,714	7
569	17	1714	Cabbage	0.12	0.00	0.11	4,818,200	8,727,300	3,909,100	91%	300%	0%	33%	9%	8%	7%	46%	12%	18%	1	136	409,091	136	318,182	7
570	17	1714	Onion	0.03	0.00	0.03	5,500,000	17,333,300	11,833,300	75%	300%	0%	33%	18%	18%	15%	30%	0%	18%	0	167	1,000,000	167	833,333	1
571	17	1714	Egg plants	0.05	0.00	0.05	1,600,000	6,120,000	4,520,000	94%	300%	0%	33%	0%	38%	31%	31%	0%	0%	0	100	600,000	100	500,000	2
572	17	1715	Tomato	0.50	0.00	0.46	145,700	217,400	71,700	80%	-	-75%	50%	0%	45%	37%	18%	0%	0%	0	11	65,217	11	54,348	1
573	17	1716	Green maize	1.00	0.00	0.93	489,200	1,032,300	543,100	83%	50%	-100%	233%	18%	44%	38%	0%	0%	0%	0	54	215,054	54	188,172	2
574	17	1716	Groundnuts	1.00	0.00	0.93	53,800	645,200	591,400	80%	50%	-100%	233%	100%	0%	0%	0%	0%	0%	0	0	0	0	0	3
575	17	1717	Rape	0.21	0.00	0.19	973,700	1,157,900	184,200	91%	-100%	-	-	5%	54%	22%	19%	0%	0%	0	105	526,316	53	210,526	2
576	17	1717	Onion	0.54	0.00	0.50	210,000	1,650,000	1,440,000	91%	-100%	-	-	43%	57%	0%	0%	0%	0%	0	20	120,000	0	0	2
577	17	1717	Tomato	1.00	0.00	0.93	406,500	1,021,500	615,000	74%	-100%	-	-	9%	5%	33%	53%	0%	0%	0	54	19,355	27	134,409	2
578	17	1718	Green maize	0.10	0.00	0.09	500,000	4,444,400	3,944,400	60%	-	0%	-	0%	56%	44%	0%	0%	0%	0	56	277,778	56	222,222	2

No.	Scheme ID	Farmer ID	Crop	Area Declared (Lima)	Area Measured (Lima)	Cultivated Area Amended (ZMK/Lima)				Ratio Sold	Increase (%)			Composition of the Cost						Labor Use (1: use)	Fertilizer per lima				Where to Sell
						Area (92.6%)	Cost	Income	Profit		Fertilizer	Chitemene	Rainfed Maize	Seeds	D Compound	Urea	Pesticide	Labor	Transport		D Compound Kg	D Compound ZMK	Urea Kg	Urea ZMK	
579	17	1719	Green maize	0.40	0.00	0.37	532,400	3,891,900	3,359,500	83%	-	-	100%	4%	25%	20%	0%	0%	51%	0	27	135,135	27	108,108	2
580	17	1720	Rape	0.08	0.00	0.07	1,857,100	3,928,600	2,071,500	91%	0%	0%	300%	15%	23%	23%	38%	0%	0%	0	143	428,571	143	428,571	2
581	17	1720	Green maize	0.30	0.00	0.28	357,100	982,100	625,000	91%	0%	0%	300%	0%	50%	50%	0%	0%	0%	0	36	178,571	36	178,571	2
582	17	1721	Onion	0.24	0.00	0.22	931,800	7,159,100	6,227,300	95%	-	0%	-	34%	10%	7%	0%	0%	49%	0	23	90,909	23	68,182	2
583	17	1721	Green maize	0.25	0.00	0.23	456,500	1,521,700	1,065,200	71%	-	0%	-	0%	57%	43%	0%	0%	0%	0	65	260,870	65	195,652	2
584	17	1722		0.24	0.00	0.22	500,000	2,068,200	1,568,200	86%	-	0%	100%	27%	45%	0%	0%	0%	27%	0	45	227,273	0	0	2
585	17	1723	Cabbage	0.20	0.00	0.19	168,400	2,394,700	2,226,300	86%	-	0%	25%	16%	47%	38%	0%	0%	0%	0	11	78,947	11	63,158	2
586	17	1723	Groundnuts	0.20	0.00	0.19	63,200	4,168,400	4,105,200	89%	-	0%	25%	100%	0%	0%	0%	0%	0%	0	0	0	0	0	2
587	17	1724	Rape	0.25	0.00	0.23	147,800	1,521,700	1,373,900	86%	-	-	-	12%	29%	29%	29%	0%	0%	0	22	43,478	22	43,478	2
588	17	1725	Onion	0.36	0.00	0.33	242,400	3,068,200	2,825,800	89%	900%	-	100%	38%	63%	0%	0%	0%	0%	0	30	151,515	0	0	2
589	17	1726	Green maize	0.50	0.00	0.46	71,700	652,200	580,500	83%	100%	0%	33%	0%	55%	45%	0%	0%	0%	0	11	39,130	11	32,609	2
590	17	1727	Tomato	1.00	0.00	0.93	364,500	908,600	544,100	92%	100%	-	150%	13%	15%	15%	19%	0%	38%	0	54	53,763	54	53,763	2
591	17	1727	Green maize	1.00	0.00	0.93	209,700	908,600	698,900	92%	100%	-	150%	23%	26%	26%	0%	26%	0%	1	54	53,763	54	53,763	2
592	17	1728	Onion	0.12	0.00	0.11	2,000,000	11,250,000	9,250,000	91%	75%	-	500%	27%	45%	27%	0%	0%	0%	0	182	909,091	136	545,455	2
593	17	1728	Green maize	0.30	0.00	0.28	321,400	3,214,300	2,892,900	67%	75%	-	500%	0%	56%	44%	0%	0%	0%	0	36	178,571	36	142,857	2
594	17	1729	Tomato	0.30	0.00	0.28	553,600	1,414,300	860,700	91%	100%	0%	-	16%	39%	32%	13%	0%	0%	0	36	214,286	36	178,571	7
595	17	1729	Rape	0.36	0.00	0.33	324,200	545,500	221,300	89%	100%	0%	-	11%	56%	23%	9%	0%	0%	0	30	181,818	15	75,758	7
596	17	1729	Cabbage	0.10	0.00	0.09	283,300	555,600	272,300	80%	100%	0%	-	8%	59%	18%	16%	0%	0%	0	22	166,667	22	50,000	2
597	18	1801	Groundnuts	0.50	0.00	0.46	0	1,630,400	1,630,400	40%	-100%	-50%	67%							0	0	0	0	0	1
598	18	1801	Beans	0.50	0.00	0.46	97,800	978,300	880,500	67%	-100%	-50%	67%	100%	0%	0%	0%	0%	0%	0	0	0	0	0	1
599	18	1801	Green maize	0.50	0.00	0.46	326,100	760,900	434,800	71%	-	-	-	0%	50%	50%	0%	0%	0%	0	33	163,043	33	163,043	1
600	18	1802	Green maize	0.50	0.00	0.46	1,065,200	3,652,200	2,587,000	71%	-47%	-100%	400%	8%	41%	35%	0%	10%	6%	1	109	434,783	109	369,565	2
601	18	1802	Rape	0.25	0.00	0.23	691,300	521,700	-159,600	67%	-47%	-100%	400%	9%	57%	19%	6%	9%	0%	1	43	391,304	22	130,435	2
602	18	1802	Groundnuts	0.16	0.00	0.15	366,700	16,000,000	15,633,300	80%	-	-	-	55%	0%	0%	0%	0%	45%	0	0	0	0	0	2
603	18	1803	Green maize	0.70	0.00	0.65	753,800	2,215,400	1,461,600	78%	150%	300%	67%	8%	24%	16%	0%	20%	31%	1	31	184,615	31	123,077	2
604	18	1803	Onion	0.16	0.00	0.15	1,700,000	6,666,700	4,966,700	75%	150%	300%	67%	14%	35%	0%	20%	20%	12%	1	100	600,000	0	0	2
605	18	1803	Rape	0.04	0.00	0.04	1,250,000	2,250,000	1,000,000	83%	-	-	-	10%	60%	0%	20%	10%	0%	1	125	750,000	0	0	2
606	18	1804	Green maize	1.00	0.00	0.93	360,200	2,451,600	2,091,400	79%	3900%	-	400%	12%	30%	36%	0%	7%	15%	1	22	107,527	22	129,032	2
607	18	1804	Beans	0.25	0.00	0.23	521,700	6,521,700	6,000,000	67%	3900%	-	400%	38%	21%	25%	0%	17%	0%	1	22	108,696	22	130,435	2
608	18	1805	Irish potato	1.00	0.00	0.93	215,100	376,300	161,200	86%	-87%	0%	400%	15%	30%	15%	5%	10%	25%	1	16	64,516	5	32,258	2
609	18	1805	Chinese cabbage	0.04	0.00	0.04	1,325,000	3,000,000	1,675,000	67%	-87%	0%	400%	9%	47%	0%	19%	19%	6%	1	125	625,000	0	0	2
610	18	1806	Irish potato	1.00	0.00	0.93	387,100	3,225,800	2,838,700	67%	700%	-	900%	11%	35%	28%	0%	14%	13%	1	27	134,409	27	107,527	2
611	18	1806	Green maize	1.00	0.00	0.93	134,400	1,548,400	1,414,000	89%	700%	-	900%	24%	20%	16%	0%	40%	0%	1	5	26,882	5	21,505	2
612	18	1807	Onion	0.09	0.00	0.08	1,062,500	15,000,000	13,937,500	75%	150%	-	1150%	35%	35%	0%	0%	29%	0%	1	63	375,000	0	0	2
613	18	1807	Green maize	0.25	0.00	0.23	652,200	6,695,700	6,043,500	73%	150%	-	1150%	27%	37%	20%	0%	17%	0%	1	43	239,130	22	130,435	2
614	18	1808	Irish potato	0.50	0.00	0.46	608,700	2,739,100	2,130,400	83%	1150%	-	300%	21%	36%	29%	9%	5%	0%	1	43	217,391	22	173,913	2
615	18	1809	Cabbage	0.18	0.00	0.17	682,400	3,529,400	2,847,000	88%	1400%	-	400%	5%	43%	17%	13%	22%	0%	1	59	294,118	29	117,647	1
616	18	1810	Green maize	0.16	0.00	0.15	333,300	533,300	200,000	75%	100%	-	0%	0%	60%	40%	0%	0%	0%	0	33	200,000	33	133,333	1
617	18	1811	Green maize	0.30	0.00	0.28	410,700	3,000,000	2,589,300	71%	150%	-	200%	0%	43%	35%	0%	22%	0%	1	36	178,571	36	142,857	2
618	18	1811	Beans	0.50	0.00	0.46	119,600	260,900	141,300	67%	-	-	-	55%	0%	0%	0%	45%	0%	1	0	0	0	0	1
619	18	1812	Beans	0.50	0.00	0.46	347,800	2,608,700	2,260,900	67%	-	-	-	63%	0%	0%	0%	38%	0%	1	0	0	0	0	2
620	18	1813	Beans	1.00	0.00	0.93	43,000	645,200	602,200	67%	-	-	200%	100%	0%	0%	0%	0%	0%	0	0	0	0	0	2
621	18	1814	Green maize	0.84	0.00	0.78	467,900	1,794,900	1,327,000	50%	700%	0%	140%	5%	66%	22%	0%	7%	0%	1	103	307,692	26	102,564	1
622	18	1814	Irish potato	0.50	0.00	0.46	195,700	326,100	130,400	67%	700%	0%	140%	44%	33%	22%	0%	0%	0%	0	11	65,217	11	43,478	1
623	18	1815	Green maize	0.50	0.00	0.46	445,700	2,130,400	1,684,700	71%	100%	-	650%	0%	49%	39%	0%	12%	0%	1	43	217,391	43	173,913	1
624	18	1815	Beans	0.25	0.00	0.23	369,600	4,347,800	3,978,200	50%	100%	-	650%	71%	0%	0%	0%	29%	0%	1	0	0	0	0	1
625	18	1816	Green maize	0.50	0.00	0.46	445,700	1,521,700	1,076,000	80%	-	-	100%	0%	49%	39%	0%	12%	0%	1	43	217,391	43	173,913	5
626	18	1806	Beans	0.08	0.00	0.07	642,900	28,571,400	27,928,500	80%	-	-	100%	44%	0%	0%	0%	56%	0%	1	0	0	0	0	1
627	18	1817	Green maize	1.00	0.00	0.93	295,700	9,677,400	9,381,700	83%	233%	-	233%	15%	33%	44%	0%	9%	0%	1	22	96,774	22	129,032	1
628	18	1817	Beans	1.00	0.00	0.93	107,500	2,150,500	2,043,000	75%	-	-	-	75%	0%	0%	0%	25%	0%	1	0	0	0	0	1
629	18	1818	Beans	0.24	0.00	0.22	113,600	9,090,900	8,977,300	75%	233%	-	300%	0%	0%	0%	0%	100%	0%	1	0	0	0	0	1
630	18	1818	Green maize	0.16	0.00	0.15	1,266,700	11,200,000	9,933,300	67%	233%	-	300%	13%	53%	21%	0%	13%	0%	1	133	666,667	67	266,667	1
631	18	1819	Green maize	1.00	0.00	0.93	158,100	903,200	745,100	67%	33%	0%	50%	5%	68%	27%	0%	0%	0%	0	22	107,527	11	43,011	1
632	18	1819	Tomato	0.50	0.00	0.46	184,800	195,700	10,900	44%	-	-	-	0%	59%	41%	0%	0%	0%	0	22	108,696	11	76,087	1
633	18	1800		0.00	0.00	0.00	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	-	-	-							0					
634	18	1821	Green maize	4.00	0.00	3.70	537,800	1,474,600	936,800	81%	50%	-	96%	13%	42%	36%	0%	9%	0%	1	54	227,027	54	194,595	1
635	18	1821	Onion	1.00	0.00	0.93	229,000	1,505,400	1,276,400	86%	-	-	-	31%	23%	0%	0%	23%	23%	1	54	53,763	0	0	2
636	18	1821	Tomato	4.00	0.00	3.70	278,400	837,800	559,400	97%	-	-	-	7%	35%	29%	0%	10%	19%	1	27	97,297	27	81,081	2
637	19	1901	Green maize	0.10	0.00	0.09	477,800	4,277,800	3,800,000	82%	100%	100%	50%	7%	58%	35%	0%	0%	0%	0	56	277,778	56	166,667	2
638	19	1901	Groundnuts	0.12	0.00	0.11	0	2,618,200	2,618,200	75%	100%	100%	50%							0	0	0	0	0	2
639	19	1902	Green maize	0.50	0.00	0.46	423,900	1,239,100	815,200	95%	100%	-	-	0%	62%	38%	0%	0%	0%	0	33	260,870	33	163,043	2
640	19	1902	Groundnuts	0.15	0.00	0.14	0	2,057,100	2,057,100	75%	100%	-	-							0	0	0	0	0	2
641	19	1903	Green maize	0.50	0.00	0.46	337,000	391,300	54,300	50%	-	-	-	16%	39%	32%	0%	13%	0%	1	22	130,435	22	108,696	2
642	19	1904	Groundnuts	0.08	0.00	0.07	1,142,900	2,571,400	1,428,500	67%	100%	0%	67%	38%	0%	0%	0%	25%	38%	1	0	0	0	0	2

No.	Scheme ID	Farmer ID	Crop	Area Declared (Lima)	Area Measured (Lima)	Cultivated Area Amended (ZMK/Lima)				Ratio Sold	Increase (%)			Composition of the Cost						Labor Use (1: use)	Fertilizer per lima				Where to Sell
						Area (92.6%)	Cost	Income	Profit		Fertilizer	Chitemene	Rainfed Maize	Seeds	D Compound	Urea	Pesticide	Labor	Transport		D Compound Kg	D Compound ZMK	Urea Kg	Urea ZMK	
643	19	1905	Cabbage	0.15	0.00	0.14	1,685,700	1,428,600	-257,100	80%	50%	-	67%	0%	32%	8%	15%	23%	21%	1	107	535,714	36	142,857	2
644	19	1905	Pumpkin leaves	0.15	0.00	0.14	250,000	642,900	392,900	67%	50%	-	67%	0%	57%	43%	0%	0%	0%	0	36	142,857	36	107,143	2
645	19	1906	Green maize	1.00	0.00	0.93	241,900	4,258,100	4,016,200	91%	0%	-100%	20%	2%	53%	44%	0%	0%	0%	0	22	129,032	22	107,527	2
646	19	1906	Groundnuts	0.50	0.00	0.46	97,800	434,800	337,000	75%	0%	-100%	20%	100%	0%	0%	0%	0%	0%	0	0	0	0	0	2
647	19	1907	Onion	0.50	0.00	0.46	569,600	1,630,400	1,060,800	80%	100%	-	100%	61%	34%	0%	5%	0%	0%	0	33	195,652	0	0	5
648	19	1907	Green maize	0.50	0.00	0.46	1,126,100	2,347,800	1,221,700	93%	100%	-	100%	21%	37%	36%	0%	6%	0%	1	109	421,739	109	400,000	2
649	19	1907	Cabbage	0.35	0.00	0.32	540,600	900,000	359,400	83%	100%	-	100%	23%	35%	14%	26%	0%	0%	0	31	187,500	16	78,125	2
650	19	1908	Cabbage	0.30	0.00	0.28	267,900	2,678,600	2,410,700	80%	3900%	-100%	900%	0%	0%	0%	33%	67%	0%	1	71	0	71	0	2
651	19	1908	Okra	0.30	0.00	0.28	292,900	414,300	121,400	86%	3900%	-100%	900%	9%	61%	30%	0%	0%	0%	0	36	178,571	36	89,286	2
652	19	1908	Green maize	0.48	0.00	0.44	488,600	1,022,700	534,100	83%	3900%	-100%	900%	35%	42%	23%	0%	0%	0%	0	34	204,545	23	113,636	2
653	19	1908	Tomato	0.10	0.00	0.09	1,466,700	2,666,700	1,200,000	80%	3900%	-100%	900%	5%	23%	19%	53%	0%	0%	0	56	333,333	56	277,778	5
654	19	1908	Groundnuts	0.12	0.00	0.11	90,900	2,290,900	2,200,000	86%	-	-	-	100%	0%	0%	0%	0%	0%	0	0	0	0	0	5
655	19	1908	Rape	0.06	0.00	0.06	1,033,300	1,600,000	566,700	75%	-	-	-	11%	49%	16%	24%	0%	0%	0	83	500,000	8	166,667	5
656	19	1909	Onion	0.30	0.00	0.28	1,282,100	3,142,900	1,860,800	91%	100%	-	135%	21%	25%	23%	17%	14%	0%	1	54	321,429	54	300,000	5
657	19	1910	Tomato	0.12	0.00	0.11	863,600	4,909,100	4,045,500	91%	100%	-75%	500%	11%	32%	26%	32%	0%	0%	0	45	272,727	45	227,273	5
658	19	1910	Cabbage	0.12	0.00	0.11	1,018,200	5,454,500	4,436,300	85%	100%	-75%	500%	11%	54%	22%	13%	0%	0%	0	91	545,455	45	227,273	5
659	19	1911	Groundnuts	0.50	0.00	0.46	0	2,826,100	2,826,100	80%	100%	-100%	-							0	0	0	0	0	5
660	19	1912	Groundnuts	0.25	0.00	0.23	0	939,100	939,100	67%	-	-100%	-							1	0	0	0	0	5
661	19	1912	Onion	0.05	0.00	0.05	1,300,000	2,200,000	900,000	82%	-	-100%	-	31%	38%	31%	0%	0%	0%	0	100	500,000	100	400,000	2
662	19	1913	Groundnuts	0.10	0.00	0.09	1,000,000	4,000,000	3,000,000	60%	-	-100%	-	0%	0%	0%	0%	0%	100%	0	0	0	0	0	3
663	19	1914	Green maize	0.50	0.00	0.46	717,400	1,891,300	1,173,900	86%	-	0%	-	3%	30%	30%	0%	15%	21%	1	43	217,391	54	217,391	2
664	19	1915	Green maize	0.50	0.00	0.46	1,304,300	2,815,200	1,510,900	95%	300%	-	150%	0%	29%	17%	0%	25%	29%	1	43	380,435	43	217,391	2
665	19	1915	Groundnuts	0.25	0.00	0.23	304,300	1,173,900	869,600	80%	300%	-	150%	0%	0%	0%	0%	71%	29%	1	0	0	0	0	2
666	19	1916	Groundnuts	0.25	0.00	0.23	0	1,252,200	1,252,200	67%	100%	-	150%							0	0	0	0	0	2
667	19	1917	Green maize	1.00	0.00	0.93	1,000,000	2,623,700	1,623,700	98%	300%	-100%	-	4%	16%	15%	0%	0%	65%	0	54	161,290	54	150,538	2
668	19	1918	Green maize	1.00	0.00	0.93	163,400	414,000	250,600	73%	100%	-	200%	0%	39%	39%	0%	21%	0%	1	22	64,516	22	64,516	2
669	19	1918	Groundnuts	0.50	0.00	0.46	8,700	939,100	930,400	17%	100%	-	200%	0%	0%	0%	0%	100%	0%	1	0	0	0	0	2
670	19	1919	Pumpkin leaves	1.00	0.00	0.93	320,400	258,100	-62,300	98%	300%	-100%	-	0%	47%	47%	0%	6%	0%	1	22	150,538	0	150,538	3
671	19	1919	Green maize	1.00	0.00	0.93	225,800	301,100	75,300	75%	300%	-100%	-	0%	50%	50%	0%	0%	0%	0	16	112,903	16	112,903	2
672	19	1919	Okra	0.06	0.00	0.06	1,166,700	1,000,000	-166,700	67%	-	-	-	0%	50%	50%	0%	0%	0%	0	83	583,333	83	583,333	2
673	19	1919	Onion	0.08	0.00	0.07	1,000,000	2,142,900	1,142,900	67%	-	-	-	0%	50%	50%	0%	0%	0%	0	71	500,000	71	500,000	2
674	19	1920	Tomato	0.50	0.00	0.46	673,900	1,043,500	369,600	75%	-	-100%	-	0%	29%	19%	0%	32%	19%	1	33	195,652	33	130,435	3
675	19	1920	Groundnuts	0.50	0.00	0.46	0	1,304,300	1,304,300	80%	-	-100%	-							0	0	0	0	0	3
676	19	1921	Groundnuts	0.12	0.00	0.11	636,400	1,636,400	1,000,000	67%	-	0%	-	0%	0%	0%	0%	71%	29%	1	0	0	0	0	2
677	19	1921	Rape	0.02	0.00	0.02	4,250,000	1,500,000	-2,750,000	67%	-	-	-	12%	41%	35%	0%	12%	0%	1	250	1,750,000	250	1,500,000	3
678	19	1922	Onion	0.03	0.00	0.03	2,733,300	4,000,000	1,266,700	70%	-	-	-	15%	30%	0%	30%	24%	0%	1	167	833,333	0	0	6
679	19	1922	Groundnuts	0.12	0.00	0.11	81,800	2,454,500	2,372,700	67%	-	-	-	100%	0%	0%	0%	0%	0%	0	0	0	0	0	5
680	19	1922	Tomato	0.08	0.00	0.07	1,214,300	3,085,700	1,871,400	83%	-	-	-	12%	29%	29%	29%	0%	0%	0	71	357,143	71	357,143	5
681	19	1923	Rape	0.15	0.00	0.14	785,700	1,178,600	392,900	91%	100%	-100%	11%	9%	55%	27%	9%	0%	0%	0	71	428,571	36	214,286	5
682	19	1923	Green maize	1.00	0.00	0.93	0	516,100	516,100	83%	100%	-100%	11%							0	22	0	22	0	5
683	19	1924	Rape	0.10	0.00	0.09	1,500,000	2,333,300	833,300	96%	100%	-	200%	7%	67%	19%	7%	0%	0%	0	167	1,000,000	56	277,779	3
684	19	1924	Pumpkin leaves	0.12	0.00	0.11	0	136,400	136,400	67%	100%	-	200%							0	0	0	0	0	3
685	19	1924	Okra	0.15	0.00	0.14	750,000	2,285,700	1,535,700	75%	-	-	-	0%	14%	71%	14%	0%	0%	0	4	107,143	107	535,714	3
686	19	1925	Groundnuts	0.50	0.00	0.46	108,700	782,600	673,900	50%	-	-	-	30%	0%	0%	0%	70%	0%	1	0	0	0	0	2
687	19	1926	Green maize	1.00	0.00	0.93	246,200	967,700	721,500	89%	300%	0%	67%	10%	33%	35%	0%	9%	14%	1	16	80,645	0	86,022	2
688	19	1926	Pumpkin leaves	1.00	0.00	0.93	0	21,500	21,500	75%	300%	0%	67%							0	0	0	0	0	1
689	19	1926	Okra	1.00	0.00	0.93	0	75,300	75,300	86%	300%	0%	67%							0	0	0	0	0	2
690	19	1926	Groundnuts	0.25	0.00	0.23	226,100	1,252,200	1,026,100	75%	300%	0%	67%	13%	0%	0%	0%	87%	0%	1	0	0	0	0	2
691	19	1927	Tomato	0.12	0.00	0.11	636,400	2,400,000	1,763,600	55%	-	-	167%	0%	43%	36%	21%	0%	0%	0	45	272,727	45	227,273	2
692	19	1927	Groundnuts	0.30	0.00	0.28	125,000	1,157,100	1,032,100	83%	-	-	167%	57%	0%	0%	0%	43%	0%	1	0	0	0	0	2
693	19	1927	Rape	0.12	0.00	0.11	2,336,400	2,509,100	172,700	87%	-	-	167%	5%	70%	10%	16%	0%	0%	0	273	1,636,364	45	227,273	2
694	19	1928	Tomato	0.10	0.00	0.09	1,555,600	2,400,000	844,400	83%	-20%	-	20%	36%	21%	18%	0%	25%	0%	1	56	333,333	56	277,778	5
695	19	1929	Rape	0.25	0.00	0.23	139,100	2,782,600	2,643,500	94%	100%	-100%	167%	6%	94%	0%	0%	0%	0%	0	22	130,435	0	0	5
696	20	2001	Groundnuts	0.32	0.00	0.30	33,300	1,600,000	1,566,700	80%	50%	-100%	75%	100%	0%	0%	0%	0%	0%	0	0	0	0	0	2
697	20	2001	Green maize	0.48	0.00	0.44	181,800	397,700	215,900	90%	50%	-100%	75%	0%	63%	38%	0%	0%	0%	0	23	113,636	23	68,182	2
698	20	2002	Groundnuts	6.00	0.00	5.56	143,900	1,933,800	1,789,900	98%	100%	-	100%	19%	0%	0%	0%	31%	50%	1	0	0	0	0	2
699	20	2003	Groundnuts	1.00	0.00	0.93	182,800	908,600	725,800	92%	150%	-	33%	24%	0%	0%	0%	29%	47%	1	0	0	0	0	2
700	20	2003	Tomato	0.25	0.00	0.23	521,700	391,300	-130,400	78%	150%	-	33%	0%	33%	25%	42%	0%	0%	0	43	173,913	43	130,435	3
701	20	2000		0.00	0.00	0.00	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	-	-	-							0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
702	20	2004	Green maize	1.00	0.00	0.93	403,200	2,258,100	1,854,900	95%	33%	-100%	60%	20%	13%	13%	0%	0%	53%	0	54	53,763	5	53,763	2
703	20	2005	Irish Potato	0.56	0.00	0.52	346,200	3,288,500	2,942,300	79%	400%	-100%	150%	0%	56%	44%	0%	0%	0%	0	38	192,308	38	153,846	2
704	20	2005	Groundnuts	0.56	0.00	0.52	28,800	576,900	548,100	75%	400%	-100%	150%	100%	0%	0%	0%	0%	0%	0	0	0	0	0	2
705	20	2005	Green maize	0.07	0.00	0.06	450,000	2,500,000	2,050,000	80%	400%	-100%	150%	0%	56%	44%	0%	0%	0%	0	83	250,000	83	200,000	2
706	20	2006	Onion	0.38	0.00	0.35	1,328,600	5,485,700	4,157,100	94%	700%	-100%	329%	22%	26%	17%	0%	10%	26%	1	57	342,857	57	228,571	2

No.	Scheme ID	Farmer ID	Crop	Area Declared (Lima)	Area Measured (Lima)	Cultivated Area Amended (ZMK/Lima) Area (92.6%)	Cost	Income	Profit	Ratio Sold	Increase (%) Fertilizier	Chite-mene	Rainfed Maize	Composition of the Cost Seeds	D Compound	Urea	Pesticide	Labor	Transport	Labor Use (1: use)	Fertilizer per lima D Compound Kg	ZMK	Urea Kg	ZMK	Where to Sell
707	20	2006	Groundnuts	2.46	0.00	2.28	133,800	1,221,100	1,087,300	96%	700%	-100%	320%	34%	0%	0%	0%	66%	0%	1	0	0	0	0	2
708	20	2007	Green maize	0.50	0.00	0.46	347,800	1,369,600	1,021,800	89%	-	-100%	150%	16%	47%	38%	0%	0%	0%	0	33	163,043	33	130,435	2
709	20	2007	Amaranth	0.50	0.00	0.46	282,600	434,800	152,200	88%	-	-100%	150%	0%	31%	23%	0%	46%	0%	1	22	86,957	22	65,217	2
710	20	2007	Irish Potato	0.25	0.00	0.23	239,100	1,913,000	1,673,900	91%	-	-100%	150%	18%	45%	36%	0%	0%	0%	0	22	108,696	22	86,957	2
711	20	2008	Groundnuts	1.00	0.00	0.93	62,400	828,000	765,600	91%	100%	-100%	67%	41%	0%	0%	0%	17%	41%	1	0	0	0	0	2
712	20	2008	Green maize	0.30	0.00	0.28	339,300	446,400	107,100	80%	100%	-100%	67%	0%	79%	21%	0%	0%	0%	0	54	267,857	18	71,429	2
713	20	2009	Groundnuts	0.21	0.00	0.19	168,400	1,768,400	1,600,000	75%	100%	-	150%	38%	0%	0%	0%	63%	0%	1	0	0	0	0	2
714	20	2010	Cabbage	0.30	0.00	0.28	1,696,400	6,785,700	5,089,300	86%	300%	-	312%	26%	11%	13%	3%	0%	47%	0	179	178,571	71	214,286	2
715	20	2011	Groundnuts	3.36	0.00	3.11	91,000	802,600	711,600	81%	150%	0%	100%	27%	0%	0%	0%	14%	59%	1	0	0	0	0	2
716	20	2012	Cabbage	0.18	0.00	0.17	3,823,500	4,941,200	1,117,700	95%	1400%	0%	250%	15%	22%	9%	23%	0%	31%	0	118	823,529	88	352,941	2
717	20	2012	Tomato	0.18	0.00	0.17	941,200	1,882,400	941,200	75%	1400%	0%	-	0%	25%	13%	44%	0%	19%	0	59	235,294	29	117,647	2
718	20	2012	Irish Potato	0.16	0.00	0.15	300,000	7,200,000	6,900,000	89%	1400%	0%	-	0%	56%	44%	0%	0%	0%	0	33	166,667	33	133,333	2
719	20	2013	Groundnuts	1.00	0.00	0.93	209,700	1,430,100	1,220,400	79%	50%	-100%	67%	23%	0%	0%	0%	26%	51%	1	0	0	0	0	2
720	20	2013	Rape	0.10	0.00	0.09	300,000	1,333,300	1,033,300	98%	50%	-100%	67%	7%	93%	0%	0%	0%	0%	0	56	277,778	0	0	2
721	20	2014	Groundnuts	1.00	0.00	0.93	139,800	1,169,900	1,030,100	88%	150%	100%	100%	31%	0%	0%	0%	23%	46%	1	0	0	0	0	2
722	20	2015	Groundnuts	4.32	0.00	4.00	92,500	240,000	147,500	90%	250%	-	350%	11%	0%	0%	0%	35%	54%	1	0	0	0	0	2
723	20	2016	Rape	0.12	0.00	0.11	845,500	1,363,600	518,100	70%	67%	300%	150%	27%	29%	16%	15%	0%	13%	0	45	245,455	45	136,364	2
724	20	2016	Tomato	0.12	0.00	0.11	3,436,400	9,000,000	5,563,600	82%	67%	300%	150%	7%	42%	12%	16%	0%	23%	0	182	1,454,545	136	409,091	2
725	20	2016	Groundnuts	0.22	0.00	0.20	350,000	6,240,000	5,890,000	92%	67%	300%	150%	29%	0%	0%	0%	21%	50%	1	0	0	0	0	2
726	20	2017	Groundnuts	1.00	0.00	0.93	602,200	5,367,700	4,765,500	96%	100%	0%	67%	11%	0%	0%	0%	0%	89%	0	0	0	0	0	2
727	20	2018	Green maize	0.50	0.00	0.46	869,600	2,152,200	1,282,600	91%	300%	0%	43%	0%	13%	13%	0%	0%	75%	0	109	108,696	109	108,696	2
728	20	2018	Groundnuts	2.00	0.00	1.85	173,000	1,513,500	1,340,500	86%	300%	0%	43%	38%	0%	0%	0%	0%	63%	0	0	0	0	0	2
729	20	2018	Cabbage	0.50	0.00	0.46	1,923,900	6,087,000	4,163,100	98%	300%	0%	43%	19%	26%	18%	9%	0%	28%	0	109	500,000	87	347,826	2
730	20	2019	Cabbage	1.00	0.00	0.93	736,600	2,322,600	1,586,000	97%	567%	0%	50%	20%	26%	7%	8%	0%	39%	0	54	193,548	16	48,387	2
731	20	2019	Green maize	0.15	0.00	0.14	500,000	3,928,600	3,428,600	73%	-	-	-	0%	57%	43%	0%	0%	0%	0	71	285,714	71	214,286	2
732	20	2020	Groundnuts	0.18	0.00	0.17	1,105,900	8,470,600	7,364,700	93%	233%	0%	100%	26%	0%	0%	0%	0%	74%	0	0	0	0	0	2
733	20	2020	Tomato	0.36	0.00	0.33	75,800	545,500	469,700	83%	-	0%	-	0%	100%	0%	0%	0%	0%	0	15	75,758	0	0	2
734	20	2021	Rape	0.04	0.00	0.04	1,625,000	3,125,000	1,500,000	90%	400%	-100%	150%	9%	39%	31%	22%	0%	0%	0	125	625,000	125	500,000	2
735	20	2021	Groundnuts	0.60	0.00	0.56	133,900	1,400,000	1,266,100	86%	400%	-100%	150%	100%	0%	0%	0%	0%	0%	0	0	0	0	0	2
736	20	2021	Irish potato	0.12	0.00	0.11	500,000	2,727,300	2,227,300	67%	400%	0%	150%	18%	45%	36%	0%	0%	0%	0	45	227,273	45	181,818	2
737	20	2022	Groundnuts	0.16	0.00	0.15	200,000	3,920,000	3,720,000	83%	50%	0%	650%	100%	0%	0%	0%	0%	0%	0	0	0	0	0	2
738	20	2023	Green maize	0.65	0.00	0.60	883,300	3,416,700	2,533,400	98%	-	-	-	0%	36%	26%	0%	0%	38%	0	83	316,667	83	233,333	2
739	20	2023	Cabbage	0.10	0.00	0.09	5,611,100	11,388,900	5,777,800	98%	-	-	-	16%	20%	12%	6%	7%	40%	1	222	1,111,111	222	666,667	2
740	20	2024	Green maize	0.40	0.00	0.37	964,900	743,200	-221,700	82%	1043%	0%	100%	13%	42%	29%	0%	0%	17%	0	81	405,405	81	275,676	2
741	20	2025	Groundnuts	0.13	0.00	0.12	400,000	5,600,000	5,200,000	86%	-	-	-	50%	0%	0%	0%	0%	50%	0	0	0	0	0	2
742	20	2025	Green maize	0.14	0.00	0.13	807,700	969,200	161,500	86%	-	-	-	0%	43%	23%	0%	0%	34%	0	115	346,154	77	184,615	2
743	20	2026	Irish potato	0.20	0.00	0.19	778,900	4,421,100	3,642,200	86%	-	-	20%	20%	27%	20%	0%	0%	32%	0	53	210,526	53	157,895	2
744	20	2026	Groundnuts	0.40	0.00	0.37	205,400	1,816,200	1,610,800	71%	-	-	20%	47%	0%	0%	0%	0%	53%	0	0	0	0	0	2
745	20	2027	Groundnuts	0.10	0.00	0.09	522,200	4,666,700	4,144,500	80%	200%	-	-	32%	0%	0%	0%	0%	68%	0	0	0	0	0	2
746	20	2028	Groundnuts	0.12	0.00	0.11	454,500	6,545,500	6,091,000	83%	1900%	-	140%	20%	0%	0%	0%	0%	80%	0	0	0	0	0	2
747	21	2101	Rape	0.21	0.00	0.19	1,447,400	2,394,700	947,300	96%	-	-100%	-100%	15%	27%	29%	29%	0%	0%	0	79	394,737	105	421,053	5
748	21	2101	Green maize	0.50	0.00	0.46	260,900	684,800	423,900	71%	-	-100%	-100%	0%	67%	33%	0%	0%	0%	0	22	173,913	22	86,957	5
749	21	2102	Green maize	0.84	0.00	0.78	442,300	576,900	134,600	78%	100%	-100%	-100%	16%	29%	23%	0%	14%	17%	1	26	128,205	26	102,564	2
750	21	2102	Rape	0.36	0.00	0.33	812,100	3,181,800	2,369,700	86%	100%	-100%	-100%	7%	30%	15%	15%	11%	22%	1	30	242,424	30	121,212	2
751	21	2103	Tomato	0.24	0.00	0.22	1,431,800	6,909,100	5,477,300	92%	333%	-	100%	11%	24%	13%	52%	0%	0%	0	68	340,909	45	181,818	3
752	21	2103	Rape	0.24	0.00	0.22	1,136,400	4,636,400	3,500,000	88%	333%	-	100%	28%	40%	32%	0%	0%	0%	0	91	454,545	91	363,636	3
753	21	2103	Chinese Cabbage	0.08	0.00	0.07	1,785,700	6,428,600	4,642,900	89%	333%	-	100%	4%	64%	32%	0%	0%	0%	0	143	1,142,857	143	571,429	3
754	21	2104	Green maize	0.36	0.00	0.33	681,800	1,212,100	530,300	75%	100%	-100%	133%	20%	44%	36%	0%	0%	0%	0	61	303,030	61	242,424	3
755	22	2201	Tomato	0.36	0.00	0.33	272,700	218,200	-54,500	83%	100%	-100%	67%	11%	67%	22%	0%	0%	0%	0	30	181,818	15	60,606	2
756	22	2201	Rape	0.08	0.00	0.07	642,900	2,571,400	1,928,500	83%	100%	-100%	67%	11%	67%	22%	0%	0%	0%	0	71	428,571	7	142,857	2
757	22	2202	Tomato	0.12	0.00	0.11	354,500	909,100	554,600	80%	-	0%	-	23%	38%	38%	0%	0%	0%	0	5	136,364	5	136,364	2
758	22	2202	Rape	0.08	0.00	0.07	457,100	2,800,000	2,342,900	86%	-	0%	-	25%	38%	38%	0%	0%	0%	0	7	171,429	7	171,429	2
759	22	2203	Green maize	0.25	0.00	0.23	347,800	1,108,700	760,900	88%	300%	-50%	400%	13%	75%	13%	0%	0%	0%	0	43	260,870	43	43,478	2
760	22	2203	Groundnuts	0.25	0.00	0.23	87,000	782,600	695,600	83%	300%	-50%	400%	100%	0%	0%	0%	0%	0%	0	0	0	0	0	1
761	22	2204	Green maize	1.00	0.00	0.93	5,400	48,400	43,000	67%	-	-100%	67%	100%	0%	0%	0%	0%	0%	0	0	0	0	0	2
762	22	2205	Rape	0.25	0.00	0.23	239,100	456,500	217,400	86%	-	0%	-	18%	55%	27%	0%	0%	0%	0	22	130,435	2	65,217	2
763	22	2206	Egg plants	0.25	0.00	0.23	173,900	669,600	495,700	86%	-90%	0%	100%	38%	38%	25%	0%	0%	0%	0	2	65,217	2	43,478	2
764	22	2207	Tomato	0.25	0.00	0.23	326,100	1,043,500	717,400	83%	100%	0%	-	20%	33%	27%	20%	0%	0%	0	22	108,696	22	86,957	2
765	22	2207	Rape	0.25	0.00	0.23	391,300	1,460,900	1,069,600	83%	100%	0%	-	17%	29%	22%	33%	0%	0%	0	22	108,696	22	86,957	2
766	22	2208	Cabbage	0.50	0.00	0.46	282,600	782,600	500,000	92%	100%	0%	140%	15%	38%	31%	15%	0%	0%	0	22	108,696	22	86,957	2
767	22	2208	Tomato	0.15	0.00	0.14	571,400	3,035,700	2,464,300	88%	100%	0%	140%	19%	31%	25%	25%	0%	0%	0	36	178,571	36	142,857	2
768	22	2209	Green maize	0.25	0.00	0.23	43,500	173,900	130,400	75%	-	-	-	0%	0%	0%	0%	100%	0%	1	2	0	0	0	2
769	22	2210	Irish Potato	0.12	0.00	0.11	500,000	909,100	409,100	80%	-	0%	-	18%	45%	36%	0%	0%	0%	0	45	227,273	45	181,818	2
770	22	2210	Rape	0.02	0.00	0.02	650,000	3,500,000	2,850,000	71%	-	0%	-	23%	77%	0%	0%	0%	0%	0	25	500,000	0	0	2

No.	Scheme ID	Farmer ID	Crop	Area Declared (Lima)	Area Measured (Lima)	Cultivated Area Amended (ZMK/Lima)				Ratio Sold	Increase (%)			Composition of the Cost						Labor Use (1: use)	Fertilizer per lima				Where to Sell
						Area (92.6%)	Cost	Income	Profit		Fertilizer	Chitemene	Rainfed Maize	Seeds	D Compound	Urea	Pesticide	Labor	Transport		D Compound Kg	D Compound ZMK	Urea Kg	Urea ZMK	
771	22	2211	Green maize	4.00	0.00	3.70	275,700	1,229,700	954,000	99%	75%	-	100%	12%	39%	29%	0%	20%	0%	1	27	109,108	27	91,091	2
772	22	2211	Tomato	4.00	0.00	3.70	264,900	3,291,900	3,027,000	99%	75%	-	100%	5%	20%	3%	51%	20%	0%	1	14	54,054	3	8,108	2
773	22	2211	Irish Potato	0.50	0.00	0.46	521,700	2,391,300	1,869,600	91%	75%	-	100%	25%	17%	6%	27%	25%	0%	1	22	86,957	11	32,609	5
774	22	2212	Green maize	0.50	0.00	0.46	489,100	1,087,000	597,900	80%	200%	200%	59%	13%	53%	33%	0%	0%	0%	0	43	260,870	33	163,043	2
775	22	2213	Tomato	0.06	0.00	0.06	1,800,000	2,400,000	600,000	83%	33%	-	36%	5%	56%	23%	17%	0%	0%	0	167	1,000,000	83	416,667	5
776	22	2213	Rape	0.06	0.00	0.06	1,300,000	1,800,000	500,000	78%	33%	-	36%	6%	38%	32%	23%	0%	0%	0	83	500,000	83	416,667	5
777	23	2301	Rape	0.24	0.00	0.22	545,500	3,295,500	2,750,000	86%	50%	50%	67%	8%	38%	33%	21%	0%	0%	0	136	204,545	45	181,818	5
778	23	2301	Tomato	0.24	0.00	0.22	636,400	1,636,400	1,000,000	83%	50%	50%	67%	7%	32%	29%	32%	0%	0%	0	136	204,545	45	181,818	2
779	23	2302	Cabbage	0.30	0.00	0.28	1,071,400	1,500,000	428,600	83%	200%	100%	200%	17%	25%	25%	17%	17%	0%	1	54	267,857	54	267,857	2
780	23	2302	Tomato	0.30	0.00	0.28	1,053,600	7,071,400	6,017,800	91%	200%	100%	200%	17%	25%	25%	25%	7%	0%	1	54	267,857	54	267,857	5
781	23	2302	Green maize	1.00	0.00	0.93	462,400	6,602,200	6,139,800	94%	200%	100%	200%	30%	35%	12%	0%	23%	0%	1	54	161,290	54	53,763	2
782	23	2303	Green maize	1.00	0.00	0.93	296,500	2,129,000	1,832,500	91%	200%	0%	350%	24%	20%	20%	0%	36%	0%	1	54	59,140	54	59,140	2
783	23	2303	Tomato	1.00	0.00	0.93	467,700	4,473,100	4,005,400	96%	200%	0%	350%	6%	17%	17%	26%	26%	5%	1	16	80,645	16	80,645	2
784	23	2303	Cabbage	0.25	0.00	0.23	326,100	1,413,000	1,086,900	92%	200%	0%	350%	13%	17%	33%	17%	13%	7%	1	2	54,348	22	108,696	2
785	23	2303	Rape	0.25	0.00	0.23	956,500	5,630,400	4,673,900	95%	200%	0%	350%	11%	23%	23%	16%	20%	7%	1	43	217,391	43	217,391	2
786	23	2303	Onion	0.25	0.00	0.23	2,065,200	8,869,600	6,804,400	98%	200%	0%	350%	32%	21%	21%	0%	16%	11%	1	87	434,783	87	434,783	2
787	23	2303	Chinese Cabbage	0.25	0.00	0.23	956,500	8,413,000	7,456,500	93%	-	-	-	11%	23%	23%	20%	11%	11%	1	43	217,391	43	217,391	2
788	23	2304	Rape	0.50	0.00	0.46	604,300	815,200	210,900	80%	-	-	-	1%	27%	13%	25%	29%	5%	1	33	163,043	11	76,087	5
789	23	2305	Rape	0.36	0.00	0.33	1,530,300	13,333,300	11,803,000	73%	233%	-75%	100%	14%	24%	21%	24%	8%	10%	1	91	363,636	45	318,182	5
790	23	2305	Green maize	0.36	0.00	0.33	1,454,500	8,727,300	7,272,800	94%	233%	-75%	100%	0%	25%	22%	0%	22%	31%	1	91	363,636	45	318,182	2
791	23	2305	Cabbage	0.50	0.00	0.46	1,152,200	956,500	-195,700	91%	233%	-75%	100%	19%	23%	15%	9%	15%	19%	1	65	260,870	43	173,913	2
792	23	2305	Tomato	0.16	0.00	0.15	1,333,300	1,866,700	533,400	93%	233%	-75%	100%	25%	40%	18%	18%	0%	0%	0	67	533,333	33	233,333	2
793	23	2305	Onion	0.12	0.00	0.11	1,181,800	1,545,500	363,700	88%	233%	-75%	100%	0%	31%	54%	0%	15%	0%	1	45	363,636	91	636,364	2
794	23	2306	Cabbage	1.00	0.00	0.93	475,300	692,500	217,200	96%	100%	-	133%	6%	32%	23%	17%	23%	0%	1	22	150,538	16	109,677	2
795	23	2306	Tomato	0.50	0.00	0.46	619,600	1,891,300	1,271,700	91%	100%	-	133%	9%	49%	25%	16%	0%	0%	0	43	304,348	22	152,174	2
796	23	2307	Rape	0.50	0.00	0.46	934,800	1,793,500	858,700	91%	100%	-100%	400%	5%	21%	35%	9%	23%	7%	1	33	195,652	65	326,087	2
797	23	2307	Green maize	0.50	0.00	0.46	87,000	4,500,000	4,413,000	87%	100%	-100%	-	0%	0%	0%	0%	0%	100%	0	0	0	0	0	2
798	23	2307	Tomato	0.32	0.00	0.30	383,300	1,400,000	1,016,700	89%	100%	-100%	-	4%	52%	43%	0%	0%	0%	0	33	200,000	33	166,667	3
799	23	2307	Cabbage	0.32	0.00	0.30	566,700	1,066,700	500,000	94%	-	-	-	3%	35%	29%	24%	9%	0%	1	33	200,000	33	166,667	3
800	24	2401	Tomato	0.90	0.89	0.89	544,900	494,400	-50,500	91%	4900%	-50%	200%	5%	16%	12%	25%	0%	41%	0	22	89,888	17	67,416	2
801	24	2401	Okra	0.06	0.33	0.33	121,200	533,300	412,100	91%	4900%	-50%	200%	38%	38%	25%	0%	0%	0%	0	15	45,455	15	30,303	2
802	24	2402	Tomato	0.50	0.47	0.47	531,900	766,000	234,100	88%	300%	-50%	20%	12%	40%	36%	12%	0%	0%	0	213	212,766	213	191,489	1
803	24	2402	Irish Potato	0.20	0.25	0.25	572,000	960,000	388,000	75%	300%	-50%	20%	21%	35%	13%	10%	0%	21%	0	40	200,000	20	72,000	2
804	24	2403	Irish Potato	1.00	0.54	0.54	51,900	500,000	448,100	67%	-	0%	33%	71%	0%	0%	29%	0%	0%	0	0	0	0	0	3
805	24	2403	Beans	1.00	0.87	0.87	34,500	41,400	6,900	67%	-	0%	33%	100%	0%	0%	0%	0%	0%	0	0	0	0	0	5
806	24	2404	Egg plants	0.50	0.70	0.70	105,700	300,000	194,300	86%	0%	-25%	-	0%	54%	46%	0%	0%	0%	0	14	57,143	14	48,571	5
807	24	2404	Groundnuts	0.25	0.14	0.14	528,600	2,057,100	1,528,500	75%	100%	-50%	-100%	0%	54%	46%	0%	0%	0%	0	71	285,714	71	242,857	6
808	24	2405	Groundnuts	0.25	0.14	0.14	0	2,057,100	2,057,100	75%	100%	-50%	100%							0	0	0	0	0	6
809	25	2501	Tomato	1.12	1.31	1.31	2,735,100	4,977,100	2,242,000	91%	-	-	-	2%	14%	11%	16%	2%	53%	1	76	381,679	76	305,344	7
810	25	2501	Green maize	1.00	1.31	1.31	404,600	641,200	236,600	83%	-	-	-	12%	0%	75%	0%	12%	0%	1	0	0	76	305,344	2
811	25	2502	Tomato	1.00	0.82	0.82	2,292,700	2,591,500	298,800	76%	50%	-	122%	2%	21%	17%	28%	10%	21%	1	122	487,805	61	396,341	7
812	25	2502	Cabbage	0.25	0.40	0.40	2,437,500	4,875,000	2,437,500	74%	50%	-	-	11%	28%	19%	22%	6%	15%	1	125	625,000	125	475,000	7
813	25	2503	Tomato	0.50	0.50	0.50	1,150,000	4,620,000	3,470,000	98%	150%	-100%	-	16%	23%	20%	24%	17%	0%	1	100	260,000	100	230,000	7
814	25	2504	Tomato	0.25	0.31	0.31	887,100	8,467,700	7,580,600	93%	33%	-	-13%	9%	27%	15%	31%	18%	0%	1	48	241,935	32	129,032	7
815	25	2505	Tomato	1.00	1.00	1.00	1,110,000	1,080,000	-30,000	93%	0%	-	-40%	3%	25%	14%	27%	8%	23%	1	50	280,000	50	150,000	7
816	25	2506	Tomato	0.50	0.50	0.50	830,000	2,950,000	2,120,000	93%	100%	-	83%	6%	24%	10%	14%	6%	40%	1	40	200,000	20	80,000	7
817	25	2507	Cabbage	0.50	0.66	0.66	1,007,600	2,424,200	1,416,600	94%	-50%	-	-40%	18%	15%	19%	8%	5%	36%	1	30	151,515	38	189,394	7
818	25	2507	Tomato	0.25	0.24	0.24	1,625,000	2,916,700	1,291,700	89%	-50%	-	-40%	10%	26%	21%	18%	6%	19%	1	83	416,667	83	333,333	7
819	25	2508	Cabbage	0.24	0.12	0.12	1,787,500	3,958,300	2,170,800	95%	-	-	-	7%	23%	19%	17%	0%	34%	0	83	416,667	83	333,333	2
820	25	2509	Tomato	0.25	0.50	0.50	1,622,000	3,840,000	2,218,000	94%	-33%	-	-20%	6%	22%	20%	15%	0%	36%	0	100	360,000	100	330,000	2
821	25	2509	Rape	0.50	0.19	0.19	1,057,900	1,894,700	836,800	83%	-33%	-	-20%	8%	60%	15%	17%	0%	0%	0	105	631,579	53	157,895	2
822	25	2510	Egg plants	0.30	0.44	0.44	863,600	3,323,900	2,460,300	80%	-50%	-	-44%	4%	46%	21%	18%	11%	0%	1	80	397,727	0	181,818	2
823	25	2510	Onion	0.50	0.00	0.46	2,043,500	14,608,700	12,565,200	75%	-50%	-	-44%	14%	29%	26%	4%	7%	20%	1	217	586,957	217	521,739	2
824	25	2510	Tomato	0.25	0.25	0.25	1,480,000	2,280,000	800,000	47%	-50%	-	-44%	9%	39%	0%	41%	11%	0%	1	200	560,000	120	0	2
825	25	2510	Green maize	0.50	0.42	0.42	821,400	1,266,700	445,300	86%	-50%	-	-44%	0%	42%	43%	0%	14%	0%	1	119	345,238	119	357,143	2
826	25	2511	Tomato	0.50	0.42	0.42	773,800	5,857,100	5,083,300	98%	100%	-	-	11%	25%	15%	31%	18%	0%	1	48	190,476	24	119,048	2
827	25	2512	Tomato	0.50	0.52	0.52	2,153,800	3,990,400	1,836,600	96%	-70%	-	900%	4%	27%	23%	16%	5%	24%	1	192	576,923	192	500,000	2
828	26	2601	Cabbage	0.11	0.12	0.12	633,300	1,166,700	533,400	75%	100%	0%	100%	14%	39%	33%	13%	0%	0%	0	42	250,000	42	208,333	2
829	26	2601	Green maize	1.32	0.37	0.37	973,000	2,310,800	1,337,800	89%	100%	0%	100%	13%	33%	35%	0%	19%	0%	1	54	324,324	68	337,838	2
830	26	2602	Rape	0.11	0.06	0.06	283,300	5,333,300	5,050,000	94%	-	-	-	29%	0%	0%	71%	0%	0%	0	83	0	83	0	2
831	26	2602	Green maize	0.98	0.35	0.35	314,300	1,600,000	1,285,700	71%	-	-	-	55%	0%	0%	0%	0%	45%	0	71	0	71	0	2
832	26	2603	Green maize	0.32	0.34	0.34	205,900	926,500	720,600	71%	25%	0%	25%	0%	0%	0%	0%	29%	71%	1	74	0	74	0	2
833	26	2603	Groundnuts	0.34	0.24	0.24	50,000	900,000	850,000	67%	25%	0%	25%	0%	0%	0%	0%	100%	0%	1	0	0	0	0	2
834	26	2604	Green maize	0.60	0.39	0.39	859,000	923,100	64,100	83%	-	-75%	-	12%	38%	37%	0%	0%	15%	0	51	307,692	64	320,513	2

No.	Scheme ID	Farmer ID	Crop	Area Declared (Lima)	Area Measured (Lima)	Cultivated Area Amended (ZMK/Lima) Area (92.6%)	Cost	Income	Profit	Ratio Sold	Increase (%) Fertilizer	Chite-mene	Rainfed Maize	Composition of the Cost Seeds	D Compound	Urea	Pesticide	Labor	Transport	Labor Use (1: use)	Fertilizer per lima D Compound Kg	ZMK	Urea Kg	ZMK	Where to Sell
835	26	2604	Tomato	0.19	0.07	0.07	95,700	1,714,300	1,628,600	93%	-	-75%	-	100%	0%	0%	0%	0%	0%	0	429	0	0	0	3
836	26	2605	Green maize	0.59	0.35	0.35	942,900	1,200,000	257,100	75%	50%	-50%	33%	14%	36%	38%	0%	12%	0%	1	57	342,857	71	357,143	3
837	26	2605	Groundnuts	0.54	0.15	0.15	100,000	1,920,000	1,820,000	75%	50%	-50%	33%	0%	0%	0%	0%	100%	0%	1	0	0	0	0	3
838	26	2606	Groundnuts	0.14	0.15	0.15	0	400,000	400,000	80%	-	-100%	-							0	0	0	0	0	2
839	26	2607	Green maize	0.40	0.48	0.48	609,400	437,500	-171,900	71%	-	-	-	20%	34%	27%	0%	0%	19%	0	42	208,333	42	166,667	2
840	26	2607	Tomato	0.08	0.08	0.08	562,500	937,500	375,000	80%	-	-	-	0%	56%	44%	0%	0%	0%	0	63	312,500	63	250,000	3
841	26	2607	Bean leaves	0.03	0.03	0.03	833,300	216,700	-616,600	77%	-	-	-	60%	20%	20%	0%	0%	0%	0	33	166,667	33	166,667	3
842	26	2607	Groundnuts	0.16	0.36	0.36	55,600	400,000	344,400	50%	-	-	-	80%	0%	0%	0%	20%	0%	1	0	0	0	0	3
843	26	2608	Green maize	0.54	0.40	0.40	688,800	975,000	286,200	92%	100%	-100%	-100%	21%	36%	32%	0%	0%	11%	0	50	250,000	50	220,000	2
844	26	2608	Beans	0.54	0.40	0.40	37,500	200,000	162,500	75%	100%	-100%	-100%	100%	0%	0%	0%	0%	0%	0	0	0	0	0	3
845	26	2609	Groundnuts	0.19	0.12	0.12	125,000	2,400,000	2,275,000	50%	100%	0%	100%	100%	0%	0%	0%	0%	0%	0	0	0	0	0	3
846	26	2609	Green maize	0.29	0.36	0.36	0	1,263,900	1,263,900	92%	100%	0%	100%							0	42	0	42	0	7
847	26	2610	Groundnuts	0.11	0.20	0.20	375,000	720,000	345,000	50%	-	0%	-	20%	0%	0%	0%	80%	0%	1	75	0	75	0	3
848	27	2701	Rape	0.09	0.10	0.10	1,650,000	5,600,000	3,950,000	86%	700%	-67%	125%	2%	61%	18%	19%	0%	0%	0	200	1,000,000	100	300,000	3
849	27	2701	Chinese cabbage	0.16	0.11	0.11	1,091,800	5,090,900	4,009,100	79%	700%	-67%	125%	3%	84%	0%	13%	0%	0%	0	182	909,091	0	0	3
850	27	2702	Tomato	0.42	0.37	0.37	1,702,700	2,973,000	1,270,300	91%	100%	-	40%	5%	28%	22%	45%	0%	0%	0	135	472,973	135	378,378	3
851	27	2702	Green maize	0.21	0.24	0.24	479,200	2,916,700	2,437,500	15%	100%	-	40%	0%	52%	48%	0%	0%	0%	0	83	250,000	83	229,167	3
852	27	2703	Tomato	0.60	0.37	0.37	432,400	6,486,500	6,054,100	96%	200%	0%	100%	22%	16%	0%	63%	0%	0%	0	14	67,568	0	0	3
853	27	2704	Green maize	1.00	0.60	0.60	666,700	1,650,000	983,300	91%	100%	-100%	78%	0%	63%	38%	0%	0%	0%	0	83	416,667	83	250,000	2
854	27	2705	Green maize	0.48	0.28	0.28	678,600	2,285,700	1,607,100	63%	100%	-	50%	0%	39%	45%	0%	16%	0%	1	54	267,857	69	303,571	2
855	27	2706	Green maize	1.00	1.38	1.38	420,300	1,365,900	945,600	83%	-90%	-100%	225%	15%	31%	30%	0%	14%	10%	1	36	130,435	36	124,638	2
856	27	2707	Tomato	0.25	0.24	0.24	1,187,500	1,416,700	229,200	71%	50%	-	67%	5%	63%	0%	32%	0%	0%	0	125	750,000	0	0	3
857	27	2707	Green maize	0.25	0.25	0.25	320,000	1,620,000	1,300,000	78%	50%	-	67%	0%	63%	38%	0%	0%	0%	0	40	200,000	40	120,000	2
858	27	2707	Rape	0.25	0.12	0.12	1,183,300	2,166,700	983,400	96%	-	-	-	18%	63%	0%	8%	11%	0%	1	125	750,000	0	0	3
859	27	2708	Green maize	2.00	1.44	1.44	569,400	2,625,000	2,055,600	88%	-50%	-100%	4900%	0%	40%	35%	0%	18%	6%	1	69	229,167	69	201,389	2
860	27	2708	Rape	0.04	0.05	0.05	4,600,000	7,000,000	2,400,000	86%	-50%	-100%	4900%	2%	78%	0%	20%	0%	0%	0	600	3,600,000	0	0	3
861	27	2708	Tomato	0.25	0.24	0.24	1,500,000	7,916,700	6,416,700	84%	-50%	-100%	4900%	17%	33%	0%	50%	0%	0%	0	83	500,000	0	0	3
862	27	2709	Green maize	2.00	1.08	1.08	398,100	958,300	560,200	87%	200%	-75%	275%	0%	56%	28%	0%	16%	0%	1	37	222,222	28	111,111	2
863	27	2709	Egg Plants	0.06	0.03	0.03	1,800,000	7,333,300	5,533,300	68%	200%	-75%	275%	9%	0%	74%	17%	0%	0%	0	0	0	333	1,333,333	7
864	27	2710	Green maize	0.18	0.20	0.20	225,000	1,225,000	1,000,000	86%	-96%	-100%	67%	0%	56%	44%	0%	0%	0%	0	25	125,000	25	100,000	3
865	27	2711	Green maize	0.30	0.33	0.33	151,500	424,200	272,700	75%	100%	-	-	0%	60%	40%	0%	0%	0%	0	15	90,909	15	60,606	3
866	27	2711	Rape	0.12	0.07	0.07	235,700	2,285,700	2,050,000	94%	-	-	-	18%	30%	30%	21%	0%	0%	0	0	71,429	29	71,429	3
867	27	2712	Green maize	0.12	0.60	0.60	166,700	750,000	583,300	89%	100%	-100%	15%	0%	50%	50%	0%	0%	0%	0	17	83,333	17	83,333	3