COMPARATIVE ADVANTAGE OF ORGANIC WHEAT PRODUCTION IN THE WESTERN CAPE

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Abstract

In a context in which the framework of agricultural policy and business is changing radically the objective of the government and farmers should be to support the development of systems that look likely to be winners in the future. As a result this paper uses a Policy Analysis Matrix (PAM) to determine whether wheat production would have a comparative advantage if produced under organic practices. The paper starts by analysing the comparative advantage of wheat under conventional[4] practices, and later contrasts conventional with organic practices. The results of the analyses mainly indicate a comparative advantage for wheat grown under organic practices especially when the social cost benefit ratio (SCB) is incorporated into the analyses. This is because the domestic resource cost (DRC) criterion that is used by the PAM is confirmed to understate the social profitability of systems that use domestic factors intensively like organic wheat systems and favours systems that use less of these factors like conventional systems. The results also show the existence of distortions in the market even if wheat were to be produced under organic practises, although these are shown to be less than for wheat produced under conventional practices.

1. INTRODUCTION

Farmers in the Western Cape Province produced approximately 32% of South Africa's wheat crop in the period 1986 to 1996. The wheat sector is important in this province given its considerable contribution towards field crop production and land use. For example, winter grains contribute more than 45% of total farm revenue in some sub-regions, including Malmesbury, Hopefield, Piketberg, Vredenburg and Moorreesburg (Troskie *et al*, 1995). Because of its key role in parts of the province, wheat production has

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[4] *Conventional means non-organic in this article and usually represents the most common agricultural production system in the Western Cape.*

relatively large income and output multiplier effects on the regional economy (Eckert *et al*, 1996). A potential expansion of wheat production also leads to positive employment effects, particularly with regard to grain processing activities, although these effects are lower when compared with other branches of agriculture (Vink *et al,* 1998). Nevertheless, the wheat sector accounted for about 26% of the 150 000 farm workers employed by the agricultural sector in the province during 2000 (Van Rooyen, 2001).

Political transformation in South Africa in 1994, coupled with trade liberalisation and market deregulation, has resulted in new policy objectives, and hence wheat producers in the Province face new trading rules and a new unregulated market environment. Moreover, changing consumer preferences have placed a premium on issues such as health consciousness, environmental and ethical trade concerns, particularly in the main consumer markets in the developed countries. As a result, demand is developing for products that are perceived to carry no (less) health and safety risks because they are produced in a certain way (Troskie, 2001). Hence, this article focuses on the potential for organic wheat farming in the Western Cape because it represents a potential niche market for a differentiated product for which demand seems to be growing, and for which it seems possible to obtain higher prices compared to the conventional product (Lampkin & Measures, 2001). Yet, organic wheat production will not be successful unless Western Cape wheat farmers are, or can become, competitive in the markets to which they sell, whether these are domestic or foreign.

In conventional economic terms, the development of new market circumstances leads the state to consider changing its intervention in the market through a reordering of existing instruments or the use of new instruments (e.g. subsidies, taxes, tariffs *etc*.) in order to assist producers to take better advantage of these opportunities. However, such policies influence the comparative advantage of commodity systems, particularly in agriculture (Kirsten *et al*, 1998), and neoclassical economic theory shows that this could lead to a misallocation of resources, even if an industry is financially viable (Samuelson & Nordhaus 1989). It is therefore important to measure the comparative advantage of organic wheat production to ascertain whether social welfare is being maximized. Once this has been done the competitiveness of an industry can be measured in the sure knowledge that any competitive success is sustainable in the long run (Porter 1985).

The main purpose of this paper is, therefore, to identify and quantify the costs and benefits of government policies affecting organic wheat production in the Western Cape, using the Policy Analysis Matrix (PAM) algorithm. The private and social profitability of organic and conventional wheat systems are compared in order to identify socially profitable avenues for resource allocation, i.e. to identify areas for public policy interventions.

2. METHODOLOGY AND DATA COLLECTION

2.1 The Policy Analysis Matrix (PAM)

The PAM, as developed by Monke & Pearson (1989), is used because it allows varying levels of disaggregation and because it makes the analysis of policy induced transfers straightforward. The model also makes it possible to identify the net effect of a set of complex contradictory policies to sort the individual effects of these policies. Moreover, the PAM framework permits sensitivity analysis in which an inventory of uncertainties may be examined for their likely impact on the underlying comparative advantage.

The PAM model is relevant in three areas of economic analysis:

- the impact of policies on the comparative advantage of commodity systems;
- the impact of investment policy on economic efficiency and comparative advantage; and
- the effects of agricultural research policy on changing technology.

2.2 Data collection

In this paper, Combud budget data[5](outputs, sales revenues and input costs valued in private terms per hectare) for the year 2000 were used to represent typical conventional wheat farms. To enhance the validity of the results, typical farms were modelled for all the main wheat producing regions in the Western Cape, including the Swartland, Northwest, South Coast, and the Little Karoo. As there were no certified organic wheat farmers in the Western Cape during the time of the research, enterprise budgets were based on the reference system where hypothetical profits of a typical organic farm were calculated by drawing on expert information in the manner suggested by Klepper *et al* (1977); Murphy (1992); and Offermann & Nieberg (2000). This approach was followed under the assumption that the conventional and organic farms being compared had a similar production potential (a similar endowment of production factors).

[5] *A complete list of the data used is available from the authors.*

2.3 Methodologies for the determination of shadow prices

There are two main approaches that economists use in determining shadow prices. The first is the world price method that takes into account the world prices of products and services, especially with regard to those goods that are freely traded on international markets (Little & Mirrlees, 1974). When local market prices do not reflect scarcity values, world prices serve as a shadow price after adjustments have been made for the costs of importing or exporting the goods, namely the physical costs of transport, storage, insurance, *etc*. This approach is, however, not always desirable because exchange rates themselves may be distorted, i.e. they often do not reflect scarcity values. Also, not all inputs and outputs are traded internationally, hence the second approach, namely the opportunity cost method. Here the opportunity costs, or the production that is given up elsewhere by withdrawing these inputs from alternative use, is used as the shadow price of inputs. In the case of the shadow price of outputs, the additional incremental benefit achieved by undertaking a project relative to the situation if the project had not been undertaken is used (UNIDO, 1972).

In practice both of these approaches are used to calculate shadow prices. Conventionally, the world price method is used where projects substitute imports or promote exports, i.e. where the inputs or outputs are internationally tradable. Locally purchased inputs are valued at international prices where the possibility exists that they could be imported or exported. On the other hand, inputs such as land and labour for which no international prices exist are valued at local opportunity costs. With regard to land valuation, Gittinger (1982); Irvin (1978) and Scott *et al (*1976) define the economic cost of land as the net value of production forgone when the use of land is changed from its 'without use' to its 'with use', measured in border prices. Where there is free market in land, the market price of a piece of land will reflect its economic value. However, Van Schalkwyk & Van Zyl (1994)] remarks that non-farm factors like policy distortions, policy and institutional expectations get capitalized into market values and hence land values tend not to reflect its true economic value to the society. In this respect Monke & Pearson (1989) suggest that in the absence of a market value that reflects the opportunity cost to use land, the rental value can be used instead. They further argue that when both financial cost and rental value fail to reflect the opportunity cost of a piece of land, its 'potential productive capacity' can be used to assess its value in its most alternative profitable use. For example, if oats production represents the best alternative to wheat production in the

Swartland area, the social cost of land for wheat production is the social profits (excluding land) from the oats production.

However, the use of social profits in alternative activities can also be misleading because different farm activities require different managerial skills and different risk factors, which are not included in the enterprise budgets. The implication is that one farm activity may show higher profits than another but the difference may be explained by managerial skills and lower risk levels in the production process. According to Ohene-Anyang (1997) the locations of most agricultural land are such that in most cases the only alternative to the land's use is no use at all. Under such circumstances, it is not likely that the rental value of land can be influenced by external forces to any appreciable extent. In this view the rental values based on Nieuwoudt's (1980) rate of return approach are used in this study and are incorporated in both financial and economic accounts. The real values of land per hectare for different regions of the Western Cape and percentages of rate of returns that are estimated between 5 and 8% were obtained from the Sub-directorate of Agricultural Economics (2000) at Elsenburg. From this discussion it can be deduced that all approaches that are used to determine agricultural land values are subject to criticism. In this regard one can argue that it is because of the extremely difficult task of associating a cost with land.

In the case of labour, the convention is to disaggregate labour according to the level of skills. However, farm workers in South Africa are generally unskilled, and managers in the wheat sector are generally owner operators. Hence, it is justified to treat all labour as unskilled and therefore non-tradable. In terms of the wage rate, the peak season market wage is taken as the most realistic estimate of the marginal value product of labour. In the Western Cape, it can be argued that the highest labour demand for dryland wheat production is during the planting season in April and harvesting in November, even though wheat production and harvesting is highly mechanised, and the unemployment rate is lower than in the rest of the country. As a result, the use of a shadow wage rate that is less than the market wage is unjustified (Gittinger, 1982). Also, although a minimum wage for agriculture has been proposed recently, this was not considered in this study, as the minimum wage will by all accounts fall below the average wage (Vink, 2001). To arrive at the wage rate used in this study, average wage rates for all sectors and according to the level of skills were obtained from Statistics South Africa. However, through personal communications with farmers and farm workers, a wage rate of about R40.00 per day (eight hours) and R5.00 per hour for permanent unskilled labour was agreed upon. For casual unskilled labour a rate of about R25.00 per day and R3.125 was also agreed upon and all incorporated into a Combud, which is a computerised program that was used for enterprise budgets used in this study. The program calculates labour costs per activity and according to time per action and thereafter the costs were entered in both financial and economic accounts.

In economic analysis, estimation of the shadow exchange rate is also of importance. Apart from the fact that changes in the exchange rate influence the world price at which commodities are imported or exported, they also have a significant influence on the price of inputs used in the production of these commodities. A study by Liebenberg (1990), Van Zyl (1990) and also by Van Schalkwyk *et al* (1995) explains the influence of an exchange rate on South Africa's agricultural production. Another example in this is Argentina, which at a certain stage became one of the worlds lowest cost sugar producer, but when the government policy of tying the peso to the US dollar was implemented, Argentine production became increasingly uncompetitive (LMC, 1999). Hence, the price of tradable goods must therefore be adjusted with the exchange rate. Various authors used a number of methods to calculate the shadow exchange rate (SER) which are mainly based on purchasing power parity (PPP) theory, for example, the Big Mac Index and the BER (Bureau of Economic Research of the University of Stellenbosch), Jooste & Van Schalkwyk (2001), Krabbe (1999). However, PPP rates are the best theoretically, but literature shows no clarity on what actual rate to use.

Hence, the starting point in this study has been that the commercial rate (R7.44 to US$ 1.00) be used in cost calculations as quoted by the South African Reserve Bank during the second quarter of the year 2000 which was the year of data collection. The reason being that regardless of whether this appears to be an over-or undervalued rate, it has the merit of being published in official statistical sources, and represents the rate at which a large body of official foreign trade was occurring. One can also argue that even though the Rand may still be protected in the form of higher interest rates, most of the restrictions on the exchange rate were removed from the time when the financial Rand was abolished in February 1995 (South African Reserve Bank, 1996). However, since it is common knowledge that the value of the commercial Rand might not be a reflection of the true (shadow) value of the Rand, a sensitivity analysis is conducted showing how the cost estimates in this study are affected by a 30% change in exchange rate. Nevertheless, this is not given attention in this paper simply to keep the length within limits.

2.4 Disaggregating input costs

The costs of tradable inputs often include substantial amounts of inputs that are not available on international markets such as transportation, electricity, labour *etc*. Therefore, after all market and social input cost categories were standardised, they were allocated to domestic factor (non-tradable) and tradable input components. The non-tradable components were then added to the cost of the domestic factors (Monke & Pearson, 1989). Due to lack of input-output matrices of national accounts, the decompositions were based on the work of Jooste & Van Zyl (1997) and Van Rooyen (2000) (see Table 1).

Table 1: Components of the economic value of some inputs

Item	% traded	% non-traded
Purchased inputs	90	10
Machinery/implements costs	80	20
Contract/hire service	35	65
Insurance	5	95

Source: Jooste & Van Zyl (1997); Van Rooyen (2000)..

3. RESULTS AND DISCUSSION

The basic results from the farm production activity budgets are divided into two categories, that is, dryland conventional and dryland organic wheat systems. The interpretation of all entries in the matrices such as private profits, social profits, and divergences in outputs; tradable inputs; and domestic factors and ratio indicators are discussed in the forthcoming sections while the values are presented in Table 2.

In this paper the Policy Analysis Matrix (PAM) is used to evaluate the comparative advantage of alternative activities, conventional versus organic wheat in the Western Cape. The most prominent indicators used by the PAM are the Domestic Resource Cost ratio (DRC) and social profitability. In simple definition the DRC measures the ratio of the cost of domestic resources used by the commodity system to the value created by the commodity system, both measured at social prices (Kydd *et al*, 1997). The activity that is an efficient user of scarce resources or has the comparative advantage have the DRC between zero and one while values above one and those negative indicate that an activity is wasting scarce resources that could be used efficiently elsewhere. Break-even activity is indicated by the DRC of one.

Similarly, social profits measure efficiency or comparative advantage, although outweighed by the DRC for comparison of different activities. The results can be taken directly from the second row of the PAM matrix; social profits equal social revenues less social costs. When social profits are negative, a system cannot survive without assistance from the government. Such systems waste scarce resources by producing at social costs that exceed the cost of importing.

Although not used by PAM, social cost-benefit ratio (SCB) is also one of the important indicators. A simple social cost-benefit ratio measures social profitability, which also indicates the economic efficiency of a commodity system. The DRC isolates the costs of domestic factors and thus understates the social profitability of activities that make intensive use of these resources like organic wheat systems and overstate activities that use less of these factors. Similar to the DRC, profitable activities have an SCB between zero and one and unprofitable activities have an SCB greater than one. Break-even activities are indicated by an SCB of one.

3.1 PAM Results for conventional wheat systems

The results, particularly for conventional wheat systems, vary according to farming areas in all regions of the Western Cape. This is because of differences in soil types, climatic conditions, and methods of production (monoculture or rotation system, and minimum or conventional tillage practices), which may influence the yield per hectare and production costs. However, due to similarities within each region, only results for selected farming areas are shown in Table 2, and will be discussed in the forthcoming sections. To prevent bias, selection is based on the most popular methods of production that are applicable in each region and also on similar systems for comparison purposes.

3.1.1 Comparative advantage analysis

3.1.1.1 Domestic Resource Cost ratio (DRC)

The analysis reveals that some regions in the Western Cape have a comparative advantage in the production of conventional wheat, especially when the import parity price is used, which is accepted at R1248.47 per ton. For example, the Swartland is one of the areas that have a comparative advantage in conventional wheat production, as shown by the DRC values of 0.48 and 0.54 in Table 2. The Uniondale area in the Little Karoo and Urionskraal in the Northwest region also show a comparative advantage for conventional wheat production, as indicated by DRCs of 0.95 and 0.96 respectively.

Table 2: PAM results for conventional and organic wheat production in the Western Cape

Farming Area	DRC	SCB	NPCO	NPCI	EPC	PC	SRP	Output Transfers (R/ha) *	Tradable Input Transfers (R/ha)	Domestic Factor Transfers (R/ha)	Private Profit-ability (R/ha)	Social Profitability (R/ha)		Net Policy Effect (R/ha)
Conventional Wheat														
Swartland (conventional tillage)	-113.25	1.28	0.72	1.03	76.01	1.26	-0.12	-766.63	79.55	-509.46	-1625.51	-1288.79		-336.72
Swartland (minimum tillage)	0.48	0.64	0.72	1.04	0.50	0.22	-0.24	-906.02	48.10	-178.16	224.40	1000.36		-775.96
Middle Swartland (minimum tillage)	0.54	0.67	0.72	1.03	0.48	0.14	-0.22	-871.18	44.67	-154.10	110.91	805.36		-694.45
Malgas/Heidelberg (conventional tillage)	-2.17	1.56	0.72	1.04	2.33	1.13	-0.10	-696.94	133.25	-582.27	-2229.41	-1981.49		-247.92
Witsand/Heidelberg (minimum tillage)	1.23	0.94	0.72	1.03	-0.13	-3.97	-0.18	-871.18	78.05	-372.63	-770.88	-194.28		-576.60
Uniondale (minimum tillage)	0.95	0.89	0.72	1.02	0.33	-9.25	-0.21	-348.47	20.42	-112.72	-231.18	24.99		-256.17
Bo-Langkloof (conventional tillage)	-0.93	1.70	0.72	1.04	1.71	1.14	-0.12	-522.71	104.89	-395.28	-1929.55	-1697.23		-232.32
Urionskraal	0.96	0.91	0.72	1.05	0.01	-19.66	-0.24	-348.47	44.50	-91.73	-286.66	14.58		-301.24
Organic Wheat												*DRC criterion*	*SCB criterion*	
Swartland (sandy*)	1.03	0.87	0.85	1.01	0.60	2.70	-0.02	-537.68	24.97	-494.85	-107.53	-39.73	455.12	-67.80
Swartland (sandy)	0.91	0.83	0.85	1.01	0.64	0.40	-0.02	-537.68	24.97	-478.54	55.35	139.46	618.00	-84.11
Swartland (clay*)	0.87	0.81	0.85	1.01	0.66	0.57	-0.02	-537.68	21.17	-465.86	124.83	217.82	683.68	-92.99
South Coast (clay)	1.46	0.96	0.85	1.01	0.38	1.02	-0.00	-537.68	37.61	-565.50	-437.92	-428.13	137.37	-9.79
South Coast (clay)	1.87	1.03	0.85	1.01	0.28	1.01	-0.00	-537.68	43.39	-576.81	-701.88	-697.62	-120.81	-4.26
Little Karoo (clay)	0.60	0.67	0.85	1.01	0.70	0.84	0.03	-537.68	20.90	-441.31	613.79	731.06	1172.37	-117.27
Little Karoo (sandy)	2.23	1.04	0.85	1.01	0.03	0.99	0.00	-537.68	52.18	-599.95	-761.91	-772.00	-172.05	10.09
Northwest (sandy)	0.77	0.77	0.85	1.01	0.59	0.76	-0.02	-537.68	25.02	-485.46	242.78	320.02	1005.48	-77.24

**Note*: (R/ha) signifies Rands per hectare, sandy and clay soil types.

However, the DRC values in these regions are nearer to one to reflect a situation that is closer to break-even profits. DRC values that are less than one in these areas suggest that wheat is an efficient user of resources especially when farmers comply with minimum tillage practices. The reason may be lower input requirements, and hence lower production costs when these practises are followed. This can also be ascribed to the restructuring of farming patterns, as wheat production is carried to high potential soils such that farms are diversified to include forage and livestock [Van der Westhuyzen & Kleynhans (1988), Nowers & Van Zyl (1991)]. In the Northwest region, lower production costs are realised mainly because producers rarely use expensive inputs like chemicals.

Conversely, the results indicate no comparative advantage for conventional wheat production in the South Coast region (Malgas/Heidelberg and Witsand/Heidelberg) even if minimum tillage practises are used, as the DRC is negative for the former and above one for the latter. These results are unexpected especially under a rotational system, but the divergence can be ascribed to high production costs as a result of the intensive wheat management required when the design includes crops that have a long production cycle, like lucerne. High costs of transportation may also be a contributing factor for the comparative disadvantage in this region.

Furthermore, the location may also have an effect to the Western Cape wheat industry as the coastal situation implies that producers realise wheat prices that are closer to the export parity price than import parity. This means that inland producers of the Free State area for example, are better off than coastal producers as the above factors could definitely undermine any competitiveness a region or country may have in production or trade. Also, when wheat is produced using conventional tillage practices, all regions realise no comparative advantage, because the practices make intensive use of inputs like pesticides and herbicides that are subject to taxation. Notwithstanding, taxation of fuel, particularly diesel in the case of agricultural production, also has a significant impact on the comparative advantage.

3.1.1.2 Profitability

Results in Table 2 also show variations in profitabilities both in private and social terms across regions and farming areas. Obviously different soil types, climatic conditions, and production costs are the reason for this variation. Similarly, transportation costs play an equally important role. With regard to private profitability, the results show that only two areas of the Swartland region have positive private profits, although these profits appear to be low. Negative private profits in all other regions show that producers are earning subnormal rates of return, and are thus expected to exit from the wheat activity, unless they can re-assess and compare alternative plans open to them for exploiting available resources at their disposal. On the other hand, social profits, which are an efficiency measure, are positive in all areas that have DRCs less than one, indicating that these areas are the efficient users of scarce resources. Conversely, negative social profits, especially in the South Coast region (Malgas/Heidelberg and Witsand/Heidelberg) reveal that the wheat system cannot survive without assistance from the government.

3.1.2 Policy Effects

3.1.2.1 Effect of divergences

The analysis has highlighted the fact that market prices diverge from their underlying social valuations mainly because of government policies, particularly taxation on imported chemicals and fuel. Table 2 shows negative values for factor transfers, which imply positive incentives for wheat farmers. This can be attributed to the primary factors of production, particularly land, because both social and the private values of land are determined in relation to alternative uses. Therefore factor transfers may include some effect of the policies and market imperfections that influence the profitability of alternative crops. With regard to output transfers, all values from the selected farming areas are found to be negative, which is a reflection of disincentives to farmers. This may be a result of transportation costs that are prominent in fixing the producer prices for wheat. Consequently, input transfers also indicate disincentives, as positive values shows that farmers are paying input prices that are higher than world prices as a result of government policies.

3.1.2.2 Net protection coefficient (NPC)

The net protection coefficient is a measure of the disparity between domestic and international prices concerning outputs (NPCO) and inputs (NPCI). Therefore an NPCO of 0.72 indicates that policies have caused the domestic wheat price to be lower than the world price by approximately 28%. This divergence may be attributed to customs and exchange costs. On the other hand, an NPCI of approximately 1.03 reveals that farmers are paying a premium for agricultural inputs, as input prices are about 3% higher than the world market prices. One of the reasons for this may be taxation on chemical inputs (10%) and on fuel (30%).

3.1.2.3 Effective Protection Coefficient (EPC)

The results in Table 2 show that three out of eight values are above one. The interpretation of this is that the net effect of policies that alter prices in product markets is to reduce private profits, and the combined transfer effect is thus negative especially in areas that use conventional tillage practises. In other words, this means that private profits are lower than they would be without commodity-affecting policies.

3.1.2.4 Net transfers

Unlike the EPC, the protection coefficient (PC) is a combined indicator that measures the total incentive effect of policies as it also includes those policies that influence factor markets. The results in Table 2 mainly indicate that there is a net transfer from social to private profits, except in areas like the Swartland that comply with minimum tillage practises. In a similar context, the subsidy ratio to producers (SRP) shows the level of transfers from divergences as a proportion of the undistorted value of the system revenues. Because divergences are not traced from market failures, negative SRP values in Table 2 imply that distorting policies are decreasing the system's gross revenues.

3.2 PAM results for organic wheat systems

The most significant factors that affect the PAM calculations for organic wheat are high domestic factor costs and low estimated yields, which result in a gap between private and social profits. Confirming Masters & Winter-Nelson's (1995) findings, the biasedness of the DRC criterion that is used by the PAM model was detected, and hence a simple social cost-benefit ratio is incorporated into the analyses.

3.2.1 Comparative cost analysis

3.2.1.1 Domestic resource cost ratio

The DRC criterion reveals a weak comparative advantage for wheat even if produced under organic management practices, although in the clay soils of the Little Karoo and sandy soils of the Northwest regions wheat would have a better comparative advantage if farmers complied with organic farming practices. The areas that do have this advantage mainly show positive profits that are closer to the break-even point. The comparative disadvantage in other areas is ascribed to variations in soil types that have different input requirements. For example, machinery used in organic farming is different because of the tillage practices needed for this method of production in these areas. Also green manure production costs are incorporated into organic wheat analysis instead of the real nitrogen fertiliser costs that are used in conventional wheat analysis.

3.2.1.2 Social cost-benefit ratio (SCB)

In Table 2 the results reveal improvement in the comparative advantage of wheat if were produced under organic practices, as the SCBs are mainly less than one. This includes one area in the South Coast region, which showed a total comparative disadvantage under the DRC criterion in both conventional and organic wheat systems.

3.2.1.3 Net profits

As indicated in the preceding paragraphs, soil types and climatic conditions that have different input requirements, particularly with regard to machinery, have a significant impact on private profits. However, unlike the conventional wheat systems where only two out of eight selected matrices reveal positive private profits, the results show that four out of eight areas would have positive private profits if wheat were produced under organic management practices. This result can be ascribed to less distorting policies, as organic wheat production is not subject to taxation on chemical inputs, although it is also subject to fuel taxation.

Like DRC values, the results also indicate lower levels of efficiency even if wheat was produced under organic management, because maximising social profits is equivalent to minimising the DRC. Similarly, social profits that are determined through the DRC criterion are also liable to its limitations. In contrast, the social cost benefit criteria mainly show positive social profits suggesting that wheat would not be produced at a social cost under organic practises. In other words, this means that the wheat system would have survived without assistance from the government if it were produced under organic practices. Therefore the choice is clear for efficiency-minded economic planners, to enact new policies or remove the distorting ones to provide private incentives for systems that generate social profits.

3.2.2 *Policy transfers*

A comparison of the extent of policy transfers between two different systems also requires that ratios such as NPC for outputs (NPCO) and inputs (NPCI), EPC, PC, and SRP be contrasted.

3.2.2.1 Net protection coefficient (NPC)

The nominal protection coefficient for output (NPCO) is estimated at 0.85 in all matrices as a result of the similar import parity price (R1768.84 per ton) used. This result indicates that the domestic price of organic wheat, which is accepted at R1500.00 per ton, is 15% lower than the world price. This is unlike the conventional system where divergence is nearly 28%. The difference between the two systems can be attributed to different distribution channels where organic wheat is mainly marketed directly to market outlets while conventional wheat is often sold through futures contracts.

On the other hand, the nominal protection coefficient (NPCI) for inputs is estimated at 1.01. The results show that policies are causing increases in input prices that are nearly 1% higher than the world prices, which can be associated with the taxation on fuel in the case of organic wheat farming. This also differs from conventional wheat results where the ratio reveals a 3% increase in domestic input prices as a result of taxation on both fuel and chemicals.

3.2.2.2 Effective protection coefficient

If wheat were to be produced under organic practises, EPC values that are less than one show that the net impact of government policies influencing product markets would be that the wheat system would have lower private profits than if there were no commodity policies. This is however not a complete indicator of incentives.

3.2.2.3 Net transfers

The total indicator of incentives (PC) is found to be above one in the South Coast region and some areas of the Swartland. This indicates that there is a net transfer from social to private profits. On the other hand, PC values that are less than one in other areas reveal a net transfer from private to social profits. Finally, the SRP values that are negative and closer to zero in Table 2 imply that distorting policies would have decreased the systems revenues even if wheat were produced under organic practices.

4. DISCUSSIONS AND CONCLUSION

The results show generally a weak comparative advantage for conventional wheat production in the Western Cape other than certain areas of the Swartland that have a strong comparative advantage. There is also a sharp contrast between tillage practices used for conventional production, with minimum tillage contributing more to the comparative advantage of wheat production than conventional tillage practices. However, the results also show that there would be an improvement in the comparative advantage of wheat production if it were produced under organic practices. This is confirmed by the social cost benefit ratio, which is observed to be a better indicator of social profitability for systems that make intensive use of domestic factors like organic farming. On the other hand, the DRC indicator that shows a weaker comparative advantage, even if wheat was produced organically, is also expected to present better results in the future, as the costs of certification for organic farming are still high at present. However, certification costs are expected to diminish with expansion of the system.

Since PAM is a static model such that it cannot capture the potential effects in prices and productivity, therefore a sensitivity analysis was conducted. The primary issue of the sensitivity analysis is the organic wheat price, which is estimated to fall by 20%. This is based on authors' observations who perceived that in organic farming lower yields are realised, particularly in the establishment phase, whereas with continuous production, yields increase as the system balances. This has a negative impact on prices of organic produce, and hence viability of organic farming. However, it can be argued that even if the prices of organic produce are likely to fall in the future, they will still be in the range of their conventional counterparts. Also, a fluctuating exchange rate can have a significant impact on the comparative advantage. Therefore an estimated 30% devaluation in the value of the rand will result in better performance of organic social production than private production.

On the other hand, the devaluation of the Rand is likely to cause an increase in production costs particularly tradable input costs. This burden is mainly skewed towards conventional wheat production systems that make intensive use of tradable inputs compared to organic wheat production systems that use less of these inputs. Therefore it can be wiser and rewarding if producers seriously consider diversifying into organic wheat production, which is a promising niche market. Farmers may thus benefit from higher premiums that would improve farm profits in the short run at least. In conclusion, careful steps were taken to minimise the limitations of this study, however, it is only natural that some would be encountered. One likely source of limitations is modelling which involves a considerable abstraction from and simplification of reality because it is very dependent on the underlying assumptions. This therefore calls for actual information that can be obtained from surveys and experimental plots. Nevertheless, organic farming tends to reveal interesting research questions having implications for enhancement of sustainable production systems for and beyond organic agriculture.

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