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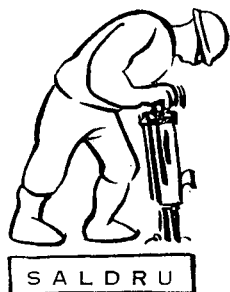
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Some Employment Patterns in South African Agriculture

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SOME EMPLOYMENT PATTERNS IN SOUTH AFRICAN AGRICULTURE.

Delia Hendrie and Alide Kooy

Introduction

This paper is an attempt to describe the employment situation on South African farms ⁽¹⁾ and to examine some of the trends in employment between 1961 and 1973, using official statistics.

Section 1 describes employment by race, type of worker and province;

Section 2 attempts to analyse employment patterns by economic region in terms of type of production, geographical location and wages;

Section 3 attempts to analyse changes in employment over time using similar explanatory variables.

In both Section 2 and Section 3, attention has been focussed almost entirely on regular (permanent) workers. Although casual workers form 43% of the total work force in agriculture, their treatment in the Agricultural Census is far from adequate, as has been explained in another paper. ⁽²⁾ However, Section 2 does contain some discussion on casual workers.

The paper is a first draft for discussion at the conference. The study was restricted

a) by time - some deficiencies are apparent to us and we hope that discussion and criticism at the conference will help to correct them;

b) by gaps in the statistics, both in time series and in coverage.

The statistics have frequently been attacked on the grounds of questionable reliability, ⁽²⁾ but they should nevertheless adequately reflect general trends.

(1): African-owned farms are excluded from the Agricultural Census.

(2) For a general discussion, and in particular for a discussion of the shortcomings of the Census on casual workers, see Delia Hendrie, Agricultural Statistics, a need for reform, SALDRU, Farm Labour Conference 1976.

Section 1: Employment in Agriculture 1961-73: a description.

TABLE 1: (1) EMPLOYMENT BY TYPE OF WORKER 1961 - 1973

Year	Total No. of Farm Workers	No. of Regular Workers	No. of Casual Workers	No. of Domestic Workers
1961	1 693 084	853 070	688 417	151 597
1962	1 794 864	872 784	769 789	152 291
1963	..	781 539	..	134 625
1964	1 253 661	756 581	365 557	131 523
1965	1 296 192	833 884	328 263	134 045
1966	..	..	..	..
1967	..	..	..	..
1968	1 640 295	..	..	..
1969	1 738 392	830 068	778 966	129 358
1970	..	..	..	..
1971	1 638 761	745 748	770 265	122 748
1972	1 505 791	736 236	652 991	116 564
1973	1 468 105	726 768	627 463	113 874

Notes:

- (1) .. denotes not available.
- (2) Employment is shown as at June for the years 1960-1964, and thereafter is at the 31st August.
- (3) The classes of farm workers distinguished are:
 - (a) regular workers - workers normally engaged in farm work in agriculture and in forestry and sugar-cane plantations and include managers, foremen and other regular farm workers.
 - (b) casual workers - seasonal and occasional workers, excluding contractors and their workers.
 - (c) domestic workers - workers who are mainly or exclusively engaged in domestic work.

The Table shows that total employment (regular plus casual plus domestic workers) fell 13% over the 13-year period. The drop was greatest for domestic workers (25%); numbers of regular workers fell 15% and numbers of casual workers 9%.

Although numbers seem to have fluctuated between 1961 and 1969, from 1969 there was a consistent decrease in employment of all types of workers.

- (1) The source for this and all other information is Department of Statistics, Agricultural Censuses for the years 1961, 1965, 1969, 1971, 1972 and 1973.

TABLE 2

EMPLOYMENT BY TYPE OF WORKER AND RACE, 1961-73.

	AFRICAN			ASIAN			COLOURED			WHITE		
	Regular Workers	Casual Workers	Domestic Workers	Regular Workers	Casual Workers	Domestic Workers	Regular Workers	Casual Workers	Domestic Workers	Regular Workers	Casual Workers	Domestic Workers
1961	731 424	583 475	126 570	5 457	750	503	104 981	103 196	24 456	11 208	996	68
1962	747 920	649 176	127 700	6 301	613	504	103 994	118 644	24 029	14 569	1 356	58
1963	667 248	..	112 477	6 013	..	373	96 287	..	21 738	11 991	..	37
1964	634 707	..	109 864	6 764	..	331	102 667	..	21 275	12 443	..	53
1965	710 353	273 027	111 923	5 354	1 245	360	105 471	53 391	21 611	12 706	1 245	151
1966	..	..	..	..	..	..	..	..	..	..	..	..
1967	..	..	..	..	..	..	..	..	..	..	..	..
1968	..	..	..	..	..	..	..	..	..	..	..	..
1969	708 470	650 388	109 541	4 502	1 590	345	102 473	125 194	19 378	14 623	1 794	94
1970	..	..	..	..	..	..	..	..	..	..	..	..
1971	636 454	649 567	105 249	3 973	1 071	191	92 385	118 554	17 308	12 936	1 073	0
1972	..	..	..	..	..	..	..	..	..	..	..	..
1973	618 493	523 777	97 142	3 626	388	174	92 850	102 495	16 558	11 799	803	0

A breakdown by race shows that numbers of Asian workers of all types fell fastest - by 38% - although the fall in numbers employed was only 2 000. Employment of African workers fell 14% - an absolute drop of 202 057 - and of 'coloured' workers 9%, or 20 730. Numbers of white workers employed rose by about 3%.

TABLE 3: Percentage Distribution of Farm Workers by Race and Type of Worker: 1973.

Race	Regular Workers	Casual Workers	Domestic Workers	All Workers
African	85,1	85,5	83,3	84,4
Asian	0,5	0,1	0,2	0,3
'Coloured'	12,8	16,3	14,5	14,4
White	1,6	0,1	0,0	0,9

In 1973, as the Table shows, Africans formed about 84% of the total labour force and about the same proportion in each category.

TABLE No. 4: Number of workers by type of worker and province: 1961-1973.

Type of Worker	Province	June 1961	August 1965	August 1969	August 1973
Regular	Cape	225 489	222 483	213 881	191 001
	Natal	152 449	172 444	176 712	152 219
	Transvaal	323 322	291 614	294 044	263 100
	O.F.S.	151 810	147 343	145 431	120 448
	R.S.A.	853 070	833 884	830 068	726 768
Casual	Cape	218 348	104 737	252 030	203 955
	Natal	62 792	52 397	100 464	82 071
	Transvaal	279 503	123 631	308 871	240 223
	O.F.S.	127 774	47 498	117 601	101 214
	R.S.A.	688 417	328 263	778 966	627 463
Domestic	Cape	51 562	46 690	42 443	36 178
	Natal	14 379	13 509	13 188	11 416
	Transvaal	47 032	40 102	40 263	34 528
	O.F.S.	38 624	33 744	33 464	31 752
	R.S.A.	151 597	134 045	129 358	113 874

TABLE 5: Percentage change in number of workers by type of worker and province.

Type of Worker	Province	1961 - 1965	1965 - 1969	1969 - 1973	1961 - 1973
Regular	Cape	-1,3	-3,9	-10,7	-15,3
	Natal	13,1	2,5	-13,9	- 0,2
	Transvaal	-9,8	0,8	-10,5	-18,6
	O.F.S.	-2,9	-1,3	-17,2	-20,7
	R.S.A.	-2,2	-0,5	-12,2	-14,8
Casual	Cape	-52,0	240,6	-19,1	- 6,6
	Natal	-16,6	191,7	-18,3	30,7
	Transvaal	-55,8	249,8	-22,2	-14,1
	O.F.S.	-62,8	247,6	-13,9	-20,8
	R.S.A.	-52,3	237,3	-19,4	- 8,9
Domestic	Cape	-9,4	-9,1	-14,8	-29,8
	Natal	-6,1	-2,4	-13,4	-20,6
	Transvaal	-14,7	+0,4	-14,2	-26,6
	O.F.S.	-12,6	-0,8	- 5,1	-17,8
	R.S.A.	-11,6	-3,5	-12,0	-24,9

A total of 37% of all farm workers were employed in the Transvaal in 1973, 29% in the Cape, 17% in the Orange Free State and 17% in Natal.

Changes in numbers employed by province show big variations for regular and for casual workers. The percentage drop in regular workers employed in the Cape, the Transvaal and the O.F.S. between 1961 and 1973 were of the same order (15 to 20%) but in Natal numbers dropped by less than 1%. For casual workers, the percentage decreases ranged from about 7% in the Cape to about 21% in the O.F.S., while numbers employed in Natal show an increase of nearly 31%. The large increase for Natal is surprising and might not have shown up had a different time of year been chosen. Numbers of casual workers employed in Natal fell by 18% between 1969 and 1973.

Figures for domestic workers by province show only small variations. But the Table suggests that the rate of decrease speeded up for all provinces in the last of the three 4-year periods (1969-73).

SECTION 2: EMPLOYMENT PATTERNS.

Employment by region can be expected to vary for a number of reasons. The Agricultural Census presents statistics for 298 magisterial districts, consolidated into 60 economic regions. Numbers 1 to 23 are in the Cape; numbers 24 to 33 in Natal; numbers 34 to 49 in the Transvaal and numbers 50 to 60 in the O.F.S.

Appendix 1 contains a full list of magisterial districts by economic region, and a map.

The analysis which follows is based on economic regions. It would have been preferable, had there been time, to work with magisterial districts, since there are considerable variations in conditions within regions.

Numbers employed have been expressed, in this section, by 100 hectares, to avoid distortions caused by region size. Appendices 2 and 3 list numbers employed by economic region and numbers per 100 ha by economic region. It is notable that numbers employed have decreased faster than numbers per 100 ha, presumably because area farmed has been shrinking.

(i) Employment per 100 ha and type of production.

Type of production categories were defined as follows: the fact that there were only 60 observations (60 economic regions) limited the number of categories which could be used. The classification was based on the percentage contribution of each region to national production totals for each of eight major activities - vegetables, pigs and poultry; deciduous fruit; other fruit; maize; cereals (including wheat); sugar; cattle, and sheep.

The existence of a strong association between number of regular workers per 100 ha, in 1973, and type of production was established by an analysis of variance test.⁽¹⁾ (For an explanation of this technique, and of that used below in correlation, see Appendix 4).

(1) $F = 21,31.$ ($F_{0,01 ; 7 ; 52} = 3,29$)

The differences in the average numbers of workers are interesting: the averages ranged from nearly 126 regular workers per 100 ha for sugar farming to about 3 for sheep-farming. Labour requirements were also relatively high for poultry, pigs and vegetables, followed by fruits other than deciduous fruits. Labour requirements for the other four categories (maize, cereals, cattle and deciduous fruits) were similar to each other at between 18 and 12 regular workers per 100 ha. (See Table 6).

It seemed necessary to test this link for a previous year in view of the apparent lack of association between changes in employment and type of production (see p. 12). But for 1969 the association between numbers of regular workers and type of production was again strong ⁽¹⁾. Further, average regular worker requirements per 100 ha had changed little between 1969 and 1973. For vegetables, pigs and poultry, there was an increase of 10,2 workers per 100 ha; cattle farming showed a drop of 4 and changes in other categories of production were positive and less than 1,5.

For all economic regions, number of regular workers per 100 ha increased by 0,3 in this period; but between 1961 and 1973 the number fell from 9,4 to 8,3.

(ii) Employment per 100 ha and location.

An attempt was made to classify economic regions by geographical location. The categories used were: urban, inside a homeland, bordering on a homeland, and 'other'. In general, regions where more than half of total area was inside, or where more than half of the boundary was common with, a homeland, were classified as 'inside' and 'bordering on' homelands, respectively.

Analysis of variance test of employment of regular workers per 100 ha in 1973 and location, showed a clear association. ⁽²⁾

$$(1) F = 6,55. \quad (F_{0,01; 7; 52} = 3,29)$$

$$(2) F = 7,70 \quad (F_{0,01; 3; 56} = 4,31)$$

The average number of workers per 100 ha in urban areas was 75,1: in homelands 41,8; in regions bordering homelands 35,0 and in 'other' areas 10,1.

Again, this test was repeated for another year (1969) and the association was confirmed. (1)

However, these results are not as interesting as they may appear, since the location categories overlap type of production categories in many cases.

(iii) Employment per 100 ha and average wage.

When numbers of regular workers per 100 ha, by region, are tested against, for example, wages of African regular workers, no association is found. (2)

(iv) Employment per 100 ha and product per worker.

The Agricultural Census lists value of farm products sold by region. If these figures are divided by the number of regular workers in each region, and the result is tested against number of regular workers per 100 ha in each region, no significant association is found. (3)

In other words, it seems that neither current wages (cash plus kind) nor product per worker significantly influence numbers employed. However, it is interesting that product per worker (regular, casual and domestic) and type of production are strongly associated. (4)

(v) Numbers of regular and of casual workers per 100 ha.

It seemed necessary to test the relationship between numbers of regular and of casual workers employed (in spite of the inadequacy of the definition of casual

(1) $F = 5,64$ ($F_{0,01; 3; 56} = 4,31$)

(2) $r = 0,19$

(3) $r = 0,20$

(4) An analysis of variance test yielded $F = 4,54$ ($F_{0,01; 7; 52} = 3,29$)

workers in the Census); to find out whether regions where high numbers of regular workers were employed also had big casual work forces, or whether farmers in regions where the regular work force was relatively large could manage with fewer casual workers than other farmers.

A strong positive correlation was found between numbers of regular workers (per 100 ha) and numbers of casual workers (per 100 ha) indicating that farmers in regions where the regular worker per 100 ha ratio was high generally also employed high numbers of casual workers. (1)

In view of this, it was not surprising to find that, as in the case of regular workers, type of production significantly affected numbers of casual workers per 100ha employed. (2)

TABLE 6: Average numbers of regular and casual workers per 100 ha by type of production.

Type of production	Number per 100 ha	
	Regular	Casual
Sugar-cane	125,9	75,3
Vegetables, pigs and poultry	84,9	28,9
Deciduous fruit	11,7	10,7
Other fruit	24,1	14,7
Maize	17,8	18,0
Cattle	12,0	23,1
Sheep	3,1	3,4
Cereals	14,2	10,3

When average numbers of casual and of regular workers for each type of production are ranked according to size, similar patterns emerge for the two types of worker.

(1) $r = 0,75$

(2) An analysis of variance test yielded $F = 6,55$ ($F_{0,01; 7; 52} = 3,29$)

Sugar-cane farming had the highest labour requirements for both types; vegetables, pigs and poultry came second in both rankings, maize fourth and sheep eighth (the lowest labour requirements). Deciduous fruit and cereals came sixth or seventh in each ranking and other fruit and cattle came third and fifth.

However, in spite of the strong association noted above, the ratio of regular to regular plus casual workers (expressed as a percentage) was found to differ significantly between regions grouped according to type of production.⁽¹⁾ A high percentage would mean a relatively 'stable' labour force. Vegetables, pig and poultry farming had the most 'stable' labour force, followed by sugar, cattle, cereals and fruits other than deciduous fruits. Deciduous fruits and maize had exactly as many casual as regular workers per 100 ha and sheep-farming had fewer regular than casual workers.

It must be remembered that these relationships hold as at 31 August; the situation might be very different if the Census was taken at another date when numbers of casual workers on the farms would be considerably higher or considerably lower.

SECTION 3: CHANGES IN EMPLOYMENT OVER TIME.

The analysis which follows is an attempt, first, to test for trends in employment between regions and second, to test these changes against the explanatory variables used above.

In 11 economic regions numbers employed rose between 1961 and 1973; in 45 regions numbers employed fell and in 4 regions there was little change. Appendix 5 shows percentage changes in numbers employed for each economic region between 1961 and 1973. The changes vary considerably between regions and also within regions over time. A comparison of percentage changes by economic region between 1961 and 1965, 1965 and 1969, and 1969 and 1973 suggests that the rate of decrease in numbers employed has accelerated.

(1) An analysis of variance test yielded $F = 8,77$ ($F_{0,01; 7; 52} = 3,29$)

TABLE 7: Frequency distributions of average annual percentage changes in regular workers employed by economic region, 1961-65, 1965-69, 1969-73.

Percentage change distribution	1961-65	1965-69	1969-73
less than -4,50	8	8	20
-4,49 to -3,00	3	6	11
-2,99 to -1,50	10	11	13
-1,49 to 0	10	14	6
0,01 to 1,50	11	11	4
> 1,50	18	10	6
TOTAL	60	60	60

The Table shows that the mode for 1961-65 is greater than 1,5%, whereas the mode for 1965-69 has shifted to the -1,49 to 0% range and that for 1969-73 is less than -4,5%. Examination of the median - a better indicator than the mode - for each time period reinforces the point. The median for 1961-65 is -0,15%; that for 1965-69 is -1,0% and that for 1969-73 is -3,1%.

Inspection of the percentage changes by region in Appendix 5 suggests, however, that over the 1961-73 period there were no striking trends within regions. Two simple tests confirm this opinion:

(i) Analysis of the variance of average annual percentage changes - calculated for the periods 1961-63, 1965-69, 1969-71, 1971-72 and 1972-73 - shows no significant differences between each region. ⁽¹⁾ Averages for each region do vary considerably, but when compared with the variation between each value in the lists, they are insignificant.

(1) $F = 0,82$ ($F_{0,05; 4; 240} = 2,37$)

Trends might become apparent if different time periods are examined for different regions; for example, percentage changes in employment in the Oudtshoorn/Ladismith/Calitzdorp area (economic region 07) show a consistently decreasing trend between 1969 and 1973 (but not between 1965 and 1973), while percentage decreases in the Bergville/Estcourt/Underberg area (economic region 27) are consistently accelerating over the whole period 1961-73.

Tests for the existence of other similar trends within regions - although time consuming - might be rewarding.

(ii) Then, analysis of the variance of average annual percentage changes in employment (1961-73) between regions grouped according to type of production, also showed no significant trend. ⁽¹⁾ However, some differences can be noted in the means of average annual percentage changes in numbers employed by type of production. The only positive mean of changes was in deciduous fruit farming (0,3%). The means for poultry, pigs and vegetables, sheep, and cattle farming were very close (between -2,9 and -3,9%) and means for maize, other fruits, cereals were also grouped (between -1,8 and -2%). In the sugar-cane farming areas the mean of average annual percentage changes was 0.

(iii) It again seemed necessary to test whether proximity to homelands or to urban areas significantly affected the rate of change in agricultural employment. This was not found to be the case. ⁽²⁾ Means of the average annual percentage changes in numbers employed for the four categories between 1961 and 1973 were very close; although those for regions in urban areas and in the homelands were slightly higher than for the other two categories.

(1) $F = 1,66$ ($F_{0,05; 7; 52} = 2,34$)

(2) An analysis of variance test of average annual percentage changes by location yielded $F = 1,04$ ($F_{0,05; 3; 56} = 2,84$)

(iv) Changes in numbers of regular workers by region between 1969 and 1973 were correlated against changes in average African wages (cash plus kind) over that period. The association was weak,⁽¹⁾ but it is worth noting that it was negative. (In other words, to the extent that there was an association at all, percentage changes in numbers of regular workers were higher where percentage changes in wages were lower.)

More rigorous tests, by race, might bring out a stronger association.

(v) It would also have been interesting to compare changes in value of production by region with changes in numbers employed, but a time series of this data is not available.

A note on domestic workers.

Numbers of domestic workers employed in each region were found to be strongly correlated with numbers of farms.⁽²⁾ The link between changes in numbers of domestic workers employed and changes in numbers of farms may, however, be less strong: in the Cape between 1961 and 1973 numbers of domestic workers employed fell 29% and numbers of farms 20%; in the Transvaal numbers of domestic workers fell 26% and of farms 23%; in Natal numbers of domestic workers fell 20% and of farms 18% and in the O.F.S. domestic workers employed dropped 17% and number of farms 25%.

(1) $r = - 0,42$

(2) $r = 0,85$

SECTION 4: CONCLUSION.

Some points which may be made in conclusion are:

- 1) Employment of all workers dropped 13% between 1961 and 1973, from 1 693 000 to 1 468 000. The number of regular workers fell by 126 300 (15%); of casual workers by 60 950 (9%) and of domestic workers by 37 720 (25%).
- 2) Employment of regular workers per 100 ha varies according to type of production. Of eight categories (vegetables, pigs and poultry farming; maize; cereals, including wheat; sugar; cattle-farming, and sheep-farming) sugar farmers employed the highest numbers (an average of 126 per 100 ha) and sheep farmers the lowest (an average of 3 workers per 100 ha) in 1973.
- 3) Employment of regular workers per 100 ha also varies according to location, classified by urban area, area inside homeland, area bordering homeland, and 'other' area.
- 4) Regions where farmers employed relatively large regular labour forces also had high casual work forces.
- 5) The ratio of regular to regular plus casual workers in 1973 varied according to type of production. The ratio was highest (the labour force was the most 'stable') in vegetable, pig and poultry farming and was lowest in sheep farming.
- 6) In 49 of the 60 economic regions employment of regular workers dropped between 1960 and 1973.
- 7) There were considerable variations in percentage changes between regions and within regions over time, and no striking trends could be found.
- 8) However, for the 60 regions taken together, it seems that the rate of decrease has accelerated markedly since 1969.

Some of the inadequacies in this paper can be attributed to lack of data. However, available data does allow the use of more detailed analysis than has been attempted. Analysis by magisterial district (instead of by economic region) would be preferable, because of differences within regions. The use of a longer time period might smooth out some of the inconsistencies in employment by region which are often the result of the choice of base year (as well as of the choice of time interval).

Analysis by farm would also be enlightening.

The extension to this paper will also include some work on wages: in particular, wage distribution by worker, the relationship of wages to farm product per worker and some attempt to define unemployment by region (or by magisterial district) and test its relationship to wage rates.

A second important subject for discussion in the follow-up to this study would, of course, be casual workers. Casual workers form 43% of the work force in agriculture and deserve greater attention in any study of agricultural employment.

Guide-lines for the better use of the data available on casual workers - and on employment in general - will probably emerge at this conference.

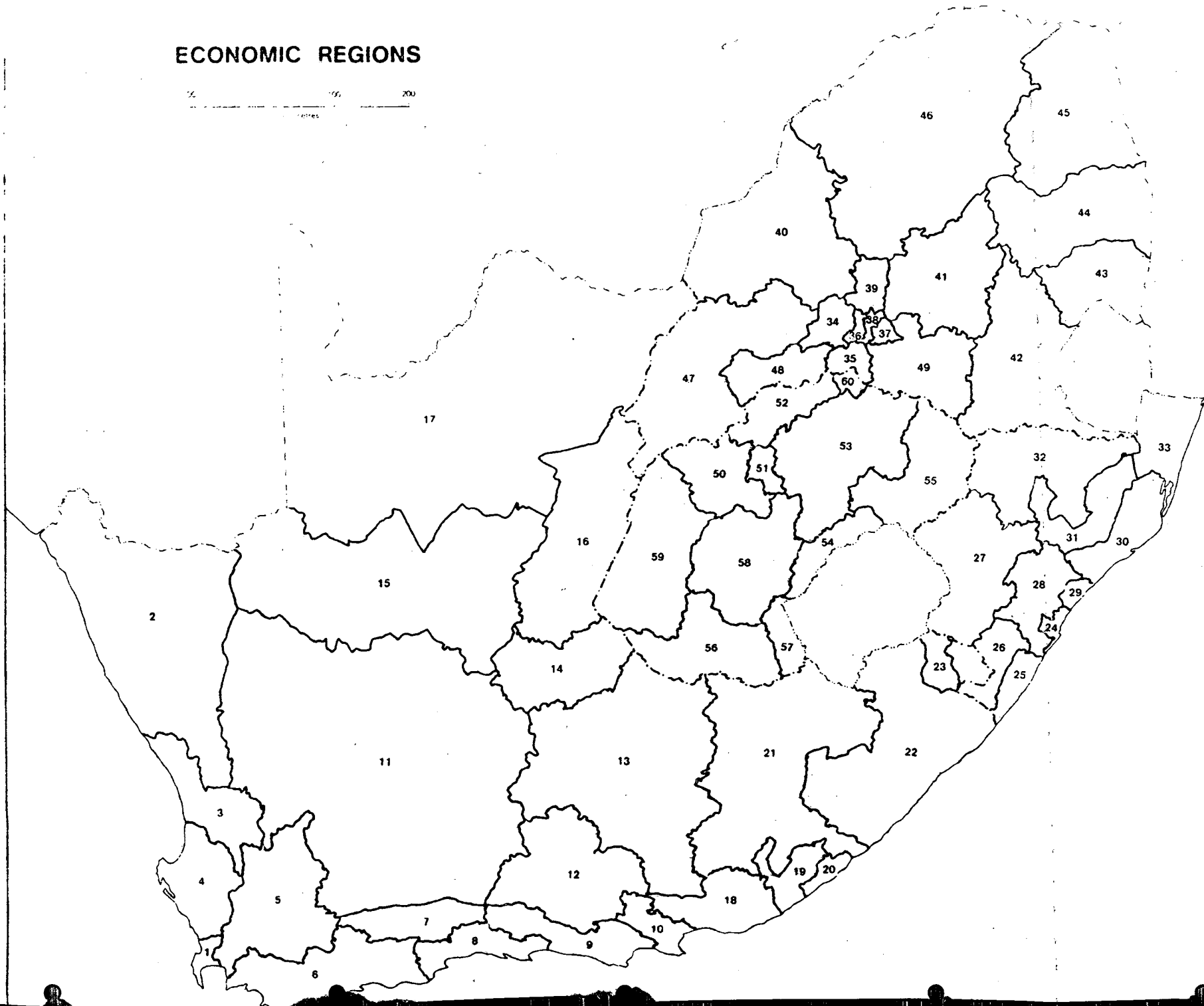
Economic Reg. No.	Magisterial District	Economic Reg. No.	Magisterial District	Economic Reg. No.	Magisterial District
01	Bellville Cape Simonstown Wynberg	10	Port Elizabeth Uitenhage	17	Gordonia Kuruman Mafeking Postmasburg Vryburg
02	Namaqualand Vanrhynsdorp	11	Beaufort West Calvinia Carnarvon Fraserburg Laingsburg Prince Albert Sutherland Victoria West Williston	18	Albany Alexandria Bathurst Kirkwood
03	Clanwilliam Vredendaal			19	King William's Town Peddie Victoria East
04	Hopefield Malmesbury Piketberg Vredenburg	12	Aberdeen Jansenville Steytlerville Willowmore	20	East London
05	Ceres Montagu Paarl Robertson Somerset West Stellenbosch Strand Tulbagh Wellington Worcester	13	Colesberg Cradock Graaff-Reinet Hanover Maraisburg Middelburg Murraysburg Noupoort Pearston Richmond Somerset East Steynsburg Venterstad	21	Adelaide Albert Aliwal North Barkly East Bedford Cathcart Elliot Fort Beaufort Glen Grey Herschel Indwe Keiskammahoek Komga Lady Grey Maclear Middledrift Molteno Queenstown Sterkstroom Stockenstrom Stutterheim Tarkastad Wodehouse
06	Bredasdorp Caledon Heidelberg Hermanus Riversdale Swellendam	14	Britstown De Aar Phillipstown		
07	Calitzdorp Ladismith Oudtshoorn	15	Hay Kenhardt Prieska		
08	George Knysna Mossel Bay	16	Barkly West Hartswater Herbert Hopetown Kimberley Taung Warrenton	22	Bizana Butterworth Elliotdale Engobo Flagstaff
09	Hankey Humansdorp Joubertina Uniondale				

Economic Reg. No.	Magisterial District	Economic Reg. No.	Magisterial District
22	Indutywa Kentani Libode Lusikisiki Matatiele Mount Ayliff Mount Fletcher Mount Frere Mqanduli Ngqeleni Nqamakwe Port St. Johns Qumbu St. Marks Tabankulu Tsolo Tsomo Umtata Umzimkulu Willowvale Xalanga		New Hanover Pietermaritzburg Umbumbulu Umvoti
		29	Lower Tugela
		30	Eshowe Hlabisa Lower Umfolozi Mtunzini
		31	Mahlabatini Mtonjaneni Nkandla Nongoma Nqutu
		32	Babanango Dannhauser Dundee Glencoe Newcastle Ngotshe Paulpietersburg Utrecht Vryheid
23	Mount Currie		
24	Durban Inanda Pinetown		
25	Port Shepstone Umzinto	33	Ingwayama Ubombo
26	Alfred Ixopo Richmond	34	Krugersdorp Oberholzer Randfontein Roodepoort Westonaria
27	Bergville Estcourt Mpendle Kliprivier Lions River Msinga Polela Underberg Weenen	35	Vanderbijlpark Vereeniging
		36	Johannesburg
		37	Benoni Boksburg Brakpan Springs
28	Camperdown Kranskop Mapumulo Ndwedwe	38	Alberton Germiston Kempton Park

Econ. Reg. No.	Magisterial District	Econ. Reg. No.	Magisterial District	Econ. Reg. No.	Magisterial District
39.	Pretoria	48	Klerksdorp Potchefstroom	57	Wepener Zastron
40.	Brits Marico Rustenburg Swartruggens Thabazimbi	49	Balfour Bethal Delmas Heidelberg Nigel Standerton	58	Bloemfontein Brandfort Dewetsdorp Excelsior Reddersburg Thaba 'Nchu Winburg
41.	Bronkhorstspuit Cullinan Groblersdal Middelburg Witbank	50	Bultfontein Hoopstad Theunissen Wesselbron	59	Boshof Fauresmith Jacobsdal Jagersfontein Koffiefontein Petrusburg
42	Amersfoort Belfast Carolina Ermelo Piet Retief Volksrust Wakkerstroom Waterval Boven	51	Odendaalsrus Virginia Welkom	60	Sasolburg
43	Barberton Nelspruit White River	52	Bothaville Parys Viljoenskroon Vredefort		
44	Lydenburg Pilgrim's Rest	53	Frankfort Heilbron Henneman Koppies Kroonstad Lindley Marquard Reitz Senekal Ventersburg		
45	Letaba Sibasa	54	Clocolan Ficksburg Fouriesburg Ladybrand		
46	Messina Pietersburg Potgietersrus Soutpansberg Wambad Waterberg	55	Bethlehem Harrismith Vrede		
47	Bloemhof Christiana Coligny Delareyville Koster Lichtenburg Schweizer-Reneke Ventersdorp Wolmaransstad	56	Bethulie Edenburg Philippolis Rouxville Smithfield Trompsburg		

ECONOMIC REGIONS

0 100 200
Kilometres



APPENDIX II. REGULAR EMPLOYEES BY ECONOMIC REGION: 1961-1973

Economic Region	1961	1965	1969	1971	1972	1973
01	5 077	5 255	4 995	4 008	4 107	3 947
02	4 360	2 104	1 940	1 772	1 708	2 062
03	2 235	4 623	4 579	4 910	5 046	5 205
04	9 973	9 898	10 251	9 671	9 430	9 688
05	34 995	37 669	39 659	35 682	36 087	36 169
06	12 622	13 003	14 441	14 063	16 393	14 119
07	4 871	5 012	4 951	4 578	4 470	4 451
08	5 235	6 503	5 707	4 808	4 806	5 183
09	6 268	6 729	6 816	6 302	6 313	6 891
10	3 582	3 000	3 132	2 954	2 956	2 948
11	8 318	8 439	7 778	7 199	7 087	7 039
12	4 002	3 728	3 008	2 612	2 528	2 580
13	15 190	14 444	12 758	10 867	10 730	10 904
14	2 043	1 905	1 699	1 469	1 474	1 464
15	3 795	4 079	2 841	2 643	2 475	2 608
16	11 339	11 344	10 590	10 579	10 387	10 276
17	21 336	21 512	21 249	20 030	19 565	18 630
18	15 263	15 258	14 665	11 994	12 092	11 334
19	4 110	4 394	3 461	3 320	3 202	3 104
20	6 424	5 094	4 875	4 192	4 181	4 256
21	34 476	30 249	27 840	23 836	22 965	22 691
22	5 295	3 752	2 652	2 216	2 209	2 174
23	4 680	4 489	3 994	3 574	3 537	3 278
24	7 343	8 269	7 070 ⁽¹⁾	7 617	7 867	7 206
25	15 323	20 815	14 832	15 536	17 152	16 486
26	10 749	19 210	14 169	12 181	12 719	11 728
27	21 872	21 062	19 770	18 807	17 940	16 688
28	22 039	26 517	27 467	26 395	28 372	30 877
29	21 863	20 581	27 777	19 249	18 039	17 621
30	31 686	33 788	32 240	30 206	31 670	30 111

Note: (1) The census reported this number to be 17070. In view of employment data in other years in this region, the reported number was read as 7 070.

Economic Region	1961	1965	1969	1971	1972	1973
31	2 268	2 034	2 631	2 811	2 951	3 000
32	18 137	18 584	19 631	18 768	17 818	17 854
33	1 169	1 584	1 125	1 164	827	648
34	9 524	9 683	10 830	9 890	8 617	8 323
35	4 307	4 622	4 404	3 852	4 186	3 309
36	3 350	2 057	1 779	1 644	1 555	1 379
37	3 882	4 660	4 390	3 802	3 688	3 502
38	3 045	2 301	1 870	2 243	1 322	1 665
39	5 771	5 440	5 568	5 945	5 143	4 488
40	34 873	23 173	21 219	22 183	25 214	25 231
41	24 342	24 699	21 356	19 513	17 134	18 429
42	29 673	33 223	34 504	32 764	30 325	31 488
43	28 930	23 475	26 135	24 385	27 091	27 504
44	15 241	13 918	14 790	11 867	9 530	7 975
45	17 926	19 724	20 006	19 440	20 970	21 080
46	60 322	47 055	46 730	39 344	37 209	36 683
47	33 388	33 349	35 409	34 020	31 871	31 548
48	10 721	9 410	11 140	10 998	9 784	9 806
49	38 027	34 825	33 915	34 523	32 805	30 693
50	12 754	14 323	13 692	12 222	12 042	11 957
51	2 906	3 302	2 829	2 764	2 905	2 735
52	12 753	12 327	13 526	13 476	13 282	13 194
53	46 120	41 722	42 052	33 312	32 899	33 362
54	14 223	12 965	12 159	9 766	9 538	9 245
55	23 802	24 772	24 575	19 122	18 957	18 233
56	6 490	6 027	5 430	4 709	4 412	4 338
57	3 650	3 337	3 295	2 855	2 732	2 724
58	18 462	18 384	17 086	14 700	13 708	14 578
59	9 238	8 741	9 142	8 955	8 718	8 696
60	1 412	1 443	1 645	1 441	1 498	1 386
TOTAL	853 070	833 884	830 068	745 748	736 236	726 768

APPENDIX III: Number of Regular and Casual Workers per 100 hectares by Economic Region 1973:

Economic Region	Regular Workers per 100 ha	Casual Workers per 100 ha
01	116,1	38,5
02	0,5	0,6
03	5,4	6,7
04	9,6	9,6
05	22,4	16,5
06	8,4	8,7
07	8,2	8,4
08	10,0	10,9
09	9,4	9,0
10	8,6	3,4
11	0,5	0,8
12	1,2	1,3
13	1,9	1,7
14	0,9	1,3
15	0,5	0,8
16	3,9	7,0
17	1,8	3,4
18	12,9	9,2
19	13,7	12,2
20	39,8	37,7
21	5,9	6,6
22	13,5	10,6
23	12,0	7,8
24	156,7	160,4
25	140,9	68,2
26	37,5	2,3
27	12,9	10,6
28	75,7	25,8
29	204,9	107,5
30	88,8	27,4

Economic Region	Regular Workers per 100 ha	Casual Workers per 100 ha
31	38,0	13,0
32	11,1	96,6
33	7,0	1,1
34	46,2	33,2
35	34,1	18,6
36	106,1	15,2
37	66,1	24,9
38	151,4	51,7
39	83,1	23,2
40	13,5	10,3
41	22,8	31,4
42	15,3	12,1
43	49,3	19,1
44	16,4	11,5
45	43,0	27,3
46	9,2	10,2
47	14,0	24,1
48	18,8	15,5
49	24,4	21,5
50	12,5	10,5
51	18,0	14,9
52	20,6	16,3
53	14,4	10,1
54	16,9	15,2
55	11,1	9,5
56	3,0	2,9
57	7,5	9,1
58	9,2	7,8
59	4,0	5,0
60	21,0	8,8
TOTAL	8,3	7,1

APPENDIX IV:

1. Analysis of variance:

This method tests the existence of significant differences between the means of several samples (or categories). The variance in variate values between samples is tested against the variance of all variate values (within samples variance). (Variance is a statistical measure of dispersion and is defined as the sum of the squared deviations of each variate value from the mean, divided by the total number of variate values

i.e.
$$\frac{\sum_{i=1}^n (x - \bar{x})^2}{n}$$

where n is the sample size and \bar{x} the mean of all variate values).

If significant differences do exist between samples this will be reflected by a high between samples variance relative to the within samples variance. The ratio of between sample to within sample variance - commonly referred to as the F-ratio - is tested against the theoretical value which would result in any random group of numbers.

If the observed value is greater than the expected value, significant differences can be said to exist within known limits of certainty. These limits are known as levels of significance. For example, a level of significance of 0,01 means that the decision to accept that significant differences between samples do exist on the grounds of the observed value being greater than the expected value will be correct 99% of the time.

The expected values of the F-ratio are listed for selected levels of significance and for various 'degrees of freedom'. The degrees of freedom depend on the number of samples (categories) into which the data falls and the total number of variate values. The notation is as follows:

$$F = 21,31 \quad (F_{0,01 ; 7 ; 52} = 3,29)$$

means that the observed value of F was 21,31; the expected value, at the 99% level of significance, was 3,29, showing a significant difference between the means of the categories (in this case, type of production categories). The numbers 7 and 53 refer to the degrees of freedom.

These are calculated as follows:

7 equals number of categories minus 1, 52 equals number of variate values minus number of categories.

2. Correlation.

This is a test of the association between two variables, x and y. The correlation coefficient r_{xy} measures the joint variation of each value of x from the mean of x (\bar{x}) and of each value of y from the mean of y (\bar{y}).

If above average values of x ($x > \bar{x}$) tend to be associated with above average values of y ($y > \bar{y}$), while there is a similar association of below average values of both variables, the coefficient will be high and positive. Similarly, if above average values of x ($x > \bar{x}$) are associated with below average values of y ($y < \bar{y}$), and vice-versa, the coefficient will be high and negative.

If there is no association between the variables, (if they are uncorrelated), the coefficient will be zero

The coefficient r_{xy} , by definition, ranges between -1 and 1. A correlation is said to be high if $|r_{xy}|$ is greater than 0,7.

The coefficient is defined as

$$r_{xy} = \frac{\sum (x - \bar{x}) \sum (y - \bar{y})}{\sqrt{\sum (x - \bar{x})^2 \sum (y - \bar{y})^2}}$$

APPENDIX V: Regular workers: average annual rate of change in numbers employed, by economic region, 1961-73:

Economic Region	Percentage change				
	1961-65	1965-69	1969-71	1971-72	1972-73
01	0,87	-1,26	-10,42	2,47	-3,90
02	-16,65	-2,01	- 4,43	-3,61	20,73
03	19,93	-0,24	3,55	2,77	3,15
04	-0,19	0,88	- 2,87	-2,49	2,74
05	1,86	1,30	- 5,15	1,14	0,23
06	0,75	2,66	- 1,32	16,57	-13,38
07	0,72	-0,31	- 3,84	-2,36	-0,43
08	5,57	-3,21	- 8,21	-0,04	7,84
09	1,79	0,32	- 3,84	0,17	9,16
10	-4,34	1,08	- 2,88	0,07	-0,27
11	0,36	-2,02	- 3,79	-1,56	-0,68
12	-1 7,6	-5,22	- 6,81	-3,22	2,06
13	-1,25	-3,06	- 7,71	-1,26	1,62
14	-1,73	-2,82	- 7,01	0,34	-0,68
15	1,82	-8,65	- 3,55	-6,36	5,37
16	0,01	-1,70	- 0,05	-1,81	-1,07
17	0,21	-0,10	- 2,91	-2,32	-4,78
18	-0,01	-0,99	- 9,56	0,82	-6,27
19	1,68	-5,79	- 2,06	-3,55	-3,06
20	-5,63	-1,09	- 7,27	-0,26	1,79
21	-3,22	-2,05	- 7,47	-3,65	-1,19
22	-8,25	-8,31	- 8,59	-0,32	-1,58
23	-1,04	-2,88	- 5,40	-1,04	-7,32
24	3,01	-3,84 (1)	3,80 (1)	3,28	-8,40
25	7,96	-8,83	2,35	10,40	-3,88
26	15,62	-7,33	- 7,28	4,42	-7,79
27	-0,94	-1,57	- 2,47	-4,61	-6,98
28	4,73	0,88	- 1,97	7,49	8,83
29	-1,50	7,78	-16,75	-6,29	-2,32
30	1,62	-1,17	- 3,21	4,85	-4,92

Note: (1): Percentage changes between 1965 and 1969 and between 1969 and 1971 were calculated using a figure for employment in this region for 1969 of 7070, not 17070, as the Census reports.

Economic Region	Percentage changes				
	1961-65	1965-69	1969-71	1971-72	1972-73
31	-2,69	-6,65	3,36	4,98	1,66
32	0,61	1,38	-2,22	-5,06	0,20
33	7,89	-8,20	1,72	-28,95	-21,64
34	0,41	2,84	-4,44	-12,87	-3,41
35	1,78	-1,20	-6,48	8,67	-20,95
36	-11,48	-3,56	-3,87	-5,41	-11,32
37	4,67	-1,48	-6,94	-3,00	-5,04
38	-6,76	-5,05	9,52	-41,06	25,95
39	-1,47	0,58	3,33	-13,49	-12,74
40	-9,71	2,18	2,25	13,66	0,07
41	0,36	-3,57	-4,41	-12,19	7,56
42	2,87	0,98	-2,55	-7,44	3,84
43	-5,09	2,72	-3,41	11,10	1,52
44	-2,24	1,53	-10,43	-19,69	-16,32
45	2,42	0,36	-1,42	7,87	0,52
46	-6,02	-0,17	-7,24	-5,43	-0,41
47	-0,03	1,51	-1,98	-6,32	-1,01
48	-3,21	4,31	-0,64	-11,04	0,22
49	-2,18	-0,66	0,89	-4,98	-6,44
50	2,94	-1,12	-5,52	-1,47	-0,71
51	3,25	-3,79	-1,16	5,10	-5,85
52	-0,85	2,35	-0,19	-1,44	-0,66
53	-2,47	0,20	-11,00	-1,24	1,41
54	-2,29	-1,59	-10,38	-2,33	-3,07
55	1,00	-0,20	-11,79	-0,86	-3,82
56	-1,83	-2,57	-6,88	-6,31	-1,68
57	-2,22	-0,32	-6,92	-4,31	-0,29
58	-0,11	-1,81	-7,24	-6,75	6,35
59	-1,37	1,13	-1,03	-2,65	-0,25
60	0,54	3,33	-6,41	3,96	-7,48
TOTAL	-0,57	-0,11	-5,22	-1,28	-1,29