

9. CROP YIELDS AND GROSS OUTPUT

9.1 Definition

Yield is a resulting index of agricultural production and comprises main product (generative part of plants) and bi-products (part of vegetative mass of plant), which can be used for different purposes.

Crop gross output is the product of the yield of a crop and its farmgate price, and normally is expressed per unit area (per hectare). As a rule, only the quantity of the main product (raw cotton, grain, etc) is measured by the farms, and although the bi-products (cotton stalks, straw, etc) may be used, they are not measured. If there is a tangible benefit from the use of the bi-product, then it has a visible or at least an imputed financial value. In the WUFMAS survey, yields of any bi-products were measured on the sample fields in addition to the main product.

9.2 Crop Yields

Each sample field has five sample plots with sizes 10m x 10m each, in which measurements are made on the soil and groundwater, and on the growing crop and at harvest. Plot sizes were smaller in 1997 due to complaints from enumerators that excessive labour was required to harvest the whole plot by hand and separate production into the main product and bi-products. It was also difficult to weigh large quantities on the small scales provided. In 1997-1998, sample plot sizes mostly were 3m x 3m for broadcast crops, and 2 rows x 10m for row crops.

The yield of the whole sample field also was recorded after harvest by farm staff. The yield of the whole field generally was 80-90 percent of the yield in the manually harvested plots but there were cases where the ratio was over 100 percent. Random unrepresentativeness of sample plots is inevitable but is not thought to be the main factor responsible for the difference. There are several possible reasons, some of which may act variously on it. The main reason is likely to be that hand harvesting of plots is more efficient than both machine harvesting and hand harvesting of the field by farm staff. Sample plots in some cases were harvested more frequently and some time in advance of the field, so differences arise from either further development of the crop or drying of the product. There is known to be some unauthorised harvesting of crops by local people before the formal harvest. Labour shortage is known to lead to the abandonment of yield, particularly of cotton. Hand threshing of grain is less efficient than by machine and this may explain instances of greater yield from the field.

Average yields from the whole field are considered more appropriate for use in gross margin analysis than those from the sample plots. **They are shown in Appendix 3 for the main crops.** Yields of the main products of all crops are summarised by average for each republic in Table 9.1.

**Table 9.1 Average Yield of Main Crop Products
(t/ha)**

Crop	Kazakhstan	Kyrgyzstan	Tadjikistan	Turkmenistan	Uzbekistan	Overall
01	02	03	04	05	06	07
1996						
Apricots			10.82			10.82
Watermelon				12.16		12.16
Potato					8.15	8.15
Apricots + Maize			15.85			15.85
Lucerne + Wheat, winter	0.25					0.25
Maize, grain	4.19	3.27	1.12		0.63	2.30
Maize, silage	25.06	21.00			18.16	21.41
Lucerne	22.07	37.06	18.10	10.52	34.41	24.43
Gram, green			0.70		0.14	0.42
Wheat, winter	1.11	4.28		2.06	2.79	2.56
Wheat, spring	0.36	2.25				1.30
Rice	3.02				4.60	3.81
Sugarbeet		22.00				22.00

Sorghum					10.08	10.08
Tomato				6.02		6.02
Triticale			2.10			2.10
Cotton, upland	2.54	3.30	2.88	2.80	2.28	2.76
Cotton, pima			2.25			2.25
Apples	20.84					20.84
Barley, winter		4.90	3.00		0.86	2.92
Barley, spring					0.28	0.28
1997						
Apricots			5.84			5.84
Curcubits					9.20	9.20
Lucerne + Wheat, winter	0.36					0.36
Lucerne + Barley, spring		1.65				1.65
Maize, grain	0.00	2.01	1.27		2.33	1.40
Maize, silage					6.61	6.61
Onion		5.40	32.67			19.03
Lucerne	19.27	22.66	25.42	16.18	28.57	22.42
Gram, green			1.04		0.00	0.52
Oats		2.87				2.87
Sunflower, for oil	0.00					0.00
Wheat, winter	2.79	2.74	2.03	1.67	2.46	2.34
Wheat, spring	1.20					1.20
Rice	3.37				3.83	3.60
Sugarbeet		23.80				23.80
Sorghum			6.60			6.60
Tobacco		2.99				2.99
Cotton, upland	2.58	2.42	1.77	2.77	2.26	2.36
Cotton, pima				2.57	2.10	2.33
Barley, winter					1.70	1.70
1998						
Apricots			5.84			5.84
Potato					6.34	6.34
Lucerne + Barley, spring		7.98				7.98
Maize, grain		3.43	2.84			3.13
Maize, silage					13.55	13.55
Lucerne	3.84	29.79	25.42	26.47	23.24	21.75
Oats		3.58				3.58
Wheat, winter	0.36	2.93		1.55	2.59	1.86
Wheat, spring	0.46	2.95		0.41		1.27
Rice	3.12				4.40	3.76
Sugarbeet					16.27	16.27
Tobacco		7.20				7.20
Cotton, upland	1.41	1.75	2.04	2.43	2.23	1.97
Cotton, upland (under plastic)		2.11			3.39	2.75
Cotton, pima				2.75	2.88	2.81
Barley, winter		2.97				2.97

Figures in the above table show that the biggest yields of raw cotton (upland) were received in Kyrgyzstan in 1996 (3.3t/ha), however in the subsequent years yields of cotton were dropped down (1997 – 2.4t/ha, 1998 – 1.7t/ha). Yields of cotton are stable in the long-term period in Turkmenistan (2.4-2.8t/ha) and Uzbekistan (2.2t/ha). Decrease of yields during survey period is observed in Tajikistan (from 2.8 to 2.0t/ha) and Kazakhstan (from 2.5 to 1.4t/ha). Yields of winter wheat were also decreased and only in Uzbekistan these are more or less stable (2.4-2.7t/ha). In Turkmenistan yields of cereals were reduced from 2.0t/ha (1996) to 1.5t/ha (1998), in Kyrgyzstan from 4.2t/ha to 2.9t/ha, in Kazakhstan from 2.7t/ha (1997) to 0.3t/ha (1998). Yields of rice during three years of survey have not change very much, for example in Kazakhstan these were 3.0-3.3t/ha, in Uzbekistan 3.8-4.6t/ha. Certain trends of yield variation can be seen in other crops. For example yield of apricots in 1996 in Tajikistan was 10.8t/ha, but in 1997 and 1998 it was only 5.8t/ha. This reduction can be explained by cyclicity of fruit tree yields with one year of high yield and subsequent one – two years of significantly low yields.

9.3 Crop Gross Output

Crop gross margins are very sensitive to the amount of the gross output. Gross output can be larger or smaller in proportion to either or both of yield or price of the product. Estimates of gross

output varied more between farm averages of the sample fields with the same crop than between the averages of farms within republics, following the same pattern as yield variation. The averages over farms are shown in Table 9.2.

**Table 9.2 Average Crop Gross Output
(US\$/ha)**

Crop	Kazakhstan	Kyrgyzstan	Tadjikistan	Turkmenistan	Uzbekistan	Overall
<i>01</i>	<i>02</i>	<i>03</i>	<i>04</i>	<i>05</i>	<i>06</i>	<i>07</i>
1996						
Apricots			0.00			0.00
Watermelons				607.78		607.78
Potato					2045.65	2045.65
Apricots + Maize			293.29			293.29
Lucerne + Barley, winter					121.98	121.98
Lucerne + Wheat, winter	45.64					45.64
Grass + Wheat, spring		648.50				648.50
Maize, grain	426.44	2153.33	128.42		65.00	693.30
Maize, silage	250.65	105.00			186.61	180.75
Lucerne	266.56	300.21	108.60	2008.67	199.20	576.65
Gram, green			475.32		68.30	271.81
Wheat, winter	151.00	998.38		180.13	340.29	417.45
Wheat, spring	41.57	662.75				352.16
Rice	604.30				1301.63	952.97
Sugarbeet		1936.00				1936.00
Sorghum					50.40	50.40
Tomato				752.88		752.88
Triticale			241.50			241.50
Cotton, upland	1083.26	1627.61	1385.88	692.07	555.77	1068.92
Cotton, pima			1081.45			1081.45
Apples	1938.08					1938.08
Barley, winter		391.50	330.00		103.11	274.87
Barley, spring					39.25	39.25
1997						
Apricots			110.35			110.35
Curcubits					459.84	459.84
Lucerne + Wheat, winter	50.09					50.09
Lucerne + Barley, spring		238.85				238.85
Maize, grain		1342.99	254.00		461.76	514.69
Maize, silage					370.64	370.64
Onion		248.40	506.33			377.37
Lucerne	194.47	169.97	152.51	194.17	203.02	182.83
Gram, green			358.24			179.12
Oats		603.99				603.99
Wheat, winter	393.08	529.51	218.44	143.08	332.84	323.39
Wheat, spring	168.00					168.00
Rice	674.13				1192.53	933.33
Sugarbeet		2094.40				2094.40
Sorghum			33.00			33.00
Tobacco		1458.51				1458.51
Cotton, upland	1134.84	1222.62	881.18	709.57	560.83	901.81
Cotton, pima				890.07	735.96	813.01
Barley, winter					203.30	203.30
1998						
Apricots			2384.17			2384.17
Potato					963.48	963.48
Lucerne + Wheat, winter		257.97				257.97
Lucerne + Barley, spring		141.85				141.85
Maize, grain		1839.71	540.25			1189.98
Maize, silage					132.13	132.13
Lucerne	165.13	229.78	152.51	370.62	324.04	248.42
Oats		331.55				331.55
Wheat, winter	47.86	308.26		122.90	327.28	201.57
Wheat, spring	54.58	285.79		33.95	0.00	93.58
Rice	893.40				1422.35	1157.87
Sugarbeet					1301.83	1301.83
Tobacco		1195.75				1195.75

Cotton, upland	318.59	438.29	831.29	503.74	439.90	506.36
Cotton, upland (under plastic)		526.59			798.25	662.42
Cotton, pima				783.95	662.12	723.04
Barley, winter		220.88				220.88

From the above table it is easy to identify the crops with highest and lowest financial benefit. For example, gross output of sugar beet is 1301-2094 US\$/ha, upland cotton 506-1068 US\$/ha, rice 933-1157 US\$/ha. No doubt that such crops as potato, apricots and apples are also profitable. Such crops as winter wheat (with gross margin 201–417 US\$/ha), winter barley (203-274 US\$/ha), green gram (174-271 US\$/ha) and sorghum (33-50 US\$/ha) have significantly smaller gross output.