South African Barley Breeding Institute

SABBI

FEASIBILITY STUDY FOR ORGANIC BARLEY PRODUCTION

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ABSTRACT

Growing small grains organically means using sustainable methods that exclude the use of standard commercial fertilizers and synthetic pesticides. The aim of this study was to investigate the use of organic farming production, in comparison to conventional practices. The organic treatment showed a significantly lower yield than all the other treatments (except Treatment 2). The input cost of the organic treatments was the lowest. The average cost of the organic treatment was 56.6% lower than the average cost of the conventional treatment. However, the treatment also had the lowest average income, 39% less than the conventional treatment. With the current data, the preliminary conclusion can be made that the organic production is not a viable practice for barley production, unless a premium is paid for the niche product.

INTRODUCTION

Organic beer, once relegated to speciality food and organic restaurants, is now emerging from that narrow role. Riding the consumer health trend, organic beers have shown increased growth, especially in Europe and the United States.
Growing small grains organically means using sustainable methods that exclude the use of standard commercial fertilizers, synthetic pesticides, preservatives, and growth regulators. Organic farmers rely on crop rotations, crop residues, animal manures, legumes, green manures, mechanical cultivation, mineral-bearing rocks, and biological pest control to maintain soil health, supply plant nutrients, and minimize insects, weeds, and diseases. Details on small-grain production practices such as planting dates, seeding rates, varieties, and harvesting methods, vary widely among regions, but are largely the same for conventional and organic production. Reducing fertilizer and pesticide inputs requires considerable knowledge and innovation. Organic management seeks to maximize the contributions of on-farm resources such as animal manures, composts, and green manures to soil fertility. However, purchased off-farm nutrients—including mineral fertilizers and fortified composts, may be necessary to ensure adequate nutrient availability during transition to an organic program. Building soil organic matter enhances nutrient availability, as well as soil moisture-holding capacity, and can aid in preventing the build-up of soil-borne plant diseases. A key part of an organic soil-building program is rotation of crops, coupled with the use of cover crops and green manures. The aim of this study was to investigate the use of organic farming production, in comparison to conventional and alternative production practices

MATERIAL AND METHODS

The perennial trial will be replicated every year under the same conditions including the exact location. However, the use of crop rotation will be implemented based on the model planned for the Dunghye Park farm. The trial was planted for the first year on May 31, 2007 and on May 21 the following year with the use of SABBF's commercial planter (Auseeder) at a seeding density of 80kg/ha. The varieties SSG 506 (2007) and S6 (2008) were used in the trial. Standard maintenance for weed and insect control were done. The five different treatments regarding the application of fungicide and fertilisers are listed below in Table 1. A trial plot of 100m x 36m was planted for each treatment. There were two replicates of each treatment randomized as below. The total area of the trial block was 100m x 360m.

Trmt 1	Trmt 2	Trmt 3	Trmt 4	Trmt 5	Trmt 3	Trmt 1	Trmt 4	Trmt 2	Trmt 5

A 100m x 9,15m strip from each plot (2007) and the whole plot (2008) was wind rowed and harvested separately according to the normal protocol. The yield, plumpness and kernel nitrogen were determined individually. The total income per ha was calculated on a base price of R1755 per ton for 2007 and R2810 per ton for 2008. The quality premium was based on differences in plumpness and nitrogen. The income difference between treatments was calculated by subtracting only the cost of the treatments from the total income. For this exercise, application costs were ignored.

Table 1: Summary of treatments

		Product	Rate/ha	Application date
Treatment 1	Fertilizer	Rapid razor (Neutrog)	200kg	With planting
		LAN	20N	With planting
		Urea	45kg	4 wks after planting
	Pest Control	Triazool* (400ml/ha)		6-8wks after planting
		Strobilurin**		12-14wks after planting
Treatment 2	Fertilizer	Atlas 5:4:0 (21)	140kg	With planting
		Bioroot	750ml	30d after emergence
		Fosfifol Cu	250ml	30d after emergence
	Pest Control	Triazool* (400ml/ha) + Fosfifol (250ml/ha)		6-8wks after planting
		Strobilurin**		12-14wks after planting
		Vit-Amino (1l/ha)		Flag leaf
Treatment 3	Fertilizer	Yara 2:1:0 (24)	150kg	With planting
		Urea	90kg	4 wks after planting
	Pest Control	Triazool* (400ml/ha)		6-8wks after planting
		Strobilurin**		12-14wks after planting
Treatment 4	Fertilizer	Rapid razor (Neutrog)	300kg	With planting
	Pest Control	Patostop (1.5l/ha)		6-8wks after planting
		Patostop (1.5l/ha)		12-14wks after planting
Treatment 5	Fertilizer	Atlas 6:5:2 (22)	150kg	With planting
		Bioroot	750ml	30d after emergence
		Fosfifol Cu	250ml	30d after emergence
	Pest Control	Triazool* (400ml/ha)		6-8wks after planting
		Strobilurin**		12-14wks after planting
		Vit-Amino (1l/ha)		Flag leaf

* During 2007 Capitan was sprayed once and during 2008 twice
** Abacus was used in 2007 and Acantu in 2008

RESULTS

Table 2: Agronomic parameters of different treatments

	Yield (kg/ha)		Plumpness (%)		Kernel nitrogen	
	2007	**2008**	**2007**	**2008**	**2007**	**2008**
Treatment 1	4.03a	2.08c	96.9a	95.6a	1.99ab	1.74b
Treatment 2	3.71a	2.33bc	96.7a	95.8a	2.03ab	1.71b
Treatment 3	3.58a	4.31a	96.6a	95.5a	2.06a	1.71b
Treatment 4	3.44a	1.84c	95.4a	95.6a	1.97b	1.75b
Treatment 5	3.34a	2.70b	97.4a	96.1a	1.99ab	1.87a
CV	**19.5**	**12.6**	**1.0**	**1.1**	**2.4**	**4.3**
LSD ($T_{0.10}$)	**1.15**	**0.55**	**1.6**	**1.66**	**0.08**	**0.11**
LSD ($T_{0.05}$)	1.64	0.79	2.2	2.39	0.11	0.15

Different letters after the data implies that there is a significant difference between the two values at a 95% confidence level

Table 3: Comparison of income per hectare for the different treatments 2007

Treatments	Total cost/ha	Yield /ha	Plump	TN	*Quality premium	Base price/ton	Total price/ha	Income
1	868.34	4.03	96.9	1.99	46.26	1755.00	7072.65	6455.14
2	897.74	3.71	96.7	2.03	46.26	1755.00	6511.05	5784.94
3	954.88	3.58	96.6	2.06	46.26	1755.00	6282.9	5493.63
4	603.99	3.44	95.4	1.97	46.26	1755.00	6037.2	5641.19
5	889.77	3.34	97.4	1.99	48.04	1755.00	5861.7	5218.56

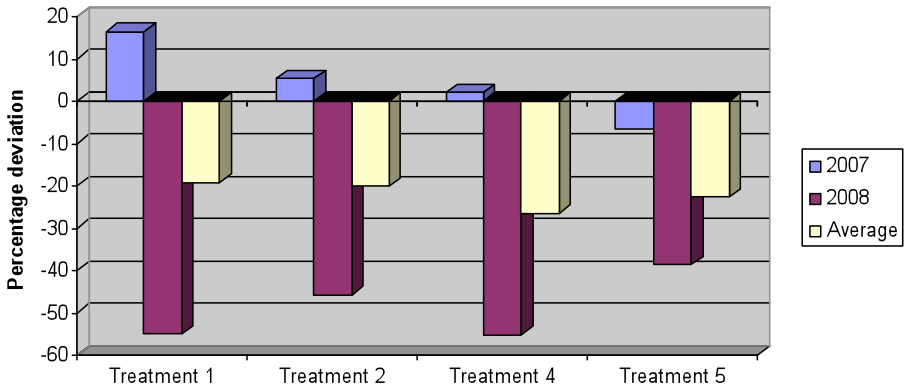
*The quality premium was only based on differences in plumpness and nitrogen.

Table 4: Comparison of income per hectare for the different treatments 2008

Treatments	Total cost/ha	Yield/ ha	Plump	TN	*Quality premium	Base price/ton	Total price/ha	Income
1	1310.85	2.08	95.6	1.74	106.46	2810	6074.99	4764.13
2	1044.78	2.33	95.8	1.71	102.10	2810	6793.93	5749.15
3	1936.95	4.31	95.5	1.71	102.10	2810	12545.33	10608.37
4	655.05	1.84	95.6	1.75	136.46	2810	5406.75	4751.70
5	1369.68	2.70	96.1	1.87	107.86	2810	7863.63	6493.95

*The quality premium was only based on differences in plumpness and nitrogen.

Figure 1: Income (R/ha) of the "organic" treatments presented as a percentage deviation from the conventional treatment.



Discussion

1. The trial covered an area of approximately 3.6ha, and due to the fact that Dunghye Park is particularly hilly, it is almost impossible to find an area, which is homogenous in terms of soil structure and quality. In addition, the trial was planted against a hill with an uneven slope for the different treatments.

2. The above-mentioned factors could be a possible explanation for the detrimental high coefficient of variance (21.0%) for the yield trial during the 2007 season. To improve the CV it was decided to harvest the whole plot in 2008 instead of only a strip. The amended protocol showed an enormous improvement and a CV of 12.6% was obtained in 2008.

3. The only truly organic treatment is Treatment 4, since commercial fungicides were used in all the other treatments. However, components of organic fertilizers were used in Treatments 1, 2 and 5

4. There were no statistical significant differences in yield between the treatments in 2007, which can be ascribed to the high CV.

5. During the 2008 season, the yield of the conventional treatment (Treatment 3) was significantly higher than all the "organic" treatments.

6. The truly organic treatment (4) showed a significant lower yield than all the other treatments with the exception of Treatment 2.

7. There was no significant difference in the percentage plumpness over treatments during both years.

8. Treatment 5 provided significantly higher kernel nitrogen that all the other treatments in 2008.

9. At first glance, it may seem that there are big differences in the income received from the various treatments (Table 3 and 4). However, there were no statistical significant differences in yield between the treatments in 2007 (Table 2).

10. The average cost per treatment in 2007 was R842.94. For the 2008 season, the average cost per treatment was R1263.46, which indicates a 50% increase.

11. From Table 3 and 4 it is evident that the treatment with the lowest input cost is Treatment 4, the "organic" treatment. The average cost of the organic treatment (R655.05) was 56.6% lower than the average cost of the conventional Treatment 3 (R1445.92).
12. This treatment also showed the lowest yield. Consequently, the treatment also had the lowest average income (R5223.97), 39% less than Treatment 3 (R9019.48).

13. SSG 506 and S6 are cultivars with reasonably good general disease resistance, and the disease pressure for fungal diseases was unusually low during the 2007 growing period of the trial. During the 2008 period similar,

low levels of disease, pressure was seen, and the disease development started only at a late stage. No significant differences were observed with the naked eye during the trial, between the plots. Even the treatment, where no fungicide was sprayed, showed a low level of infection.

14. With the current data, the preliminary conclusion can be made that the organic treatment is not a viable practice for small grain production, unless a premium is paid for the niche product.

15. The average input costs of the other four treatments ranged from R971.26 (Treatment 2) to R1445.91 (Treatment 3), a difference of R474.65 per hectare. Although Table 3 showed big differences in income between the treatments, statistically there was no significant difference between the yields of the treatments in 2007. However, during the 2008 season Treatment 3 showed a significantly higher yield than all the other treatments, which provided an additional R2654.25 per hectare compared to the average income of the other treatments.

16. Due to the contradictory data of the two years, it is extremely difficult to make a conclusion that one treatment could guarantee a higher income than the others could. The only given is that there are differences in cost per hectare, and that that will be the deciding factor in the viability of the different production practices.

17. This trial will be repeated in 2009. However, the use of crop rotation will be implemented based on the model planned for the Dunghye Park farm and subsequently oats will be planted in 2009.