11. VARIABLE COSTS

The term “variable costs” is understood as inputs in money term for growing a certain crop. This category of costs excludes the farm overhead cost and costs of infrastructure maintenance. Such approach can be explained by the purpose of cost evaluation. Variable costs allow to evaluate economic benefit from growing of any crop i.e. its profitability and to optimize the use of inputs in order to get economically profitable output.

Variable costs were estimated as the product of the rate of each input used per ha and its price. In the gross margin calculated for each field, each item was costed separately.

11.1 Input Prices

Study of pricing policy and market were outside the scope of WUFMAS Program. Some prices were collected for economic analyses of agricultural production. However, materials collected by WUFMAS program allow to do some general conclusions. Financial farm gate prices of main inputs (seed, agrochemicals, fuel, irrigation water) are given in Tables 11.1 – 11.4.

It should be noted, that prices of inputs converted into US dollars are more or less constant year by year. Some fluctuation of prices, even their reduction in Tadjikistan, can be explained by difference between official exchange rate of national currency (rouble) and the real one.

Prices of fertilisers (Table 11.1) are quite stable. There is a trend towards some increase of prices of phosphorus fertilisers (for example double superphosphate) from 0.16 $/kg in 1997 to 0.23 $/kg in 1999 and decrease of prices of nitrogen fertilisers in Uzbekistan. This republic is the manufacturer and exporter of nitrogen fertilisers. Price of urea in Uzbekistan is 0.22 $/kg of N. This is three times less than world market price. In all republics prices of fertilisers world market prices.

The reason of this situation is the use of subsidized energy which is a large component in fertilisers production. Apart from this, direct state subsidies to agrochemicals are 50 percent in Turkmenistan. Prices of agrochemicals (Table 11.2) are more or less the same year by year, but remain quite high. That’s why it is difficult ti buy them. Especially expensive are herbicides (landox, granstar) with the prices 200-400US$/kg. The cheapest chemicals are defoliants.

Price of water (Table 11.3) remains low in the all republics of the region as compared with world market prices. In Turkmenistan water is still free of charge. There are two prices of water in Kazakhstan. One price is for water users associations (2.68 $/tcm), another one is for rayvodkhozes (2.12 $/tcm). In Kyrgyzstan and Uzbekistan prices of are different depending on the time of its use, during vegetation period is one price and another one is for dormant period. In Uzbekistan from 1999 water charge was included in the tax on land. Reduction of water prices in some republics can be probably explained by fluctuations of exchange rates. But in reality the price of water is much higher as compared with present price, established by the government.

Table 11.1 Average Prices of Fertiliser Products and their Nutrients ($/кг)

Republic	1996				1997				1998				1999			
	Pro-duct	N	P	K	Pro-duct	N	P	K	Pro-duct	N	P	K	Pro-duct	N	P	K
Ammonium nitrate																
Kazakhstan	0,09	0,27	0	0	0,09	0,27	0	0	0,10	0,30	0	0	0,16	0,48	0	0
Kyrgyzstan	0,15	0,45	0	0	0,16	0,48	0	0	0,16	0,48	0	0	0,09	0,27	0	0
Tadjikistan	0,15	0,45	0	0	0,09	0,27	0	0	0,12	0,36	0	0	0,13	0,39	0	0
Turkmenistan	0,04	0,11	0	0	0,09	0,27	0	0	0,10	0,30	0	0	0,05	0,15	0	0
Uzbekistan	0,16	0,48	0	0	0,12	0,36	0	0	0,12	0,36	0	0	0,10	0,30	0	0
Average	***0,12***	***0,36***	***0***	***0***	***0,11***	***0,33***	***0***	***0***	***0,12***	***0,36***	***0***	***0***	***0,11***	***0,32***	***0***	***0***
Ammonium sulphate																
Kazakhstan	0,12	0,57	0	0	0,07	0,33	0	0	0,10	0,48	0	0				
Kyrgyzstan	0,12	0,57	0	0	0,11	0,52	0	0								
Tadjikistan																
Turkmenistan					0,09	0,43	0	0								
Uzbekistan	0,15	0,71	0	0	0,12	0,57	0	0	0,11	0,52	0	0	0,10	0,48	0	0
Average	***0,13***	***0,62***	***0***	***0***	***0,10***	***0,46***	***0***	***0***	***0,11***	***0,50***	***0***	***0***	***0,10***	***0,48***	***0***	***0***
Urea																
Kazakhstan																
Kyrgyzstan																
Tadjikistan	0,16	0,35	0	0					0,10	0,22	0	0				
Turkmenistan																
Uzbekistan					0,10	0,22	0	0	0,09	0,20	0	0	0,09	0,20	0	0
Average	***0,16***	***0,35***	***0***	***0***	***0,10***	***0,22***	***0***	***0***	***0,10***	***0,21***	***0***	***0***	***0,09***	***0,20***	***0***	***0***
Ammonium phosphate (Amofos)																
Kazakhstan																
Kyrgyzstan																
Tadjikistan	0,16	0,02	0,65	0	0,10	0,02	0,36	0	0,10	0,02	0,36	0	0,16	0,02	0,65	0
Turkmenistan																
Uzbekistan	0,21	0,02	0,88	0	0,19	0,02	0,79	0	0,17	0,02	0,69	0	0,24	0,02	1,03	0
Average	***0,19***	***0,02***	***0,77***	***0***	***0,15***	***0,02***	***0,58***	***0***	***0,14***	***0,02***	***0,53***	***0***	***0,20***	***0,02***	***0,84***	***0***
Diammonium phosphate																
Kazakhstan																
Kyrgyzstan																
Tadjikistan									0,22	0,04	0,90	0				
Turkmenistan																
Uzbekistan					0,22	0,04	0,90	0	0,17	0,04	0,65	0				
Average					***0,22***	***0,04***	***0,90***	***0***	***0,20***	***0,04***	***0,78***	***0***				
Nitro-Amofos																
Kazakhstan					0,09	0,05	0,39	0								
Kyrgyzstan																
Tadjikistan																
Turkmenistan																
Uzbekistan					0,18	0,05	1,27	0	0,10	0,05	0,48	0				
Average					***0,14***	***0,05***	***0,83***	***0***	***0,10***	***0,05***	***0,48***	***0***				
Single superphosphate																
Kazakhstan	0,12	0	1,71	0	0,13	0	1,86	0								
Kyrgyzstan					0,16	0	2,29	0								
Tadjikistan	0,12	0	1,71	0	0,13	0	1,86	0	0,15	0	2,14	0	0,08	0	1,14	0
Turkmenistan					0,05	0	0,71	0					0,08	0	1,14	0
Uzbekistan	0,12	0	1,71	0	0,15	0	2,14	0	0,09	0	1,29	0	0,18	0	2,57	0
Average	***0,12***	***0***	***1,71***	***0***	***0,12***	***0***	***1,77***	***0***	***0,12***	***0***	***1,71***	***0***	***0,11***	***0***	***1,62***	***0***

Table 11.1 Continued….. Average Prices of Fertiliser Products and their Nutrients ($/кг)

Republic	1996				1997				1998				1999			
	Pro-duct	N	P	K	Pro-duct	N	P	K	Pro-duct	N	P	K	Pro-duct	N	P	K
Double superphosphate																
Kazakhstan													0,16	0	0,89	0
Kyrgyzstan																
Tadjikistan																
Turkmenistan																
Uzbekistan	0,09	0	0,50	0,00	0,15	0	0,83	0,00	0,23	0	1,28	0,00	0,16	0	0,89	0
Average	***0,09***	***0***	***0,50***	***0,00***	***0,15***	***0***	***0,83***	***0,00***	***0,23***	***0***	***1,28***	***0,00***	***0,16***	***0***	***0,89***	***0***
Calcium chloride																
Kazakhstan																
Kyrgyzstan																
Tadjikistan									0,10	0	0	0,20	0,12	0	0	0,24
Turkmenistan																
Uzbekistan	0,07	0	0	0,13	0,13	0	0	0,26	0,10	0	0	0,20	0,09	0	0	0,18
Average	***0,07***	***0***	***0***	***0,13***	***0,13***	***0***	***0***	***0,26***	***0,10***	***0***	***0***	***0,20***	***0,11***	***0***	***0***	***0,21***
Potassium sulphate																
Kazakhstan													0,16	0	0	0,40
Kyrgyzstan																
Tadjikistan																
Turkmenistan																
Uzbekistan					0,13	0	0	0,33					0,10	0	0	0,25
Average					***0,13***	***0***	***0***	***0,33***					***0,13***	***0***	***0***	***0,33***

Table 11.2 Average Price of Agro-chemicals ($/kg or l)

Insecticides					Fungicides					Herbicides					Other chemicals				
	1996	1997	1998	1999		1996	1997	1998	1999		1996	1997	1998	1999	Defoliants				
Arrevo	12	22,5	11,1	13,2	Granozan	12				2,4-D4		7	7			1996	1997	1998	1999
Antio	12		12,9	12,9	Raksel		11			Agropur	12				Drop-Ultra	16	38	5,21	5,21
BI-58	12	8,07	6,22	5,79	Sulphur	12	0,07	0,13	1,8	Basagran		16,4	15,1	15,1	Ustex	12	6	8,61	8,6
Bulldock		18			Fundazol	12	6,59	7,24	7,3	Grandstar			450	450	Mg chlorate	1,55	0,62	0,44	0,4
Decis			12,9	12,9	Tuzal	12	8,88			Dezarmon	12	1,97	4,48	4,48					
Dravin 755	12									Landox		3,9	390	0,32	Growth Regulators				
Nurelle D	12	14,7	11,8	11,9						Pardner			9,38	8,5		1996	1997	1998	1999
Omite	12	6,54	3,65	3,65						Satis		9,16	6,64	6,64	Pix	12	13,1		
Rogor		13,5	6,6							Stomp		8,77							
Sumi alpha	12		10,3	10,3											Biological Agents (/box)				
Sumi-8	12	10														1996	1997	1998	1999
Talstar			40	36											Trichogramma		0,33		
Thiodan	12		21																
Phosalone		12,9																	
Average	12	13,3	13,6	13,3	Average	12	6,64	3,69	4,55	Average	12	7,87	126	80,8					

Table 11.4 Average Price of Fuel and Lubricants (US $ per litre)

Item	Kazakhstan				Kyrgyzstan				Tadjikistan				Turkmenistan				Uzbekistan			
	1996	1997	1998	1999	1996	1997	1998	1999	1996	1997	1998	1999	1996	1997	1998	1999	1996	1997	1998	1999
Exchange rate to US$	66	75	84	150	16,7	17	30	42	210	750	800	1436	3780	5000	5200	5200	41	80	110	136
Disel	0,07	0,24	0,12	0,08	0,40	0,29	0,26	0,21	0,19	0,80	0,19	0,28	0,19	0,11	0,06	0,06	0,30	0,30	0,28	0,12
Motor oil	0,34	0,53	0,35	0,33	1,00	0,65	0,78	0,48	1,30	0,68	0,50	0,56	0,70	0,38	0,46	1,20	1,60	1,13	1,39	1,6
Transmission oil	0,36	0,80	0,35	0,35	1,20	1,12	1,13	1,12	1,50	1,13	1,50	0,63	1,35	0,45	0,46	2,88	2,00	1,56	1,68	1,84

Table 9.7 Price of Water for Irrigation of Agricultural Crops

(US$/tcm)

Year	Kazakhstan	Kyrgyzstan	Tadjikistan	Turkmenistan	Uzbekistan
1996	2.97	1.00	1.24	0	0
1997	2.12	0.88 (0.29)	0.65	0	0.71
1998	2.12 (2.68)*	0.66	1.25	0	0.47 (0.55)*
1999	1.46 (1.68)*	0.78 (0.39)*	1.11	0	0.55

Note: the price for water in Kyrgyzstan in brackets is for off-season use.
()* the price for water in WUA

Prices of fuel as prices of water (Table 11.4) differ by republics. Price of diesel fuel is much less in Turkmenistan as compared with other republics. The highest price of fuel is in Kyrgyzstan. Fluctuation of prices by years is also related with fluctuation of the exchange rates on the national currency to US$. The price (converted into US$) actually paid for fuel is used in calculations of gross margin.

Price of fuel is the important part of machinery costs, because 50 percent of machine hourly rates is fuel cost. The rest components are depreciation costs, cost of repair, salary of driver and labourers associated with machinery use and these are distributed as 45 and 5 percent.

Labour use as average salary per month is shown in Table 11.5. However, it should be noted, that apart from official salary, which is very often paid in kind (different services and products) there is an imputed payments as allocation plot for growing vegetables and some other benefits. But it was impossible to calculate all these payments. Therefore, the only way to calculate labour use was the official salary from farm accounts in each republic.

Table 11.5 Average Notional Wages Rates for Casual Labour

(US$/month)

Year	Kazakhstan	Kyrgyzstan	Tadjikistan	Turkmenistan	Uzbekistan
1996	65.47	18.50	4.30	4.83	19.91
1997	44.00	14.12	2.38	9.86	19.14
1998	36.31	15.25	2.02	34.32	19.72
1999		4.73	1.70	13.10	16.22
Average	**41.61**	**13.84**	**2.21**	**18.09**	**19.03**

In the analyses of agricultural production the actual financial output prices (Table 11.6) and official purchasing prices from the ministries of agriculture were used. Free market prices and state order prices were taken in consideration while calculating the average output prices. It is necessary to note that during four years of monitoring the financial prices were changed in all republics. For example, in 1996-1997 prices of raw cotton in Kazakhstan and Kyrgyzstan were quite high 440-480 $/t, i.e. on the level of world market prices, but in 1998 they were only 250 $/t. The reason was the significant decrease of world market cotton price. So the decrease of cotton price was almost 50 percent. In Uzbekistan and Turkmenistan in the conditions of state order for cotton the decrease prices was 10-15 percent. Prices of wheat and other cereals were dropped due to decrease of world market prices. Kazakhstan is the only wheat-exporting republic in Central Asia. In the republics with free market economy as Kazakhstan and Kyrgyzstan, wheat price is close to world market price (130-140 $/t). There is a state order for wheat in the other republics and price is established by the governments on the level (80-120 $/t). In the seed farms in Kyrgyzstan price of wheat seed is high (325$/t), maize seed (657$/t). Price of rice remains steady high. In Kazakhstan and Uzbekistan price of rice is 286$/t and 308$/t accordingly and in 1998 it was close to world market prices (291$/t). This steady prices can be explained by the fact that local rice varieties are very popular in this region.

There is a general trend towards decrease of vegetable prices in all republics. This is related to decrease of export in order to saturate local market and to the greater extent due to high customs duties.

Fodder crops are rarely traded for cash and mainly consumed within the farm. So realistic prices are difficult to judge.

Таблица 11. Financial Output Prices in 1996, 1997, 1998 ($/t)

KAZAKHSTAN				
Crop	1$ = 53	1$ =75	1$ = 84	**Average**
	1996	1997	1998	
Cotton upland (raw cotton)	350	426		**388**
Cotton upland (fibre)			700	**700**
Wheat	111	140		**126**
Barley	138			**138**
Maize, grain	97	13		**55**
Rice	400	200	125	**242**
Rice, polished		285	286	**286**
Potato	248	233	119	**200**
Water melon	50	49		**49,5**
Grapes	60	87		**73,5**
Fruits (orchards)		93		**93**
Apples	200			**200**
Lucerne, hay		24	33	**28,5**
Lucerne, fresh	10			**10**
KYRGYZSTAN				
	1$ =12	1$ =17	1$ =30	**Average**
	1996	1997	1998	
Cotton upland (raw cotton)	393	493	250	**379**
Tobacco		488	435	**462**
Wheat	285	139	120	**181**
Barley	140	118	67	**108**
Barley, seeds		306	630	**468**
Oat		59	89	**74**
Oat, seeds		206	197	**202**
Maize, grain	232	657	63	**317**
Maize, silage	10	59		**35**
Rice		471	468	**470**
Potato	250	224	87	**187**
Sugar beet	34	88		**61**
Vegetables		59	33	**46**
Onion		46	86	**66**
Grapes	60	206	326	**197**
Apples	200	88		**144**
Lucerne, fresh	10	9	13	**11**
TURKMENISTAN				
	1$ =3780	1$ =4165	1$ =5200	**Average**
	1996	1997	1998	
Cotton, pima (raw cotton)		336		**336**
Cotton, upland (raw cotton)	344	247	207	**266**
Wheat	41	84	78	**68**
Gram, green	680			**680**
Potato	150			**150**
Sugar beet	34			**34**
Vegetables			29	**29**
Tomato	25			**25**
Grapes, apples	54			**54**
Lucerne, hay		66	78	**72**
Lucerne, fresh	2	12		**7**
TADJIKISTAN				
	1$ =210	1$ =620	1$ =856	**Average**
	1996	1997	1998	
Cotton, upland (raw cotton)	387	481	300	**389**
Wheat		99		**99**
Barley	150			**150**
Maize, grain	115	128	190	**144**
Rice		244	560	**402**
Gram, green	680	343		**512**
Potato	250			**250**

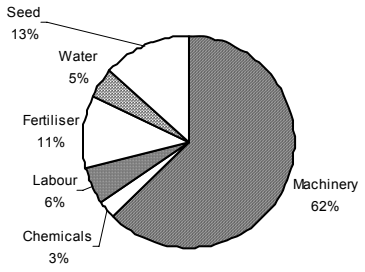
Sugar beet	34			**34**
Tomato	92			**92**
Onion		31		**31**
Water melon	65			**65**
Grapes	65			**65**
Apples	65			**65**
Apricot, fresh		32		**32**
Lucerne, fresh	5		13	**9**
UZBEKISTAN				
	1$ =41	1$ =81	1$ =110	**Average**
	1996	1997	1998	
Cotton, pima (raw cotton)		344		**344**
Cotton, upland (raw cotton)	241	226	205	**224**
Wheat	78	121	114	**104**
Rice	400	283	308	**330**
Potato	251	134	152	**179**
Tomato	71	74	55	**67**
Cabbage		114	72	**93**
Cucumbers		174	36	**105**
Carrot		245	72	**159**
Onion		58	96	**77**
Water melon	45	38	27	**37**
Melon		51	29	**40**
Grapes	106	105	115	**109**
Fruits (orchards)	158	70	214	**147**
Apricot		58	123	**91**
Lucerne, fresh	5	4	13	**7**

11.2 Total Variable Costs

Total variable costs is the sum of all component variable costs of production: machinery, agrochemicals, labour, fertilisers, irrigation water, seeds.

Overall average breakdown of variable costs by all years of monitoring is shown in Figure 11.1. Distribution of costs as percentage of total in decrease order is as following: machinery 56 percent, seeds 12 percent, fertilisers 10 percent, labour 6 percent, agrochimicals 2 percent, water 5 percent. However, the pattern varies so much between crops.

Figure 11.1 Overall Breakdown of Variable Costs



Total average variable costs ($/ha) by crops and republics for all years of monitoring are shown in Table 11.7. Variable costs of agricultural production are varied from 27$/ha for apples to 587$/ha for rice. It should be noted that there is wide variation of variable costs for the same crop within republic but less so between averages by republics. The breakdown of the component variable costs for each crop is shown in Table 11.8. The overall picture for main crops is illustrated in Figures 11.2 – 11.5.

For cotton (Figure 11.2) some 45-57 percent of the total variable costs is in machinery, 14-18 percent is in labour, 10-17 percent is in fertilisers, 5-9 percent is in seeds, costs of water and

agrochemicals are negligible. There is a trend towards reduction of agrochemicals use and increase of labour cost on the account of machinery cost.

For lucerne (Figure 11.4) the significant part of the total variable costs (89-95 percent) is in machinery, the remaining part tends towards decrease due to reduction in use of agrochemicals (3.0, 0.13 and 0.05 percent in 1996, 1997 and 1998 respectively).

The cost of agrochemicals for growing rice (Figure 11.3) tends to grow and it is first of all due to use of very expensive herbicides, explaining wide variation of costs from 6 to 32 percent.

Table 11.7 Average Total Variable Cost of Crop Production ($/ha)

Crop	Kazakhstan					Kyrgyzstan					Tadjikistan					Turkmenistan					Uzbekistan					Overall
	1996	1997	1998	1999	Av.	1996	1997	1998	1999	Av.	1996	1997	1998	1999	Av.	1996	1997	1998	1999	Av.	1996	1997	1998	1999	Av.	
Apricot											76	48	48		57										57
Water melon																227				227						227
Curcurbits																						255			255	255
Potato																					1894		926		1410	1410
Apricot + Maize											165				165											165
Barley, winter + Lucerne																					208				208	208
Wheat, winter + Lucerne	44	250			147			220		220																171
Wheat, spring + grass						128				128																128
Barley, spring + Lucerne							226	166		196																196
Maize, grain	133	49			91	143	141	134		139	279	207	410		299						49	181			115	173
Maize, silage	91				91	87				87											330	187	182		233	175
Onion							206			206		168			168											187
Lucerne, mature	73	102	123		100	219	110	49		126	439	301	330		357	196	275	379		283	355	538	311		401	253
Lucerne, first year	71	29	36		45																1	172	160		111	78
Gram, green											221	148			185						201	31			116	150
Oats							278	195		236																236
Sunflower		96			96																					96
Wheat, winter	300	289	116		235	328	277	212	162	245		270			270	213	179	141	75	152	372	388	328	119	302	235
Wheat, spring	125	235	95		152	149		212		181								123		123			67		67	144
Rice	313	467	533		438																802	755	850	392	700	587
Sugar beet						120	132			126													591		591	281
Sorghum												144			144						187				187	166
Tobacco							393	371		382																382
Tomato																162				162						162
Triticale											183				183											183
Cotton, upland	265	280	145	133	206	775	457	282	195	428	399	406	381	291	369	192	247	168	327	234	347	398	310	338	348	317
Cotton, upland (under plastic)								300	208	254													434	519	476	365
Cotton, pima											519				519		307	153		230		469	304		386	350
Apples	27				27																					27
Barley, winter						47		150		99	175				175						128	225			177	145
Barley, spring																					154				154	154
Overall	144	200	175	133	170	222	247	208	188	221	273	211	292	291	255	198	252	193	201	210	387	327	406	342	371	259

Table 11.8 Breakdown of Financial Variable Costs
(% of total)

Crop	Machinery			Agrochemicals			Labour			Fertiliser			Water			Seed		
	1996	1997	1998	1996	1997	1998	1996	1997	1998	1996	1997	1998	1996	1997	1998	1996	1997	1998
Lucerne	88	89	95	3	0	0	1	1	1	5	5	1	1	2	2	3	4	1
Maize, silage	79	59	80	0	0	0	4	2	6	11	6	6	1	1	1	5	33	7
Wheat, winter	87	67	45	0	0	0	1	1	1	10	10	15	0	1	0	1	21	38
Wheat, spring	49	60	62	7	0	1	0	0	1	0	0	10	0	1	1	44	39	26
Barley, winter	75	52	78	0	0	0	0	1	0	24	13	0	0	1	0	0	34	22
Maize, grain	74	62	55	4	2	3	5	4	3	11	12	22	2	6	4	4	14	13
Rice	48	61	44	0	6	32	3	2	2	29	11	8	1	4	4	18	16	10
Apricot	52	42	42	0	0	0	15	14	14	0	0	0	32	44	44	0	0	0
Sorghum	18	81	0	0	0	0	20	1	0	29	6	0	1	9	0	32	3	0
Triticale	65	0	0	0	0	0	2	0	0	33	0	0	0	0	0	0	0	0
Cotton, upland	44	57	51	27	6	3	14	18	18	10	10	17	1	2	2	5	6	9
Cotton, pima	69	54	55	5	0	4	6	17	14	17	22	16	0	0	1	4	7	10
Sugar beet	77	72	65	0	0	0	6	11	14	0	0	14	3	3	0	14	13	6
Gram, green	52	57	0	0	0	0	8	4	0	14	5	0	0	16	0	26	18	0
Overall	**63**	**58**	**48**	**3**	**1**	**3**	**6**	**5**	**5**	**14**	**7**	**8**	**3**	**6**	**4**	**11**	**15**	**10**

Figure 11.2 Breakdown of Variable Costs for Cotton, %

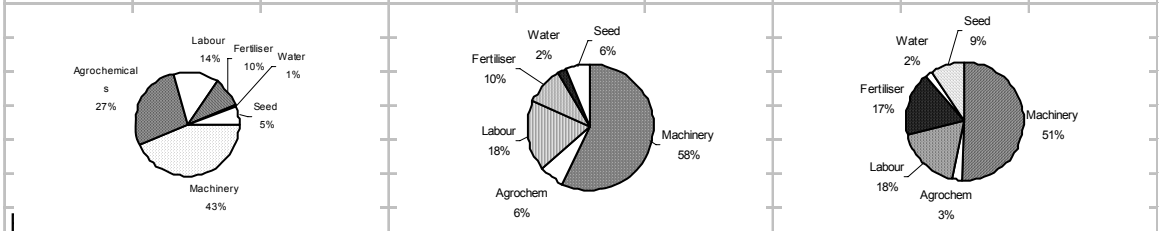


Figure 11.3 Breakdown of Variable Costs for Rice, %

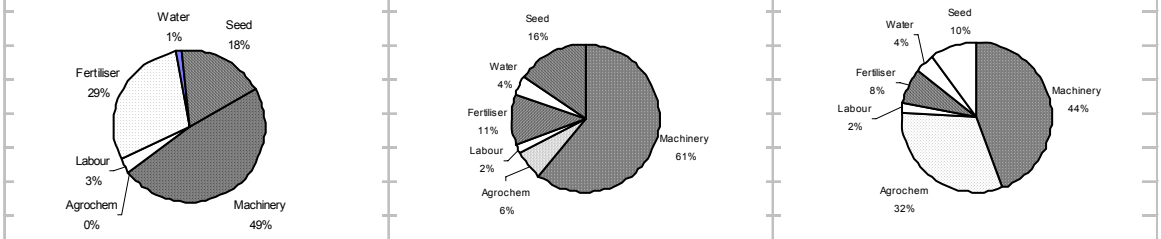


Figure 11.4 Breakdown of Variable Costs for Lucerne, %

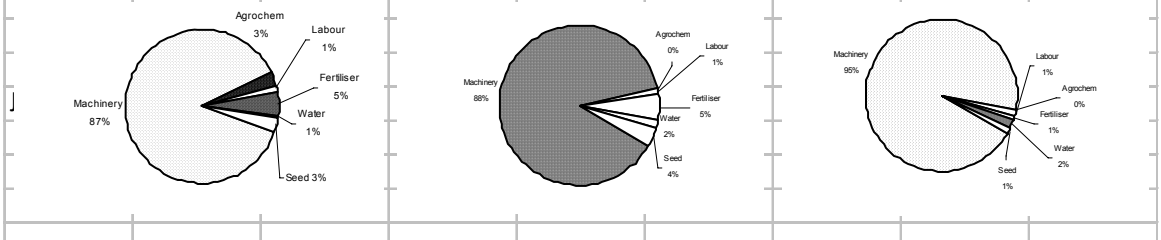


Figure 11.5 Breakdown of Variable Costs for Wheat, %