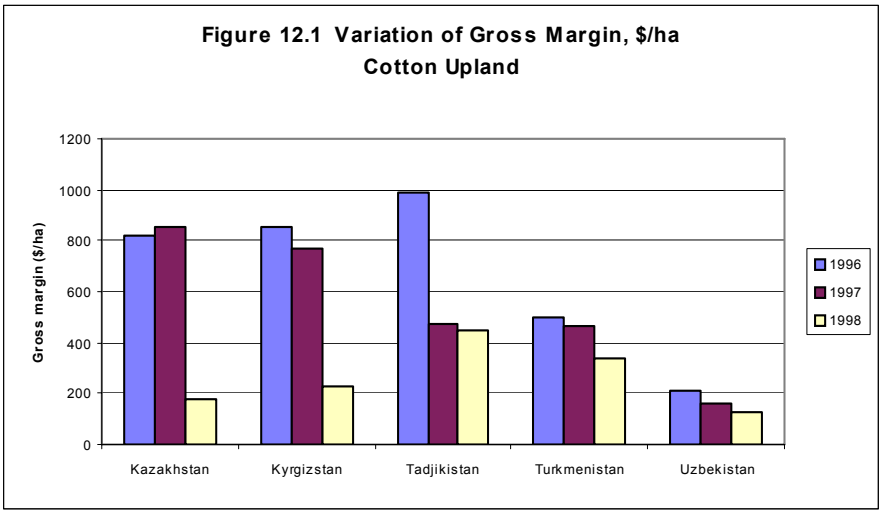
12. GROSS MARGIN AND PROFITABILITY OF CROP PRODUCTION

The net benefit is a basis for evaluation of crop production profitability. Net benefit is a difference between gross margin and all taxes. The net benefit is a planning tool of farm production and if it will be used for decision making in free market conditions it can help to get maximum possible net benefit. But there was no intension to study the level of taxation on farm level within WUFMAS program.

Gross margin (Annex П I 12.1) is defined as the difference between gross output (the total revenue from enterprise) and the total variable cost of production. This value is the measure of farm profitability. Gross margin was calculated for 360 fields in 1996, for 220 fields in 1997, for 240 fields in 1998. Total number of sample fields with different crops is shown in Table 12.1. The majority of crops has positive average value of gross margin (Table 12.2). But cotton has the most stable value of gross margin in the region. The average value of gross margin for upland cotton by republics was 392.7$/ha, 396.8$/ha, 201.3$/ha in 1996, 1997 and 1998 respectively.

Significant difference in gross margin between the republics and by years can be mainly explained by the difference of farm gate price for cotton. Cotton farm gate prices in 1997 were as following: in Uzbekistan - 244 $/t, in Turkmenistan – 247 $/, in Tadjikistan – 597 $/t, in Kazakhstan - $/t, in Kyrgyzstan – 493 $/t.



Due to state order for cotton in Uzbekistan the gross margin was less by 49 percent as compared with average for the region. In Kazakhstan and Kyrgyzstan in the conditions of free market the grass margin was higher than average by 46 and 36 percent respectively. In Turkmenistan all inputs are subsidized therefore cost of cotton production is less here than in the other republics. Due to this fact with approximately the same farm gate prices for cotton the gross margin in Turkmenistan is higher than average by 13 percent. In 1998 gross margin of cotton was dropped in all republics (except Tadjikistan) due to reduction of farm gate price. The most significant reduction, almost by 80 percent, (Figure 12.1) is observed in Kazakhstan and Kyrgyzstan where farm gate price was dropped by 55-50 percent with simultaneous reduction in yield by 45 and 28 percent respectively. In Uzbekistan and Turkmenistan gross margin became less by 113$/ha due to reduction of farm gate price by 16 percent. Variation of gross margin between fields and farms within republic can be explained by the ratio between total variable costs and gross output. Repeated land preparation and replanting of cotton are the major reasons of cost increase and reduction of gross margin.

Table 12.1 Number of Sample Fields Under Different Crops

	Kazakhstan				Kyrgyzstan				Tadjikistan				Turkmenistan				Uzbekistan				Overall
Crop	**1996**	**1997**	**1998**	**1999**	**1996**	**1997**	**1998**	**1999**	**1996**	**1997**	**1998**	**1999**	**1996**	**1997**	**1998**	**1999**	**1996**	**1997**	**1998**	**1999**	
Apricots									2	4	4										10
Water melon													1								1
Cucabrits																		1			1
Potato																	2		2		4
Apricot + Maize									2												2
Barley, winter + Lucerne																	1				1
Wheat, winter + Lucerne	4	1					2														7
Wheat, spring + grass					1																1
Barley, spring + Lucerne						1	3														4
Maize, grain	2	1			3	4	3		1	1	1						1	1			18
Maize, silage	2				1												9	3	4		19
Onion						1				2											3
Lucerne		**7.0, 17.5%**	**7.0 (18,92%)**			**5.0, 12,5%**	**6.0 (14,63%)**				**1.0, (5%)**			**3.0, (15 %)**	**1.0, (5%)**			**9.0, 7,76%**	**9.0, (7,2%)**		**48.0, (6.3%)**
Gram, green									1	1							3	1			6
Oats						1	1														2
Sunflower		1																			1
Wheat, winter	**1(3,23 %)**	**2(5%)**	**1(2,7 %)**		**13(41, 94%)**	**13(32, 5%)**	**9(21,9 5%)**	**10(83,33%)**		**6(23,08%)**			**8(47,0 6%)**	**8(40%)**	**8(40 %)**	**5(71,4 3%)**	**39(30, 95%)**	**32(27, 59%)**	**25(2 0%)**	**28(73,6 8%)**	**208(27,26 %)**
Wheat, spring	2	1	1		1		3								1				1		10
Rice	**7(22,5 8%)**	**14(35 %)**	**11(29,73%)**														**8(6,35 %)**	**9(7,76 %)**	**9(7,2 %)**	**2(5,26 %)**	**60(7,86%)**
Sugar beet					1	1													3		5
Sorghum										2							1				3
Tobacco						1	3														4
Tomato													1								1
Triticale									1												1
Cotton, upland	**12(38, 71%)**	**13(32, 5%)**	**17(45, 95%)**	**2(100 %)**	**10(32, 26%)**	**13(32, 5%)**	**7(17,0 7%)**	**1(8,33 %)**	**1(8,33 %)**	**10(38, 46%)**	**14(70 %)**	**2(100 %)**	**7(41,1 8%)**	**6(30%)**	**9(45 %)**	**2(28,5 7%)**	**60(47, 62%)**	**56(48, 28%)**	**55(4 4%)**	**7(18,42 %)**	**304(39,64 %)**
Cotton, upland (under plastic)							3	1										2	16	1	23
Cotton, pima									3					3	1			1	1		9
Apples	1																				1
Barley, winter					1		1		1								1	1			5
Barley, spring																	1				1
Total	**31**	**40**	**37**	**2**	**31**	**40**	**41**	**12**	**12**	**26**	**20**	**2**	**17**	**20**	**20**	**7**	**126**	**116**	**125**	**38**	**763**

Table 12.2 Ranking of Crops by Gross Margin, $/ha

1996	$/ha
Kazakhstan	
1101 Apples	1911,3
201 Cotton, upland	818,1
107 Maize, grain	293,9
108 Rice	291,3
1001 Lucerne	194,4
1002 Maize, silage	159,8
1501 Winter wheat +Lucerne	2,0
102 Wheat, spring	-83,2
101 Wheat, winter	-148,8
Kyrgyzstan	
107 Maize, grain	2010,5
302 Sugar beet	1816,1
201 Cotton, upland	852,2
101 Wheat, winter	670,2
1502 Spring wheat + grass	520,8
102 Wheat< spring	513,5
103 Barley, winter	344,3
1001 Lucerne	81,2
1002 Maize, silage	18,4
Tadjikistan	
201 Cotton, apland	986,4
202 Cotton, pima	562,6
508 Gtam, green	254,2
103 Barley, winter	155,2
1503 Apricots + Maize	128,1
111 Triticale	58,2
1104 Apricats	-76,3
107 Maize, grain	-150,9
1001 Lucerne	-330,0
Turkmenistan	
1001 Lucerne	1812,9
605 Tomato	590,8
201 Cotton, upland	499,9
402 Watermelon	380,3
101 Wheat, winter	-32,5
Uzbekistan	
108 Rice	499,3
201 Cotton, upland	208,6
301 Potato	152,0
107 Maize, grain	16,5
0 Not planted	-7,1
103 Barley, winter	-25,0
101 Wheat, winter	-31,2
1504 Barley, winter + Lucerne	-85,5
104 Barley, spring	-114,8
1001 Lucerne	-126,1
508 Gram, green	-132,6
110 Sorghum	-136,1
1002 Maize, silage	-143,3

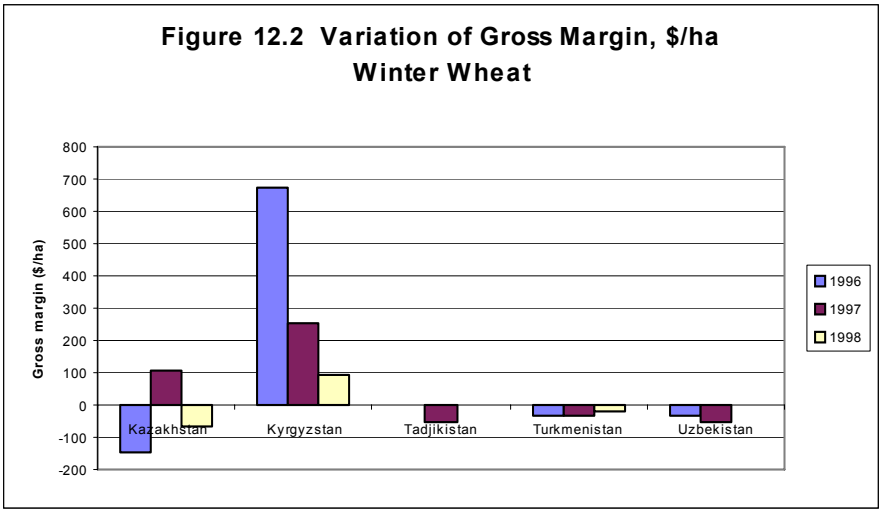
1997	$/ha
Kazakhstan	
201 Cotton, upland	855,1
108 Rice	207,1
1001 Lucerne	116,6
101 Wheat, winter	103,7
107 Maize, grain	-48,7
102 Wheat, spring	-66,7
1501 Wheat, winter + Lucerne	-200,2
Kyrgyzstan	
302 Sugar beet	1962,8
107 Maize, grain	1202,2
205 Tobacco	1065,9
201 Cotton, upland	765,3
105 Oats	326,3
101 Wheat, winter	252,2
1001 Lucerne	59,9
603 Onion	42,1
1506 Barley, spring + Lucerne	12,8
Tadjikistan	
201 Cotton, upland	475,7
603 Onion	338,5
508 Gram, green	210,2
1104 Apricots	62,5
107 Maize, grain	47,3
101 Wheat, winter	-51,3
110 Sorghum	-111,5
1001 Lucerne	-148,1
Turkmenistan	
202 Cotton, pima	583,5
201 Cotton, upland	462,3
101 Wheat, winter	-36,0
1001 Lucerne	-80,6
Uzbekistan	
108 Rice	437,5
202 Cotton, pima	267,3
400 Melons	205,1
1002 Maize, silage	183,8
201 Cotton, upland	162,9
103 Barley, winter	-22,1
508 Gram, green	-31,0
0 No planting	-33,4
101 Wheat, winter	-54,7
1001 Lucerne	-268,7

1998 год	$/ha
Kazakhstan	
108 Rice	360,9
201 Cotton, upland	174,0
1001 Lucerne	70,8
0 No planting	-10,6
102 Wheat, spring	-40,8
101 Wheat, winter	-68,3
Kyrgyzstan	
107 Maize, grain	1705,3
205 Tobacco	824,8
206 Cotton, upland (under plastic)	226,4
1001 Lucerne	180,8
201 Cotton, upland	156,0
105 Oats	136,7
101 Wheat, winter	96,5
102 Wheat, spring	73,9
103 Barley, winter	70,9
1501 Wheat, winter + Lucerne	37,7
1506 Barley, spring + Lucerne	-24,4
Tadjikistan	
1104 Apricots	2336,3
201 Cotton, upland	449,9
107 Maize, grain	129,8
1001 Lucerne	-177,9
Turkmenistan	
202 Cotton, pima	631,4
201 Cotton, upland	335,9
1001 Lucerne	-8,8
101 Wheat, winter	-17,7
102 Wheat, spring	-89,3
Uzbekistan	
302 Sugar beet	710,4
108 Rice	572,3
206 Cotton, upland (under plastic)	364,5
202 Cotton, pima	358,0
201 Cotton, upland	130,3
301 Potato	37,0
1001 Lucerne	29,9
101 Wheat, winter	-0,4
0 No planting	-48,5
1002 Maize, silage	-49,6
102 Wheat, spring	-67,4

Gross margin of winter wheat proves that this crop is not profitable for the majority of sample farms. Average gross margin of winter wheat in 1998 was 68.3$/ha, 96.5$/ha, 17.7$/ha, 0.4$/ha in Kazakhstan, Kyrgyzsatn, Turkmenistan and Uzbekistan respectively. There is a trend towards decrease (Figure 12.2) of gross margin year by year. In Kazakhstan in 1998 gross margin was less by 172$/ha as compared with 1997, that of in Kyrgyzsatan was 155.7$/ha. The reason for this was reduction of both yield and farm gate price.

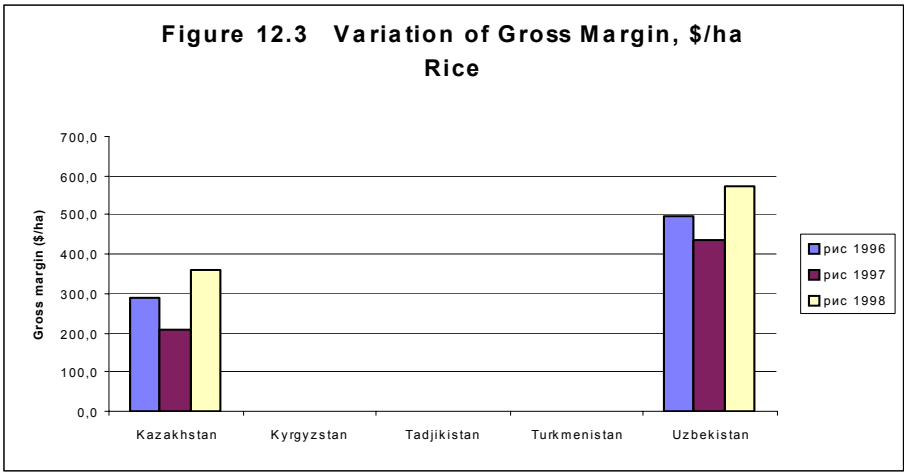
Winter wheat production in Uzbekistan and Turkmenistan is unprofitable. Positive value of gross margin was achieved in the farms of Khorezm and Bukhara oblasts in Uzbekistan only. In Kyrgyzstan the highest gross margin from winter wheat (400-700 $/ha in 1997 and 530 $/ha in 1998) was received in the seed farms at much more higher price than for food wheat. Cost of wheat production mainly depends on the cost of harvesting which in turn depends on the type of machinery used. Cost of combine harvester use (hours per hectare) is higher than cost of windrower use, but actual use harvesters is less than normative value. Therefore, the use of imported harvesters very often increases variable cost and reduces profit. In order to increase the efficiency of harvesters it is necessary to increase their actual productive use in 6-7 times.

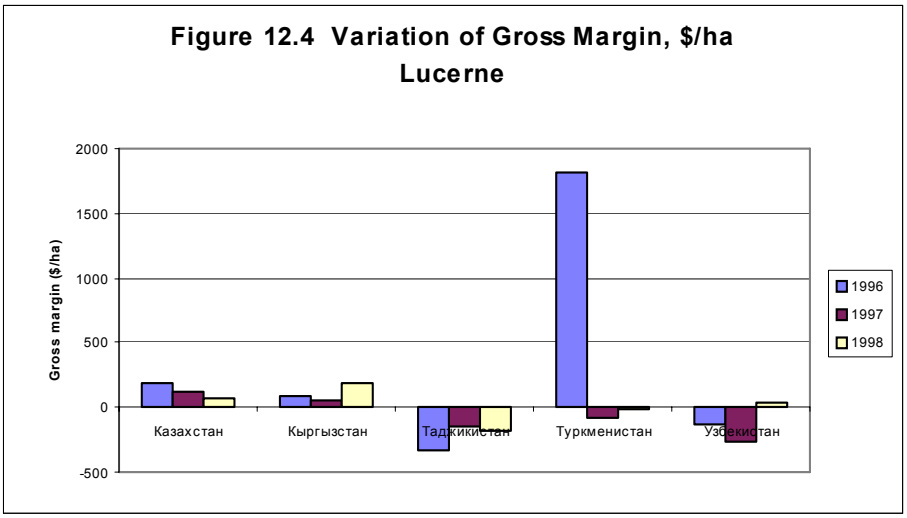
Figure 12.2 Variation of Gross Margin, $/ha
Winter Wheat



Rice was grown in WUFMAS sample farms in Kazakhstan and Uzbekistan only. In all these farms rice was profitable crop. On average gross margin of rice was 291$/ha and 499$/ha in 1996, 207$/ha and 438$/ha in 1997, 361$/ha and 572$/ha in 1998 in Kazakhstan and Uzbekistan respectively. The highest gross margin of rice was in the farm 26 in Khorezm olast, Uzbekistan. Variation of rice gross margin by years is shown in Figure 12.3. Both in Uzbekistan and Kazakhstan the lowest gross margin was in 1997 with highest values in 1998. Comparison of cost of production and gross output has revealed that the main reason for gross margin variation is yield. In addition, the use of self-propelled harvesters has reduced variable cost as compared with cost of windrovers use.

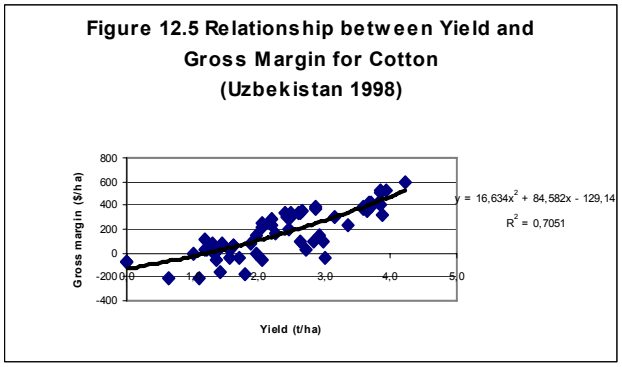
Figure 12.3 Variation of Gross Margin, $/ha
Rice

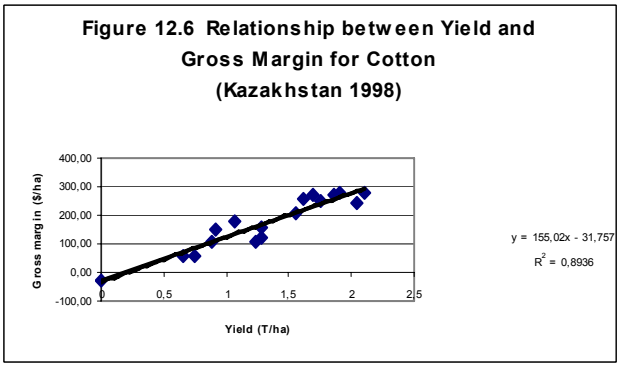




Ranking of crops by gross margin (Table 12.2) allows to identify the most profitable crops for the region. There is no doubts that cotton is the most profitable crop for the region with stable gross margin. The following crops have stable high gross margin: sugar beet, tobacco, maize for seeds In Kyrgyzstan, cotton and apricots in Tadjikistan, cotton and rice in Uzbekistan.

Gross margin data allow to analyse relationship between revenue and yield and identify the critical level of yield when farm profitability is negative. Labourers' salary is a part of revenue, so for the purpose of this analysis it is excluded from variable cost. It is necessary to note, that share of labour in total variable cost is negligible: 16 percent for cotton and only 2 percent for rice and wheat. Therefore, the value of net benefit to great extent depends on gross margin value. So, profitable level of cotton yield on average by region's fields is around 1.6t/ha, that of for wheat is 2.0-2.5t/ha. But on the level of farm total variable cost is higher by 15-20 percent due to different taxes, therefore the average critical yield of cotton is 1.9-2.1t/ha, that of wheat is 2.2-2.7t/ha.





Relationships between yield of cotton and wheat and gross margin in 1998 are shown in Figure 12.5, 12.6. These curves show the critical level of yield when profit is zero, i.e. gross output covers only cost of production of this particular crop. In Kazakhstan the critical yield level of cotton was 7-8 t/ha, that of in Uzbekistan was around 15 t/ha.

Relationships between total variable cost and yield for main crops were derived on the basis of information from WUFMAS database and are shown below in Figures 12.7-12-10. These relationships can be used in the planning zone economic optimization models of agricultural production.

Figure 12.7 Relationship between Yield and Variable Cost for Cotton Uzbekistan

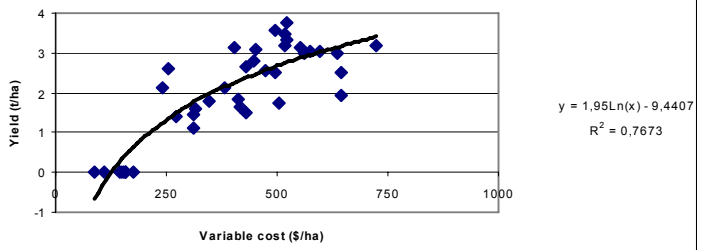


Figure 12.8 Relationship between Yield and Variable Cost for Rice Uzbekistan

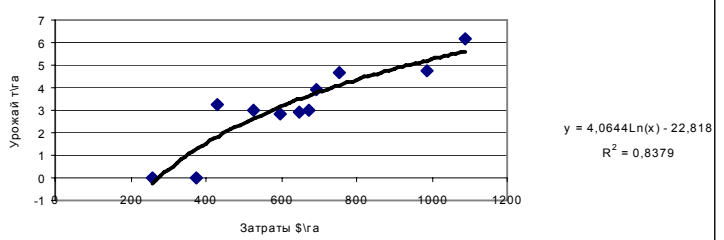


Figure 12.9 Relationship between Yield and Variable Cost for Lucerne, Mature Uzbekistan

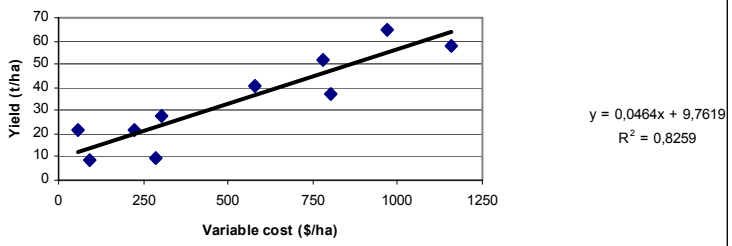


Figure 12.10 Relationship between Yield and Variable Cost for Wheat Uzbekistan, Fergana 1998