Government of Malawi

DEPARTMENT OF CLIMATE CHANGE & METEOROLOGICAL SERVICES

AGROMETEOROLOGICAL UPDATE

FOR SECOND ROUND 2010/11 AGRICULTURAL ESTIMATES

Released 7th APRIL 2011

SEASONAL HIGHLIGHTS

- **The DCCMS issued the Seasonal Rainfall Forecast for 2010/11 growing season on 1st September 2010**
- **The bottom line of the 2010/11 rainfall this season would be adequate for agricultural production as the greater part of Malawi would experience normal to above normal total rainfall amounts**
- **Generally effective rains started between end of November and mid December 2010 when most areas received good rains with better distribution and intensity.**
- **However, from January localised areas started experiencing dry spells which intensified during the second half of February. The impact was most severe in localised low lying areas in the south particularly for the late planted crop and local maize wilted permanently before reaching maturity.**
- **In March high rainfall intensities caused water logging soils conditions and flooding in low lying areas particularly in Mzimba, Karonga, Nkhotakota , Salima and Nsanje districts**
- **Cumulative rainfall situation at end of March 2011 indicated that a greater part of Malawi had experienced normal rainfall amounts with better distribution this season compared to same period last season...**
- **Most climate models indicate that the moderate-strong La Niña event that has persisted since mid-June 2010 is now showing the first signs of weakening. However, the event is expected to last at least through the first three or four months of 2011 and Malawi is expected to receive average to above average rainfall amounts during the period March to May 2011...**
- **Despite localized dry spells in January and February and flooding in March 2010/11 second round national Maize production from the model is estimated at 3,477,406 Metric Tonnes.**

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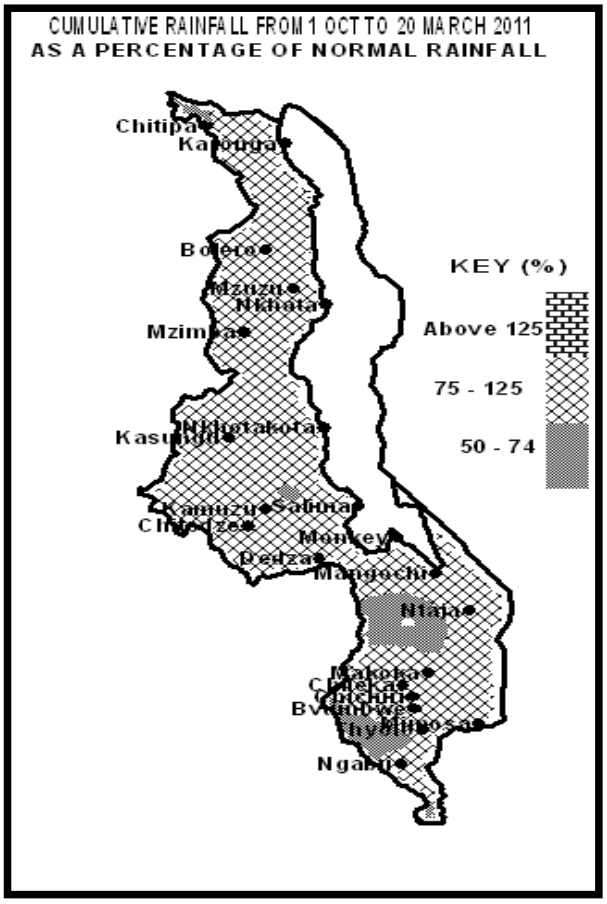
2010/11 Growing Season Preparedness

The Department of Climate Change and Meteorological Services issued the 2010/11 Seasonal Rainfall Forecast on 1st September 2010. At that time, moderate to strong La Nina conditions, which are the cooling of Sea Surface Temperatures over the eastern equatorial Pacific Ocean, had established and were predicted to persist into the first quarter of 2011.

La Nina conditions are usually associated with average to above average rainfall over a greater part of Southern Africa and drought conditions over Eastern Africa region. As such Malawi lies in the transition zone between Eastern African and Southern African climate regions. The effects of La Nina are therefore mixed depending on strengths but generally the southern half experiences better rainfall performance than the northern half where some areas may experience poor rainfall performance.

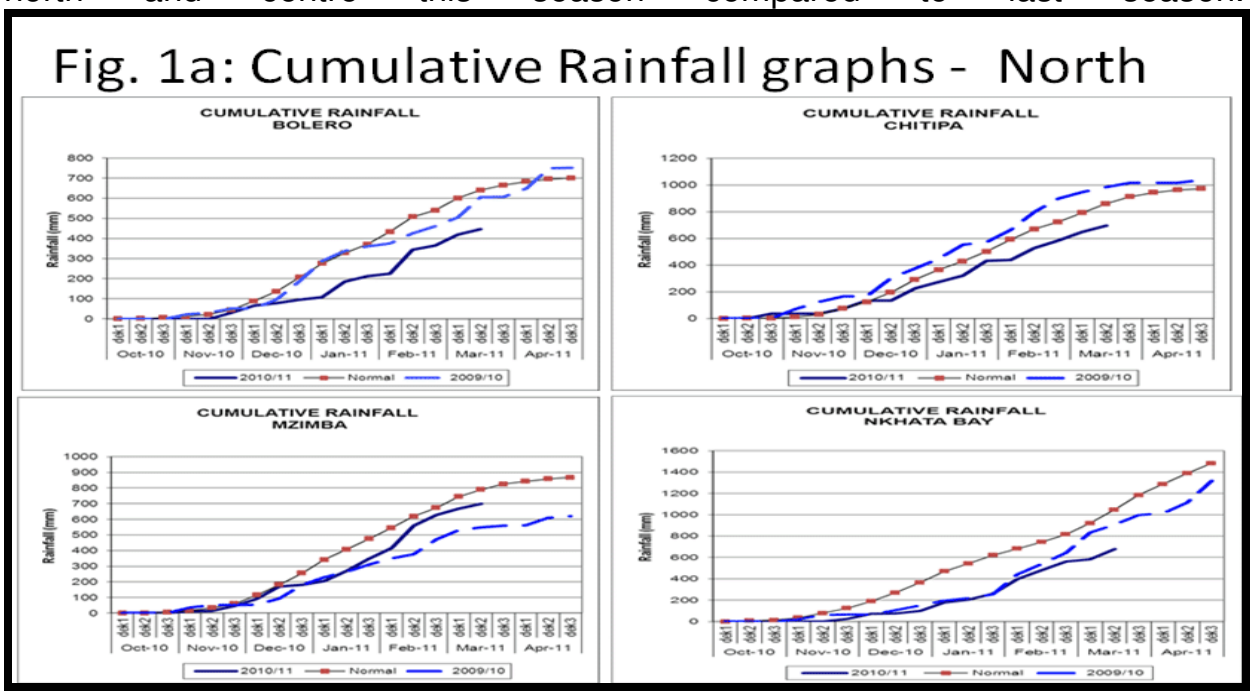
The bottom line of the forecast was that during 2010/2011 rainfall season, a greater part of Malawi would experience normal to above normal total rainfall amounts that could result in floods especially in prone areas.

The Progress of 2010/2011 Rainfall Season

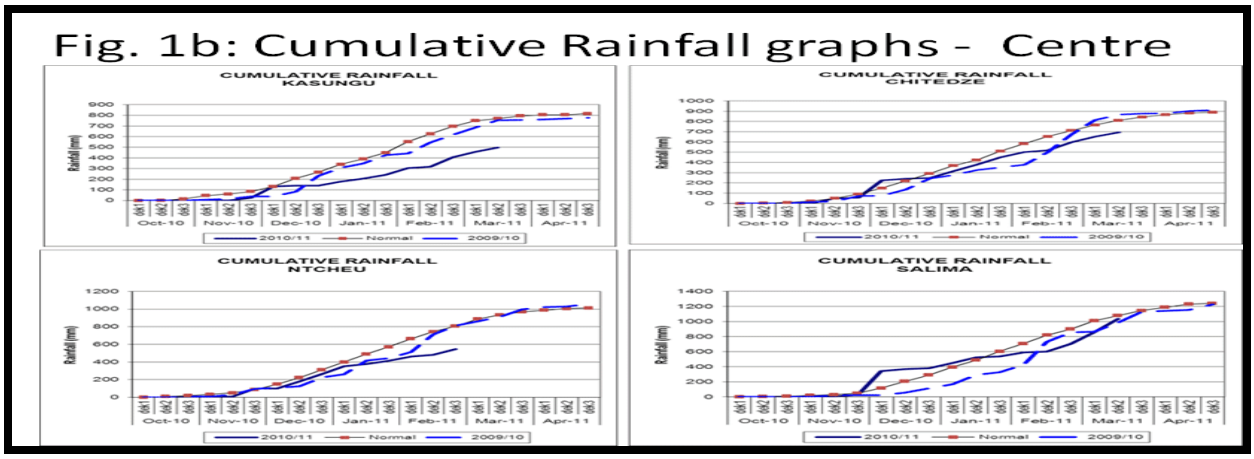


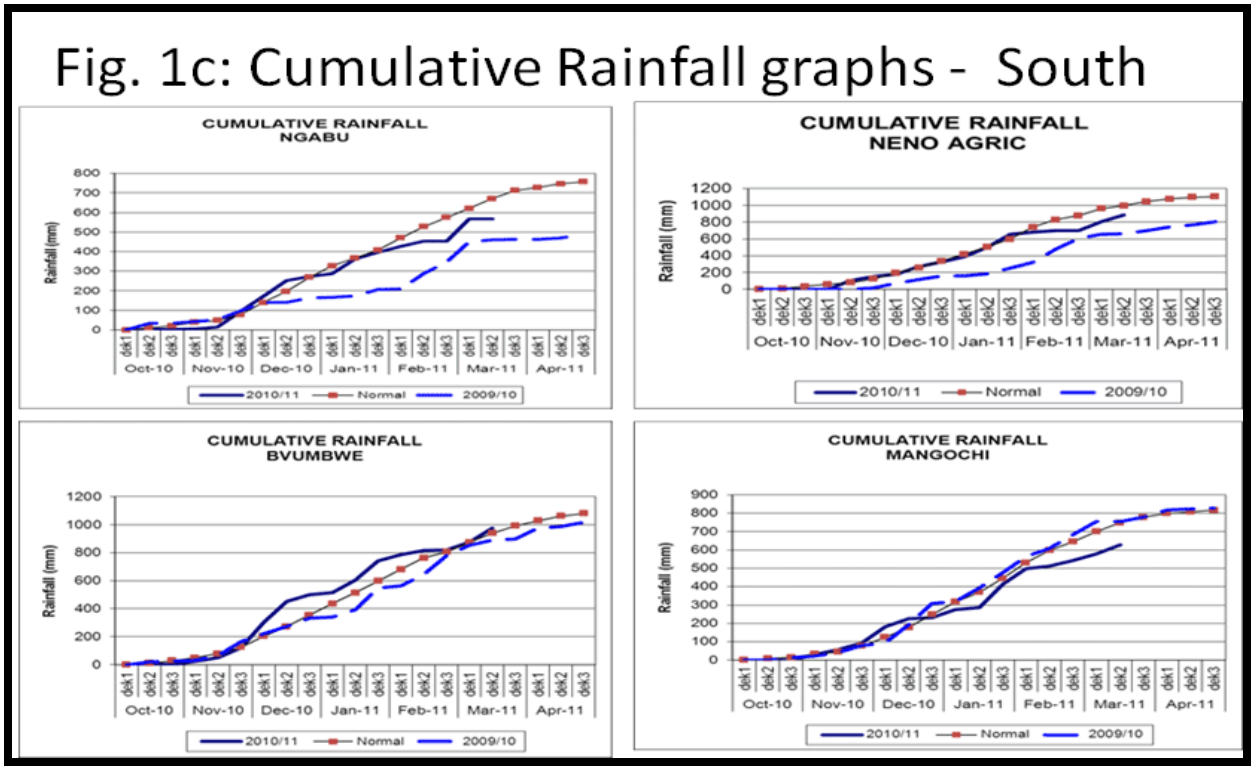
The main rains generally started between middle of November and early to mid-December which represented average to late onset when compared to last season as well as the climatological start of rains in Malawi. A few areas received first effective rains in December and these included Karonga district in the north and some parts of Dedza and Mchinji districts in the Centre. The spatial and temporal distribution of rainfall in most areas has been good with no major breaks except in the north where some areas had experienced dry spells especially at the beginning of the season. At the end of December 2010, which is the end of the first half of the season, rainfall in Malawi had been generally normal to below normal in most parts of Malawi. The rainfall has been generally good in the northern and central parts of Malawi, but in the southern parts, a dry spell affected the crop throughout the month of February, intensifying during the second half of February. This dryness resulted in permanent wilting of the crop before reaching maturity. The impact of the dry spell was most severe on the late planted crop. In contrast, crops were reported doing well in

the northern and central parts of Malawi. At 20th March 2011, ten day cumulative rainfall graphs indicated that generally less rainfall has been received in the north and centre this season compared to last season.



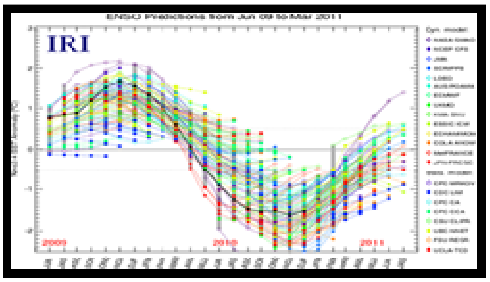
However, rainfall distribution and amount in both time and space was better this season than last season. On the other hand the south has received more rains this season compared to last season.





2010/11 Seasonal Forecast Update

Most climate models indicate that the moderate-strong La Niña event that has persisted since mid-June 2010 is now beginning to show the first signs of weakening. However, the event is expected to last at least through the first three or four months of 2011 and atmospheric impacts remain strong.



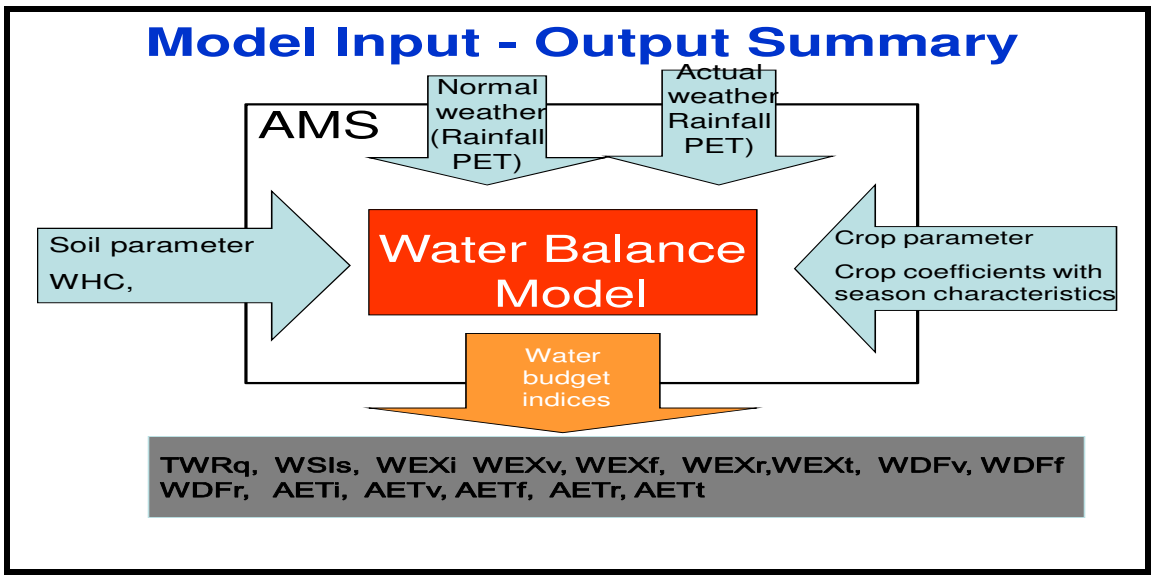
Rainfall Forecast for March to May 2011

During the month of April the main rainfall season is expected to be winding up over most parts of Malawi starting from the south. However, during the period March to May 2011 models suggest that average to above average rainfall amounts are likely to occur over most parts of Malawi with much of the contribution coming from March rainfall.

THE MALAWI MAIZE YIELD ASSESSMENT MODEL

The Malawi Maize Yield Assessment Model is a FAO Crop Specific Soil Water balance – based model that was adapted to Malawi conditions. The model has a number of objectives including the following main objectives:

- Monitoring Crop conditions with the aim of objectively predicting crop yields (tons/ha) and production long before the harvesting actually takes place to give planners and decision makers in government enough lead time
- To support early warning systems for food security, management of Natural Resources, Disasters and weather and climate risks in agriculture.



In this model Crop yield indices have been calculated for past years for various locations in Malawi. Using simple linear regression analysis, the data was analysed against historical crop yields data for each location.

The relationship between the index and yields is tentatively as follows:

Index	Comments	Expected Yields
100	Excellent	100% or more
97 – 99	Good	90 – 99%
80 – 96	Average	50 – 89%
60 – 79	Mediocre	20 – 49%
50 – 59	Poor	10 – 19%
<50	Complete failure	<10%

It is important to note that the model must have reliable historic yield data in order to forecast yields. In other words, the model is not a substitute for a well-functioning system that gives statistically sound estimates of crop yields as well as area and production. However, the model can be used in conjunction with such a system, particularly to serve as a check.

Why use Crop Water Satisfaction Index

With knowledge of **area planted** and **potential yield** values, Crop Water Satisfaction Index values can be translated into production estimates.

- Production (tons) = f (Yield)
- Yield (tons/ha) = f (WRSI)

A simple linear regression model is of the form:

Y = a + b*WRSI

Where Y = estimated yield (dependent variable)
a = constant
b = coefficient of variable
WRSI = Water Requirement Satisfaction Index

ASSUMPTIONS OF CROP WEATHER MODEL

- When running the model at any particular time, rainfall is assumed to be normal to the end of the season
- The model output leans towards minimum reported district yield in a bad season and towards maximum reported district yield in a good season
- Fertilizer uptake is reflected in the historical reported yield data
- Year to year variability of yield is due to weather variables
- Soil types and Water Holding Capacities are based on FAO classifications
- The area planted reported by the Ministry of Agriculture and Food Security is assumed correct
- In the absence of actual hectarage data previous season's data is used (assumed not to have changed)
- The effects of pests and diseases, and other environmental, political, socially-economic ally induced factors are not taken into account

STRENGTHS OF THE MODEL

- It can be run on a ten day interval and at district level
- The model is a very useful early warning tool since it can provide reliable yield estimates well ahead of the final production figures (as early as February)
- Model results compare very well with agricultural production estimates survey (APES) output by MoAFS
- Model outputs gives room for planning for both the best and worst case scenarios
- The model is scientific and therefore objective
- The model can be adapted for any crop provided historical yield data is available
- The model can be run on a simple desktop/ laptop computer
- Use of the model is cost-effective compared to other methodologies

2010/11 RESULTS FROM MAIZE YIELD ASSESSMENT MODEL

TABLE 1: 2010/11 LOCAL & COMPOSITE MAIZE PRODUCTION ESTIMATES

LOCAL MAIZE - SEASON 2010-2011

ADD	Area Pl.	WRSI	a	b	S.E.	t stud.
SHIRE VALLEY	30206	82	-65.01	1.679	14.289	1.761
BLANTYRE	136548	85	-68.00	1.663	13.821	1.714
MACHINGA	207481	84	-86.13	1.978	15.190	1.714
SALIMA	35416	95	-128.30	2.444	13.652	1.721
LILONGWE	217566	91	-114.41	2.275	10.452	1.692
KASUNGU	208119	94	-80.44	1.909	11.668	1.693
MZUZU	89708	96	-85.82	1.980	10.945	1.717
KARONGA	27103	95	-140.85	2.583	13.004	1.812
NATIONAL	952147	90	-86.17	1.954	12.980	1.645

RDP	EST. YIELD (% Max.)	EST. YIELD (kg/ha)	EST. PROD. (Tonnes)	YIELD LOW	YIELD HIGH	PRODUCTION LOW	PRODUCTION HIGH
Balaka	81	1374	55829	930	1819	37786	73872
Blantyre	74	2275	54349	1547	3002	36961	71737
Chikwawa	72	1005	24141	653	1356	15701	32581
Chiradzulu	74	1832	29239	1246	2418	19885	38593
Chitipa	104	2932	47430	2266	3599	36651	58210
Dedza	93	1813	108368	1469	2157	87804	128933
Dowa	99	2408	139280	1926	2889	111409	167151
Karonga	104	2429	26545	1877	2981	20512	32577
Kasungu	99	2326	148690	1860	2791	118936	178444
Likoma	103	1792	11	1467	2118	9	13
Lilongwe	93	1925	185148	1560	2291	150014	220282
Machinga	81	1485	56116	1005	1965	37980	74252
Mangochi	81	1789	144940	1211	2367	98098	191782
Mchinji	99	2366	143346	1893	2840	114661	172030
Mulanje	74	2030	59319	1380	2679	40341	78297
Mwanza	74	1449	13127	985	1913	8927	17327
Mzimba	103	2233	168112	1828	2639	137581	198642
Neno	74	1539	23511	1047	2032	15989	31033
NkhataBay	103	2621	18190	2145	3097	14887	21494
Nkhotakota	104	2556	37285	1977	3135	28843	45726
Nsanje	72	1011	6248	658	1365	4064	8433
Ntcheu	93	1534	94524	1243	1825	76587	112461
Ntchisi	99	2521	64944	2017	3026	51948	77940
Phalombe	74	2055	53835	1397	2712	36612	71058
Rumphi	103	3103	23210	2540	3667	18995	27425
Salima	104	2469	51418	1910	3028	39776	63059
Thyolo	74	2244	37995	1526	2961	25839	50151
Zomba	81	1469	70614	995	1944	47792	93435

CROP YIELD ASSESSMENT BASED ON THE WATER SATISFACTION INDEX (WRSI)
YIELD: kg/ha WRSI: % AREA: Hectares PRODUCTION: Tonnes
90% CONFIDENCE INTERVAL: Y(est)+/-t(0,10)*Std. Err. of Y(est)
AREA BASED ON SECOND ROUND 2010/11 CROP ESTIMATES FIGURES

ADD	10/11 WRSI	10/11 YIELD	YIELD LOW	YIELD HIGH	10/11 AREA	10/11 PROD	PROD LOW	PROD HIGH
SHIRE VALLEY	82	1006	654	1358	30206	30389	19764	41014
BLANTYRE	85	1987	1352	2623	136548	271375	184555	358195
MACHINGA	84	1578	1068	2089	207481	327499	221656	433341
SALIMA	95	2505	1937	3072	35416	88702	68618	108786
LILONGWE	91	1784	1445	2122	217566	388041	314405	461676
KASUNGU	94	2384	1907	2862	208119	496259	396953	595564
MZUZU	96	2336	1911	2760	89708	209523	171471	247574
KARONGA	95	2729	2109	3350	27103	73975	57163	90787
NATIONAL	**90**	**1981**	**1507**	**2454**	**952147**	**1885762**	**1434587**	**2336937**

TABLE 2: 2010/11 HYBRID MAIZE PRODUCTION ESTIMATES

HYBRID MAIZE - SEASON 2010-2011

ADD	Area Pl.	WRSI	a	b	S.E.	t stud.
SHIRE VALLEY	13902	86	-108.484	1.991	12.513	1.734
BLANTYRE	120900	91	-108.072	1.982	10.000	1.740
MACHINGA	85229	84	-72.913	1.448	7.893	1.833
SALIMA	29015	95	-57.574	1.334	18.938	1.729
LILONGWE	130338	93	-52.891	1.350	6.276	1.833
KASUNGU	192230	95	-31.645	1.063	11.382	1.729
MZUZU	61786	97	-24.802	0.853	13.925	1.782
KARONGA	22443	95	-194.014	2.779	18.037	1.771
NATIONAL	655843	92	-76.262	1.763	14.768	1.645

RDP	EST. YIELD (% Max.)	EST. YIELD (kg/ha)	EST. PROD. (Tonnes)	YIELD LOW	YIELD HIGH	PRODUCTION LOW	PRODUCTION HIGH
Balaka	49	1615	29243	1136	2094	20569	37918
Blantyre	72	2767	55283	2100	3433	41967	68599
Chikwawa	63	1508	13083	990	2027	8585	17581
Chiradzulu	72	2616	34853	1986	3246	26458	43248
Chitipa	71	2772	26267	1518	4027	14382	38152
Dedza	72	2372	68554	1995	2749	57664	79444
Dowa	69	2481	97693	1776	3186	69922	125464
Karonga	71	2401	31136	1315	3487	17048	45223
Kasungu	69	2411	179676	1725	3096	128600	230752
Likoma	58	2039	302	1170	2907	173	430
Lilongwe	72	3108	225318	2614	3601	189524	261111
Machinga	49	2272	27104	1598	2946	19064	35143
Mangochi	49	1471	31398	1035	1908	22085	40712
Mchinji	69	2439	149492	1746	3133	106996	191987
Mulanje	72	2782	78214	2112	3452	59374	97054
Mwanza	72	2128	14971	1616	2641	11365	18577
Mzimba	58	2168	102632	1245	3092	58901	146363
Neno	72	2198	17152	1669	2728	13020	21283
NkhataBay	58	2039	15291	1170	2907	8776	21807
Nkhotakota	69	2224	24642	1162	3286	12873	36411
Nsanje	63	1439	7526	945	1934	4938	10113
Ntcheu	72	2318	67060	1949	2686	56407	77714
Ntchisi	69	2652	45162	1898	3406	32324	57999
Phalombe	72	2637	39143	2002	3272	29714	48571
Rumphi	58	2531	17233	1453	3610	9890	24576
Salima	69	2590	46454	1353	3828	24268	68640
Thyolo	72	2720	81048	2065	3375	61526	100570
Zomba	49	1941	65715	1365	2517	46221	85208

CROP YIELD ASSESSMENT BASED ON THE WATER SATISFACTION INDEX (WRSI)
YIELD: kg/ha WRSI: % AREA: Hectares PRODUCTION: Tonnes
90% CONFIDENCE INTERVAL: Y(est)+/-t(0,10)*Std. Err. of Y(est)
AREA BASED ON SECOND ROUND 2010/11 CROP ESTIMATES FIGURES

ADD	10/11 WRSI	10/11 YIELD	YIELD LOW	YIELD HIGH	10/11 AREA	10/11 PROD	PROD LOW	PROD HIGH
SHIRE VALLEY	86	1482	973	1992	13902	20608	13523	27694
BLANTYRE	91	2652	2013	3291	120900	320664	243424	397903
MACHINGA	84	1801	1266	2335	85229	153460	107938	198982
SALIMA	95	2450	1280	3621	29015	71096	37142	105051
LILONGWE	93	2769	2329	3209	130338	360932	303595	418269
KASUNGU	95	2456	1757	3154	192230	472022	337842	606202
MZUZU	97	2192	1258	3127	61786	135458	77741	193176
KARONGA	95	2558	1400	3715	22443	57403	31431	83376
NATIONAL	92	2427	1757	3096	655843	1591644	1152635	2030653

Despite dry spells in January and February and localised flooding in March the 2010/11 second round national maize production from the model is estimated at 3,477,406 Metric Tons