SETTLEMENT OF COMMERCIAL FARMERS ON TRUST LAND: PROMOTING LAND RENTAL AND ACCOUNTING FOR RISK IN FARM PLANS

MC Lyne
Department of Agricultural Economics, University of Natal, Pietermaritzburg

GF Otterman
Department of Agricultural Economics, University of Natal, Pietermaritzburg

EA Le Roux
Department of Development Aid, Pietermaritzburg

Abstract

This article reviews the approach employed by the Department of Development Aid (DDA) in settling black commercial farmers on Trust land. It is argued that farm sizes should be determined by market forces rather than by administrators, and that risk should be treated more rigorously in the farm planning process. A MOTAD model is used to account for income risk in an existing farm plan. The results highlight flaws inherent in current policy and procedures.

Uttersel

Verligting van kommersiële boere op trusgroude: Bevordering van 'n grondhuurmark en ingesigt van risiko in beplanningsproses

Hierdie artikel beoordeel die beplanningsmetode wat deur die Departement van Ontwikkelingshulp gebruik word om swar kommersiële boere op Trust-lande te wees. Dit word voorspel dat plaasgrootte regdes deur markregte bepaal moet word as deur administratiewe en dat risiko inbeslaan moet word in die beplanningsproses. 'n MOTAD model is gebruik om risiko in inkoopfiren in 'n bestaande boerderyplan. Die resultate beoordeel die met die huidige beleid en procedures.

1. Introduction

A transition from subsistence to commercial farming has positive income implications for emerging farmers and positive welfare implications for consumers in South Africa. These are the main objectives of the Department of Development Aid (DDA) in establishing black commercial farmers on Trust (State) land. Current policy also directs that each farmer should be able to generate the same farm income, preferably for equity reasons. This article reviews the approach employed by DDA in settling prospective farmers on Trust land and considers a procedure that would enable market forces to play a role in determining farm sizes. It is also contended that income risk should be treated more rigorously in the farm planning process. Some practical methods of incorporating income risk in farm plans are discussed and a MOTAD model is used to generate new solutions from an existing plan. The plans are compared and conclusions are drawn regarding the efficiency and equity advantages of allowing market forces to determine farm sizes on Trust land.

2. Policy strategies

In essence, the DDA's approach to resettlement involves the following steps: (a) divide Trust land into viable farm units, (b) select prospective farmers and (c) rent and ultimately sell the units to successful candidates. To set this process in motion a decision must be taken on what constitutes a viable farm.

Policy directives which fix farming scale (e.g., the target income of R20000 recommended by Avruch's Legislative Assemblancy) do not imply equity and could also conflict with efficacy goals. For example, the target income may not be sufficient to attract candidates of high calibre if their expected income from of-farm work is higher or less than that from farming. If potential farmers are not forthcoming the stated objective of retraining a cell of commercial producers may never be realised. From an equity point of view, the policy would not doubt be considered similar by potential farmers who perceive that they would be better off in some other occupation, or who consider the farm too large to manage with their limited resources. Fixing the scale of operation effectively precludes sustainability. If subsistence were permitted, farmers could choose their own scale of operation by renting in and leasing out land.

After selecting prospective farmers from a list of applicants, government officials must collect rent and evict farmers who do not pay. They must also ensure that tenants do not over-utilize land in an attempt to maximize their gains over a short-term contract. Present property owners have an incentive to evict tenants who do not pay as this implies foresees income. Likewise, they resent over-utilization of their assets by tenants as this implies foresees future income. Private property owners also have an incentive to invest in fixed improvements which raise the productivity of their land and increase its rent. Clearly, while government owns the land it must bear some responsibility for financing fixed improvements. Unfortunately, the incentives which guide landlords are wasted when individual effort (inactivity) is not fully rewarded (penalized).

At present, administrators are also expected to assess the performance of settled farmers as rental payments made by "successful" tenants are treated as contributions toward the purchase price estimated for the farm. It is not clear what action would or could be taken against tenants who do not pay their rents or who use only part of their farm. When subsistence is prohibited there is no financial penalty for non-use of land. The rent charged by government does not act as an incentive to farm as it must be paid regardless of whether the land is used or not. Conversely, when land can be sublet, successful applicants would rather lease it to users than leave it idle and forego rental income. This represents a market solution to the efficiency problem of establishing the "best farmers on the land." The market also has passive equity implications as incentives are voluntary and access to Trust land is extended to farmers who were not originally considered for selection. When successful candidates do acquire title to their farms, an anonymous situation will arise as these owner-operators will be...
able to alter the prescribed scale of their operations through land tenure arrangements determined in this market will reflect their expectations about future income streams from farming (allowing for all costs including management and risk) and may well be significantly different from those inferred from land sales in the Trust lands. By preventing subletting, the current approach (allowing in determining land transactions. Rentals determined in determining the scale of rentals) would not discriminate against farmers who rent land to other farmers would have an incentive to retain this land if governments charged them a rental equal to the market rate. In this case, land would transfer to tenants who use it, and new farm boundaries would be established. Farmers could then be given an opportunity to purchase the land at or below its market price. It should be noted that permission to sublet land is a necessary but not a sufficient condition for land rental. If transaction costs are high the market will attract few participants and land will not transfer to efficient farmers. Administrators should not discriminate against farmers who rent land. Instead they ought to take a pro-active role in drafting and updating rental contracts. Existing support services available to settled farmers might require substantial modification to cater for new tenants farmers and a wider range of farming enterprises. This more flexible approach would still require farm planning. Prospective farmers need information about appropriate enterprises and expected incomes on the farms offered. These expectations would normally include a risk component. This would be useful in determining maximum stocking rates and other rentals on farms that would normally include in rental contracts in order to reduce moral hazard. In formulating these plans it would be necessary to account for variability in yields and prices as individuals are generally risk averse. The following section deals with planning methodology and has implications for both the planning and proposed approach to settling farmers on Trust land.

3. Planning methodology

The planning process adopted by DDA usually begins with a summary of the main agricultural opportunities and constraints in the region. The next step involves solicitation of applications from interested enterprises. This involves (a) identifying enterprises ecologically suited to the area, (b) assessing landowners' experience with enterprises in order to estimate realistic yields and production costs, and (c) excluding enterprises that are not economically viable.

The economic assessment of suitable enterprises is normally based on a comparison of their gross margins, defined as gross income minus production costs. Estimated gross margins per ha or per animal unit (AU) drawn from commercial agriculture are adjusted to reflect local conditions. Although mean gross margins per ha or per AU are widely used in planning, land degradation income risk arising from yield and price variation. Rental production costs per ha or per AU are relatively stable from year to year. Yields vary with changing enterprise, sometimes while production costs vary with changes in market supply and demand. It is imperative that risk be considered in farm planning exercises because farmers generally behave in a risk-averse manner, i.e., they prefer to secure a lower income for a 'safer' farm plan with lower income variation. Variation in farm incomes can often be considered as a random variable with a distribution function that can be estimated.

Risk-efficient farm plans can be generated using mathematical programming techniques. For the problem under study, conventional mathematical programming techniques to use include MOTAD (Minimization Of Total Absolute Deviations. Baumol's L = E - βσ criterion (where E = expected income, β = risk aversion coefficient and σ = standard deviation of E) and Target MOTAD, a safety-first approach (Hazell and Norton, 1986). An advantage of these techniques is that they can be used solving the linear programming (LP) algorithms for which personal computers is readily available. A disadvantage is that yield and price (or income) data recorded over at least six years are required. When these are not available for the study area, estimates can be derived from other similar regions.

Baumol's L = E - βσ criterion is closely related to the MOTAD approach and enables the user to derive a farm plan that has a certain level of income risk (where E = expected income, β = risk aversion coefficient and σ = standard deviation of E) and Target MOTAD, a safety-first approach (Hazell and Norton, 1986).

This criterion was applied to data taken from a plan of a settlement in Southern Natal. A 95% value of σ was used at this level of risk aversion is considered appropriate for small-scale farmers. For example, I. J. L. Dillon and Scandizzo (1979) calculated a 95% value of σ of 1.15 for farmers on the Pueblo Project in Mexico. Brandon et al. (1984) reported values of 0.9 and 1.2 for landlords and farmers in Brazil.

The farm under study, and assuming a specified net disposable of income $3000, the target or expected annual income was set at R1002, comprising $3000 net disposable income, overhead costs of R500, and repayments of R433. Table 1 compares the results of two risk efficient solutions (Plan 1 and 2) with the original plan (Plan A) which did not account for risk. The objective function value for Plan A (R7109 = R500 + R1002 + 1947 = 1757) indicates that this income would be exceeded 85% of the time of the time as illustrated in Figure 1. It is evident that the enterprise mix in Plan is different from that of Plan A. For arable crops, the area under maize is higher while dry bean production is slightly lower. For the grasslands, the area under Diguares is greater while Enset (Enset): production is lower. Figure 1 shows that for Plan, risk efficient solutions (Plans 1 and 2) have a higher probability of achieving a minimum income. This is considered important for the problem at hand, since the planners need to know with a high degree of certainty that a minimum income will be achieved in any one year. The assumed criterion is that a farmer wishes to maximize E (an estimate of average income) and Target MOTAD, a safety-first approach (Hazell and Norton, 1986).

Table 1: Comparison of two risk-efficient plans with a plan that does not account for risk (Plan A)

<table>
<thead>
<tr>
<th>Particulars</th>
<th>Plan A</th>
<th>Risk-efficient Plan 1</th>
<th>Risk-efficient Plan 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dispersable income (R)</td>
<td>5000</td>
<td>5000</td>
<td>5000</td>
</tr>
<tr>
<td>Expected income (R)</td>
<td>15000</td>
<td>15000</td>
<td>15000</td>
</tr>
<tr>
<td>Standard deviation (σ)</td>
<td>3000</td>
<td>3000</td>
<td>3000</td>
</tr>
<tr>
<td>Objective function (E-βσ)</td>
<td>R7109</td>
<td>R500 + R1002 + 1947</td>
<td>R500 + R1002 + 1947</td>
</tr>
</tbody>
</table>

Particulars: Planting costs; Total cost; Livestock production; Human capital; The difference of R875 between the expected incomes of Plan A and Plan 1 is due to interest on operating capital being allocated to individuals in Plan 1 but Plan 2 has a special cost of plan A.

4. Conclusion

Establishing successful owner-operators on land currently held by the State could influence future policy in favor of private land tenure. However, imposing (temporary) equality in farm incomes has negative implications for both efficiency and equity. Farmers do not strive for the same farm plans as they have different levels of risk aversion and the value of opportunity cost of their resources (eg. their own management and labor) (tends to change over time). If set farmers could submit their holdings for agricultural purposes, land will transfer to the most efficient farmers that transactions costs are not prohibitive. Equality would improve as rental transactions are voluntary. Information about farmers, land rents and farm sizes generated by the market would also facilitate the task of shifting title from the State to emerging farmers. It is recommended that prospective farmers be offered a range of risk-efficient farm plans (involving different scale, income and risk) and that successful applicants be allowed to sublet their holdings. Risk efficient farm plans can be identified using linear programming techniques like MOTAD. These are easy to apply and can be solved on a personal computer. When MOTAD was applied to data from an existing DDA plan the risk accounted for the area required to specify a target income (with reasonable certainty) more than doubled.

Note

The authors would like to thank two anonymous referees for their useful comments.

References


able to alter the prescribed scale of their operations through land reallocation determined in this market will reflect the expectations about future income streams from farming (allowing for all costs including management and risk) and may well accommodate the small farmers’ remaining Trust lands. By preventing subleasing, the current approach to farmer settlement may delay the operation of market forces in determining farm sizes.

Creating farms that are intended to generate equal incomes is therefore meaningless in the long-run. It would be more equa and income for farms of different size and would thus allow successful applicants to sublet land. Rental agreements in this market would provide a benchmark against which rents charged by government could be compared. Successful applicants who sublet land to other farmers would have no incenti to retain this land if governments charged them a rental equal to the market rate. In this case, land would transfer to tenants who use it, and new farm boundaries would be established. Users could then be given an opportunity to purchase the land and below market prices. It should be noted that permission to sublet land is a necessary but not sufficient condition for land rental. If transaction costs are high the market will attract few participants and land will not transfer to efficient farmers. Administrators should not discriminate against farmers who rent land. Instead they ought to take a pro-active role in drafting and updating rental contracts. Encouraging support services available to settled farmers might require substantial modification to cater for new tenant farmers and a wider range of farming enterprises.

This more flexible approach would still require farm planning. Prospective farmers need information about appropriate enterprises and expected incomes on the farms offered. These information would aid in selecting individual enterprises and would be useful in determining maximum stocking rates and other replacement ratios. It would thus allow tenants to include in rental contracts in order to reduce moral hazard. In formulating these plans it would be necessary to account for variability in yields and prices as individuals are generally risk averse. The following section deals with planning methodology and has implications for both the planning process and proposed approaches to settling farmers on Trust land.

3. Planning methodology

The planning process adopted by DDA usually begins with a summary of the main agricultural opportunities and constraints in the region. The next step involves solicitation of appropriate enterprises. This involves (a) identifying enterprise ecologies and (b) ensuring that local farmers’ experience with the enterprises in order to estimate realistic yields and production costs, and (c) excluding enterprises that are not economically-viable. The economic assessment of suitable enterprises is normally based on a comparison of their gross margins, defined as gross income minus variable production costs. Estimated gross margins per ha or per animal unit (AU) drawn from commercial agriculture are adjusted to reflect local conditions. Although mean gross margins per ha or per AU are widely used in planning, the overall enterprise income arising from yield and price variations. Rental production costs per ha or per AU are relatively stable from year to year. Yields vary with changing enterprise combinations while rental prices vary with changes in market supply and demand. It is imperative that risk be considered in farm planning exercises because farm operators generally behave in a risk-averse manner, i.e., ceteris paribus so as to choose the risk level for a ‘safer’ farm plan with lower income variation. Variation in farm income can often be considered as a random variable with a normal distribution of the scale of risky enterprises. Although plans developed for settlement farms are based on ‘conservative’ yields and prices, risk income (capturing both variance and covariance of enterpise incomes) is normally not accounted for, and cannot be accounted for in sensitivity analyses where successive solutions are generated with different (but certain) yield and price est.

A consequence of this partial analysis is that the recommended enterprise mix may not be risk efficient in the sense that variance in the target income is minimized. Even if the recommended plans were risk efficient it may not be the one that an individual farmer would have chosen from the set of all risk efficient plans as individuals have different levels of risk aversion.

Risk-efficient farm plans can be generated using mathematical programming techniques. For the problem under study, con-

venient mathematical programming techniques to use include MOTAD (Minimization Of Total Absolute Deviations). Baumol’s L = E - β criterion (where E = expected income, β = a risk aversion coefficient and E = standard deviations of E) and Target MOTAD, a safety-first approach (Hazell and Norman, 1986). An advantage of these techniques is that they can be solved using the linear programming (LP) algorithm for which Pensoft Computer software is readily available. A disadvantage is that yield and price (or income) data recorded over at least six years are required. When these are not available for the study area, estimates can be derived from other similar regions.

Baumol’s L = E - β criterion is closely related to the MOTAD approach and enables the user to derive a farm plan that has a certain (e.g., an 85 or 95 per cent) probability of achieving a minimum income. This is considered important for the problem at hand, since the Planner needs to know with a high degree of certainty that a minimum income will be achieved in any one year. The assumption implicit in Baumol’s criterion is that a farmer wishes to maximize L (an estimate of income, an enterprise with the maximum value of E - β is selected). The expected income is equal to the weighted average of the income from all the different enterprises. For a given income distribution, the expected income is the value of income which will be exceeded 85 per cent of the time (Hazell and Nor-

ton, 1986).

This criterion was applied to data taken from a plan of a settling farm in Southern Natal. A measure value of was used as this level of risk aversion is considered appropriate for small-scale farmers. For example, Brandao, McCarrl and Scandiano (1978) measured a mean (= 0.9 for a sample of farmers in northeast Brazil while Moscaite and de Janary (1977) calculated a mean of 1.13 for farmers on the Pueblo Project in Brazil. Brandao et al. (1984) report values of 0.9 and 1.2 for landlords and farmers in Brazil.

For the farm under study, and assuming a specified net dispo-
sable income of 80000, the target or expected annual income was set at 81000, comprising 80000 disposable income, overhead costs of 8000 and loan repayments of 81000. Table 1 compares the results of two risk efficient solutions (Plans 1 and 2) with the original plan (Plan A) which did not account for risk. The objective function value for Plan 1 (R7990 = 81000 - 81000 - 81000) indicates that the income generated by Plan 1 will be exceeded 85 per cent of the time as illustrated in Figure 1. It is evident that the enterprise mix in Plan 1 is different from that of Plan A. For arable crops, the area under maize is higher while dry bean production is almost entirely on the grasslands, and the area under Kingeria is larger while Enterolobium production is lower. Kikuyu production is lower at 3.8 ha. With regard to timber enterprises, Pinus radiata (25 ha) and Eucalyptus (25 ha) are replaced by other enterprises (total 50 ha). Intensive beef production would involve 47 AU which is lower than the 65 AU recommended in Plan A. Farm size is greater at 1134 ha.

Plan 1 is risk as incomes below the target level occur 50 per cent of the time. If the Planners required that farm income should exceed the target level 85 per cent of the time (Figure 1), farm size would have to be 257.7 ha, as shown in Table 2 under Plan 2. This is clearly much smaller than the farm size originally recommended for settlement (100 ha).

It should be remembered that ’optimal’ plans could take several years to implement and that the farming years will be crucial in terms of farmer survival, especially as regards cash flows. A detailed analysis of resultant incomes is an important component of planning. However, risk-efficient farm plans should be determined first and their cash flow implications analysed after-

Table 1: Comparison of two risk-efficient plans with a plan that does not account for risk (Plan A)

<table>
<thead>
<tr>
<th>Particulars</th>
<th>Plan A</th>
<th>Risk-efficient Plan 1</th>
<th>Risk-efficient Plan 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disposable income (R)</td>
<td>81000</td>
<td>7990</td>
<td>7968</td>
</tr>
<tr>
<td>Expected income (E)</td>
<td>80000</td>
<td>7990</td>
<td>7968</td>
</tr>
<tr>
<td>Standard deviation of E (σ)</td>
<td>8200</td>
<td>1250</td>
<td>1250</td>
</tr>
<tr>
<td>Objective function (E-σ)</td>
<td>7680</td>
<td>6740</td>
<td>6740</td>
</tr>
</tbody>
</table>

Note

The authors would like to thank two anonymous referees for their useful comments.

References

BRANDAO, E, McCARRL, BA and SCHUH, GE (1984). 'Predicting the impact of new cropping practices upon subsis-
tence farming: A farm level analysis in Brazil.' Western Jour-

