SOUTH AFRICAN LAND AND MARKET REFORMS: EQUITY VERSUS EFFICIENCY

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Abstract

This study makes a contribution to the land redistribution policy, which is presently not only one of the most definitive political and development issues, but perhaps the most intractable in South Africa. The study develops and uses a mathematical model for regionalised farm-level resource use and output supply response to show that the current policy requires more economic imperatives, as it tends towards smallholder agriculture that cannot produce adequate yields to meet either domestic demand or a tradable volume. Given the challenges of a free market and the fact that the settled small-scale, resource-poor (mainly black) farmers are less efficient compared to large-scale (mainly white) farmers from whom government transfers land, the study compares and prescribes land redistribution strategy that considers equity with efficiency. The study further suggests that agricultural land may act as a safety net for the poor, where the efficiency argument does not hold.

Keywords: farm-level, supply response, equity, efficiency, land and market reform, policy analysis

Introduction

In an economy, factors that determine agricultural supply include resource availability which itself is a function of the climate. Government can enhance agricultural supply with the use of policy that encourages effective allocation of existing resources, increases the rate of use of the existing resources and encourages the competitive industry structure, amongst others.

South Africa is sub-tropical along the east coast and is characterised by prolonged droughts. The climate determines the spatial distribution of farm resource use and output supply. Subsequently, agricultural supply varies from region to region and within each region (DWAF, 2002). In addition, during the greater part of the twentieth century, the government, through a number of policy measures, supported commercial large-scale (mainly white) farmers. The economy was protected from the uncertainty in world prices. On the other hand, smallholder (mainly black) farmers did not have access to information, support services and improved technology. Therefore, the difference between black (mainly subsistence) and white (mainly commercial) farmers is huge in relation to farm resource use and output supply (NDA, 2004).

Since 1994, one policy measure meant to correct the imbalance of resource use and output supply in South Africa is Land Redistribution for Agricultural Development (LRAD). LRAD projects are meant to assist the portion (black, women and youth) of the population in land acquisition, thereby settling and supporting small-scale commercial farmers. The LRAD programme involves transferring 30% of

farmland under large-scale commercial farmers to settle a number of small-scale commercial farmers before 2015 (DLA, 2006). In addition, trade is liberalised, the market deregulated and subsidies and price supports to large-scale commercial agriculture are removed to enhance competitiveness.

However, the literature shows that some of the problems in the farm industry may be attributed to the market and land reform implementations. For example, land reform and its implementation are raising, among other problems, uncertainty about property rights, insecure land tenure, free-rider problems, land invasion and crime in the farming communities (Ortmann & Machethe, 2003).

Trade liberalisation and market deregulation expose the farmers to risks associated with the vagaries in world prices and exchange rate volatility. For instance, while exports have grown rapidly since 1990, imports have grown even faster in some sub-sectors of agriculture because of tariff reductions (Kirsten, 1998). At one point, the rate of farm sequestration increased due to a rising debt/asset ratio resulting not only from the effect of bad weather, but also through market deregulation, the elimination of government support to commercial farmers and relatively high nominal interest rates (Van Zyl, 2001).

Land and market reforms may affect agricultural supply and consequently regional and national food self-sufficiency in the short term and the near future, as is theoretically plausible to expect farmers to respond to the changes in the agricultural policy by changing their level of resource use and output supply, in an effort to maximise farming profits. This insight is based on the argument by Just (1993) that farmers do respond to changes in exogenous variables such as price or policy variables by changing land allocation and/or cropping patterns. Moreover, production and price risks might affect these farmers to different degrees, since they have a distinct efficiency level, resource endowment and experience. The effects may also differ on different farming enterprises.

This study estimates risks in the revenues of selected production activities, simulates 'representative' farmers' risk attitudes and incorporates the risks and risk attitudes into the model. The model is applied to simulate potential changes in resource use and output supply as a result of the implementation of land redistribution, given the challenges of a free market.

Methodology

In this study, a case study of Free State province was undertaken because an analysis of the effects of changes in policy and development strategies, on resource use and output supply response, might be complex at national level. Agriculture happens to be very important in a number of contexts to the Free State province. So also is Free State agriculture important to the South African agriculture as a whole.

The study explores the advantages of mathematical modelling and as much as possible, minimises the problems of such methodology. For example, to avoid over-specialisation, which is a common problem in mathematical modelling, the study uses the Positive Mathematical Programming (PMP) calibration approach (Howitt, 1995). Efforts were also made to make the model's specification and calibration as rich and realistic as possible by incorporating risk and farmers' risk attitudes into the model. Previous trends in regional output producer prices and yields were used to estimate the risk in production revenues. The model was also calibrated to an *a priori* supply response that was estimated with econometric models as reported in the literature (BFAP, 2006). The model features constraints due to resource availability and land quality distribution.

Data used

At regional level, regional data such as hectares allocated to crops, numbers of animal breeding stocks and output levels of some farming activities were used. These data are taken as farmers' or farm types' decision variables; models are often calibrated to these variables (Paris and Arfini, 2000). In this study

however, judicious use of regional and farm-level data was made as allowed by the PMP modelling approach. At farm-level, enterprise budget data for each production activity, namely the unit costs of resources, resource requirement per activity level, yield, output prices and average activity level were used. These data were sourced from Combud Enterprise Budgets. The Combud Enterprise Budgets are compiled and updated from time to time by the Provincial Department of Agriculture (PDA) for the homogenous production sub-regions in each province. Time series data between 1994 and 2004 on farm gate output prices, producer price index (output) and yields were used to formulate the probability distribution of the revenues.

Base year (2004) data on resource use and output supply at regional and farm-type levels were used as variables in the model according to the PMP modelling approach. The data include those necessary for accounting equations and resource constraints, activity levels, policy variables such as the proposed rural land tax, water quotas, farmland and irrigation water availability at farm- and regional-level, farmland prices and rents, the number of farm units, crop and animal products supply levels, etc. These data were sourced from the reports of censuses of commerical agriculture, reports on the survey for the drought relief programme in the 5 zones of the province, the agricultural information database at the Free State PDA, the database of LRAD projects from the Department of Land Affairs (DLA), the national register of water use from the national Department of Water and Forestry Affairs (DWAF), etc.

Data and model validation

The data were validated in consultation with resource persons (extension officers, agricultural economists, agronomists, etc.) from the PDA, DLA, DWAF, etc. using their knowledge and experience to validate the data. Additionally, data from other sources were used to cross-check the base source data.

The model is validated in its capability to reproduce observed data. The model reproduces almost exactly the base activity levels. It also reproduces exactly the observed base period allocation of land among cropping activities and among farm types at regional level. It is also calibrated to an *a priori* supply response at all levels. Policies on land redistribution and market deregulation were conceptualised into some scenarios. The model was used to simulate the possible impacts of these scenarios. The effects on farm-level supply curves were examined. The farm type supply curves were aggregated into a regional supply response.

Results and discussions

Output supply response based on Scenario I

In Scenario I, the effects of the risk in the marginal revenues of the selected production activities and the trends in the number of farm units are combined. The technical progress in the farm industry, as found in the literature, is also assumed. The cost of production is assumed as constant.

The number of farm units in the large farm type has been decreasing at the arithmetic mean of 129 farm units per year from 1994 to 2004. This trend is assumed to continue to decrease from 8,531 in 2004 to 7,112 in 2015. This is a decline of about 17%. However, the number of farm units in the small farm type is assumed to continue increasing from 495 in 2004 to 8,635 in 2015 at the arithmetic mean of 740 farm units per year. It is acknowledged that this increase is very high as such an increase has never been recorded in the Free State LRAD programme. However, this assumption is based on the proposal by the Ministry of Agricultural and Land Affairs which hopes to transfer land at the rate of 2.2 million ha per year from 2006 to 2015, in order to reach the target of transferring 30% of farmland from commercial agriculture by 2014.

Table 1 shows that for the large farm type, despite that the expected marginal revenues of white maize, yellow maize and wheat may be higher in 2015, the supplies decrease for all crops and animal products by an average of 15.23%. The general decrease in the supply of the crops and animal products could be explained by the decrease in the number of large farm units. The decline could have been more pronounced if technical progress had not been incorporated into this scenario. The differences in the decline in crop and animal products could be attributed to different risk levels and expected marginal revenues.

Table 1: Base level and % changes in supply as a result of Scenario I

	Base			***27.50% land transfer***		
	Large farm type	**Small farm type**	**Region**	**Large farm type**	**Small farm type**	**Region**
No of farm units	8531	495		7112	8640	
Crop	**(ton)**			**(%)**		
White maize	2718395	6055.29	2724448.07	-15.03	1657.51	-11.32
Yellow maize	1617420	12557.90	1629976.83	-15.12	1657.14	-2.24
Wheat	517674.00	280.78	517956.78	-14.56	1658.85	-13.65
Soya beans	30508.34	-	30508.34	-15.33	-	-15.33
Sorghum	162899.11	-	162899.11	-15.14	-	-15.14
Sunflower seed	269342.58	-	269342.58	-15.54	-	-14.54
Livestock	**(ton/litre/unit)**			**(%)**		
Beef-cattle	60255.18	336.18	60591.36	-15.41	1657.81	-6.13
Mutton	30000.00	150.92	30150.88	-15.38	1657.98	-7.00
Pork	10233.02	259.77	10492.79	-15.31	1658.36	26.13
Broilers-chicken	74360.98	8.14	74369.12	-15.18	1659.02	-15.00
Layers-eggs	515199600	568755.24	515768700	-15.36	1658.07	-13.52
Dairy milk	357984700	274069600	360725400	-15.38	1657.99	-3.66

Source: Own simulation results from the model

For the small farm type, as expected, the supply curves for crops and animal products are shifted to the right at an average of about 1,658%. This could mainly be explained by a massive increase (1,645%) assumed in the number of farm units. It confirms that percentage change in the number of farm units could lead to a more or less proportional change in the supply curves.

These data show the overwhelming effects of the increase in the number of farm units and technological progress. An increase in the number of small farm units shifts the regional supply curves to the right. This looks promising with respect to establishing more developing farm units as a means of redressing the imbalance in the industry. However, these results should be interpreted with caution. It is obvious that some LRAD farms will be established. However, one burning issue in agrarian reform remains the productivity and efficiency among the LRAD farms, as the government lacks enough resources to provide integrated support services which would enhance productivity amongst the LRAD farmers.

Additionally, the decreasing effects that the declining number of large farm units has on the regional supply curves crowd-in the increasing effects that the increasing number of small farm units has on them. This happens for all crops, but is especially pronounced in the supply responses for soya beans, wheat, sorghum, sunflower seeds, broilers-chicken and layers-eggs. These are relatively capital-intensive production activities. The net positive change in the regional supply curve for pork production is as a result of the observation that a relatively high proportion of the small farm type is engaged in rearing pigs for pork production. It is the only production activity where small farm units produced about 2.28% of the regional production. This result shows the implication of small farm types not having enough capital and other resources necessary to engage in capital-intensive production activities.

Output supply response based on Scenario II

In this scenario, the assumed technical progress for the small-scale farmers in Scenario I was dropped, as an indication exists that most LRAD farms have not been able to make a substantial contribution to the regional supply. This may, among other things, be attributed to a lack of capital, experience, and the like, which are necessary for large volume production.

Columns 2, 3 and 4 in Table 2 show that the assumed technical progress has negligible effects on the simulated production levels of the small farm type. It may therefore be inferred that multiplying the number of small farm units has a negative implication on regional resource use and output supply, especially where land is being transferred from the large farm type to settle small farm units. The decline in the supply response is, on average, about 0.25%. These results raise concern about the policy objective to settle a large number of small farm units which are less efficient compared to large farm units.

Table 2: % changes in supply as a result of Scenarios II and III

	Scenario II			Scenario III		
	Large farm type	Small farm type	Region	Region	Region	Region
Crop	**(%)**			**1%**	**5%**	**10%**
White maize	-15.03	1645.45	-11.34	7.32	14.60	24.04
Yellow maize	-15.12	1645.45	-2.33	17.95	25.69	35.69
Wheat	-14.56	1645.45	-13.66	5.92	15.20	27.34
Soya beans	-15.33	-	-15.33	3.78	9.48	16.76
Sorghum	-15.14	-	-15.14	-32.73	-29.15	-24.58
Sunflower seed	-15.54	-	-14.54	-30.86	-24.47	-16.10
Livestock	**(%)**			**(%)**		
Beef-cattle	-15.41	1657.81	-6.13	-2.78	1.13	6.02
Mutton	-15.38	1657.98	-7.00	-1.24	2.91	8.13
Pork	-15.31	1658.36	26.13	-11.47	-7.89	-3.40
Broilers-chicken	-15.18	1659.02	-15.00	-1.52	3.33	9.51
Layers-eggs	-15.36	1658.07	-13.52	2.29	6.78	12.45
Dairy milk	-15.38	1657.99	-2.66	2.07	6.49	12.07

Source: Own simulation results from the model

Output supply response based on Scenario III

This scenario presents a picture of a pursuit of equity with more economic imperatives. This is not an objection to the land reform process in the South African context, but the presentation, from another perspective, of a more efficient method of agrarian reform. Government may target the farmland of inefficient large farms for redistribution, to settle black farmers who have a proven commitment to farming as an economically viable activity. This may assist the settled farmers to gain economies of scale, as compared to small farm types that are numerous in number but with low productivity, as observed in most under-developed and developing countries. It has been established earlier in this study that the means by which a nation may be more productive and thus become wealthier, is to allocate the existing resources efficiently and to increase the rate of use of such resources.

From the previous scenario, the yearly decrease of about 129 farm units in the large farm type will result in about 7,112 farm units by the year 2015, when 30% of the transfer will have been achieved. The farmlands of 1419 large-scale farmers, who cease to be active, may be transferred to settle large-scale committed (black) farmers. Expected marginal revenues for 2015 are assumed. Each of the activity levels has different level of revenue risk. Technical progress is also assumed.

Taking size as an indication of efficiency, an increase in technical progress at 1%, 5% and 10% was simulated in this scenario. Among and in addition to other changes, the increase in technical progress is expected to shift the supply curves to the right for each crop and animal product. Furthermore, the economics, the risk in the marginal revenues of each crop and animal product, coupled with the risk attitudes of the farm types, are expected to have effects on the supply curves.

The last three columns in Table 2 show possible impacts of the assumed increase in technical progress. It is observed that at a 1% increase in technical progress, the supplies of white maize, yellow maize, wheat, soya beans, layers-eggs and dairy milk would increase, while the others would decrease. This may be explained by the relative level of risk in the marginal revenues and the magnitudes of the gross margins, which resulted in substitution between the enterprises. At a 5% increase in technical progress, more of

the enterprises have positive responses. Therefore, these results show that having more farmland, which may imply reduced lack of capital constraints as assumed in this model, would not necessarily imply a general increase in all the production activities. At a 10% increase in technical progress, there is an increase in response.

Conclusions

In Scenario I, it may be inferred that a decline in the number of farm units shifts the farm-type supply curves by almost the same proportion. It is important to note that the decreasing effects that the declining number of large farm units has on the regional supply curves, crowd-in the increasing effects that the increasing number of small farm units has on the regional supply curves. This happens for all crops, but is particularly pronounced in relatively capital-intensive production activities namely soya beans, wheat, sorghum, sunflower seeds, broilers-chicken and layers-egg productions. Scenario II indicates that multiplying the number of small farm units has a negative implication for regional resource use and output supply, especially where land is being transferred from a more efficient large farm type. Scenario III shows a possible picture of an agrarian reform that allows the emergence of a larger farm unit and assisting a previously disadvantaged portion of the population, who have a proven commitment to farming as a business.

Policy implications

Policy needs to discourage settling small-scale farmers presently observed in the LRAD projects. Land reform may limit the production of the large-scale farm sub-sector, especially if the farmland is transferred from a large-scale farmer to proliferate a number of small-scale farmers who are less efficient. This could also lead to a poverty trap for the settled farmers and land fragmentation, which has consequences for large production necessary for export surplus. The land of inactive and less-successful large-scale farmers who are bankrupt, can be targeted for redistribution to settle black farmers with a proven commitment to farming on a large enough farmland. This will enhance such farmers' competitiveness. Small-scale farmers may be settled, but only on very intensive projects with high-valued crops such as vegetables on irrigation projects. Such farm units may be small in size but big in turnover. However, more research is necessary on this approach.

It is in the interest of all the stakeholders in the farming industry to implement land transfer and capacity development of intended beneficiaries simultaneously and quickly, especially in the use of risk-hedging mechanisms and the art of enterprise diversification. It is noted that rural land may act as a safety-net.

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