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A CASE STUDY

Impact of agriculture input support programme on economic benefit in Zimbabwe

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ABSTRACT

In Zimbabwe smallholder farmers face several challenges including minimal use of necessary inputs for intensification such as fertilizer, herbicides, inadequate availability of quality seed and unstable prices. This situation leads to a dilemma where to improve on yields. If they maintain the status where little or no pesticides and fertilisers are applied some farms get little or no yields. In response, the Government of Zimbabwe, through the Ministry of Agriculture, Mechanization and Irrigation Development and its partners introduced agriculture input support programme in 2011. The objective of the study was to assess the impact of the agriculture input support programme on economic welfare of the society. Both primary and secondary data were used in this study. Primary data were collected through administration of structured questionnaire to estimate production cost per hectare. The sampling frame was provided by Ministry of Agriculture. A sample size of 120 farmers was interviewed. The economic surplus method was employed to evaluate the impact of the agriculture input support programme. The results showed that tomato production had increased from an average of 18700 kg per hectare to 23700 kg per hectare. Change in quantity due to the input programme was approximately 5.8 per cent of the observed quantity. The estimated total surplus for the pivotal supply shift was about $1418.31 while $2925.51 was the approximated amount for a parallel shift. This shows that the programme has the potential to enable graduation of smallholder farmers from one socio-economic group to the next better group. The Government of Zimbabwe can intensify training and raising awareness of the programme among beneficiaries to increase the productivity. It is therefore vital that more funds should be allocated to the programme.

KEY WORDS : Economic benefit, Impact, Tomatoes, Input support programme

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The Zimbabwe government's fast track land reform programme commenced in 2000 which resulted in the dismantling of the economically important large-scale commercial farming industry. As a result of structural changes in the sector, the economic crisis of the past decade and recent droughts, Zimbabwe's agricultural sector has declined precipitously and the country is no longer food self-sufficient. National productivity decreased to a fraction of what it was at the turn of the century which has had a debilitating effect on the nation's economy. The service industry that once supported the farming sector has been seriously compromised resulting in hardships for smallholder farmers who relied on those services. At the height of the economic crisis in 2008, large-scale input providers ceased operation and many smallholder farmers reduced or stopped production exclusively. These smallholder farmers face several challenges including minimal use of necessary inputs for intensification e.g. fertilizer, herbicides, unavailability of quality seed and unstable output prices. This situation leads to a dilemma

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where to improve on yields. If they could maintain the status where little or no pesticides and fertilisers are applied some farms get little or no yields. Increase in pesticide and fertiliser use can lead to an increase in yields that can provide several benefits, including welfare gains to both smallholder farmers and consumers.

Access to input is perceived as one of the solutions to the problems of the smallholder farmers. In response, the Government of Zimbabwe, through the Ministry of Agriculture, Mechanization and Irrigation Development (MoAMID) introduced Agriculture Input Support Programme in 2011. The programme is being implemented by MoAMID, various implementing partners, technical providers and agro-dealers. The overall objective of the agriculture input support programme is to increase the production and productivity of smallholder farmers in Zimbabwe, improve food security, livelihoods and on farm incomes. Farmers benefit from accessing inputs, extension support and training on improved farming practices and technologies. The availability of quality seeds and other inputs helps smallholder farmers to boost agricultural production and incomes. The government of Zimbabwe perceive the programme as an innovative approach that puts farmers in the driver's seat to move agriculture forward in Zimbabwe. More specifically the objectives of the programme are to target surplus production beyond household food security requirements, enable graduation from one socio-economic group to the next, decrease dependency on annual input support programmes and ensure efficiency of inputs use (Government of Zimbabwe, 2011). The study aims to assess one of its objectives which, is graduation of society from one socio-economic group to the next by estimating the impact made by the programme on economic welfare of the society in year 2012.

The agriculture input support programme aims to increase production and productivity of smallholder farmers ensuring surplus production beyond household food security requirements by providing farmers with access to agricultural inputs using electronic voucher mechanisms (e-voucher), providing farmers with extension support to ensure increased agricultural productivity and optimum use of inputs, supporting farmers with quality inputs and linking farmers with private sector companies in order to access output markets and to access credit facilities. The electronic cards are open, allowing farmers the option to purchase agricultural inputs classified according to four broad categories which are as follows: quality seeds, fertilizers and lime, agro-chemicals and implements and spare parts for farming equipment. Necessary security is associated with the electronic card, such as the farmer's name, National Identity number (ID), gender, etc. to ensure that only the intended beneficiaries are able to redeem inputs using the cards. The cards are also protected by a pin number. When lost or stolen, the beneficiary will inform the implementing partner, who will contact MoAMID. MoAMID will then contact the technical partner so the card is stopped and a replacement issued. In order to ensure that inputs are readily available at the agro-dealer outlets at the required time, wholesalers are sensitised to the voucher programme. They are informed of the amount of the agricultural inputs required so that appropriate distribution arrangements can be made with local agro-dealers (Government of Zimbabwe, 2011).

During beneficiary selection, bias is minimised by establishing a team comprising FAO, MoAMID and local leaders to select beneficiaries in accordance with set criteria. The programme targets communal farmers, old resettlement farmers and small-scale commercial farmers. Zimbabwe is estimated to have about 1 524 396 smallholder farmers broken down as follows, 1 403 651 communal farmers, 107 625 old resettlement farmers and 23 120 small-scale commercial farmers (Government of Zimbabwe, 2012). The programme is supporting at least 870,000 smallholder farmers. Four broad categories of rural households have been identified.

Farmers receive vouchers worth USD 400, redeemable at contracted private companies or agro-dealers (based on contractual agreements with the private sector). This empowers farmers to choose the agricultural inputs they need. Agro-dealers provide invoices to participating farmers as evidence of sale and for record keeping. For each purchase made, 10 per cent of the value of the purchase would be paid for in cash by the farmer to the agro-dealer. Farmers make a 100 per cent repayment on the value of the inputs received at interest free and the support is also based on credit guarantees enabling private sector to support smallholder farmers at reasonable costs, extension support, farmers' capacity building and contracting support. These programmes implemented with the aim to link smallholder farmers to markets and enable them to generate surplus production and income from cash crop sales.

The e-voucher procurement team carries out additional spot checks on the agricultural inputs held by the agro-dealers twice a month. To ensure that comparable prices are maintained during implementation. These prices are shared with MoAMID, the implementing partner and the beneficiaries. The team also collects additional samples during the spot checks to ensure that specifications of improved varieties are consistent with those verified at the beginning of the programme. Agro-dealers that are found not to have inputs conforming to input scheme standards will be instantly disqualified from the programme.

The scheme receives financial and technical support from the UK's Department for International Development (DfID), the Australian Agency for International Development

(AusAID), the European Union and Zimbabwe's agriculture ministry. MoAMID opened a client account with the selected technical provider of the system. This allows for instant payment to the agro-dealer from whom the inputs are being purchased.

According to Government of Zimbabwe (2012), the agriculture input support programme has its own constraints, including the lack of collateral security among agro-dealers, resulting in reluctance by suppliers to supply in bulk, and a tendency among dealers to hike prices of inputs and tools. Beneficiaries also sometimes fail to get their inputs because they have poorly handled and damaged their e-voucher cards or because they have lost their identity information. However, the agriculture input support programme has proved to be successful in irrigable crops as evidenced by increase in output (Government of Zimbabwe, 2012).

The tomato crop as a superlative cash crop for smallholder farmers in Zimbabwe benefited from the agriculture input support programme. The input scheme is perceived as a real big push-start to get going for smallholder tomato producers as many of the inputs available in the market are imported; hence, expensive to small-scale and resource-poor farmers. The farmers, therefore, resort to retained seeds and untimely application of fertilisers and chemicals below recommended amounts or producing without applying fertilisers and chemicals. According to Government of Zimbabwe (2012) as a result of the programme tomato production system has seen a tremendous growth in the use of the fertiliser and herbicides to control pests and diseases. Smallholder tomato producers are now using high-yield crop varieties called rodade, chemical fertilizers, irrigation and application of other modern agricultural techniques. This has served as a relief for tomato growers who were hitherto plagued with poor soils and an acute pests and disease problem in their tomato fields. The increase in production and good quality of tomatoes was evidenced in 2012/13 season. This study focuses on tomatoes. Zimbabwe is now used as an example for the programme in other countries such as Malawi and Zambia. However, there is no empirical evidence to show the impact of the programme on welfare of the society. This study aims at contributing to a better understanding of the impact of the programme on total economic surplus by assessing tomato subsector as it shows positive signs of the programme. Thus, the research assesses the impact of the input support programme on economic benefits of the society contributed by tomato subsector. There is need to estimate the economic benefits in relation to associated costs. Without clear demonstrations of its benefits, farmer participation in the programme is unlikely to attract the sustained resource allocation it needs to be sustained. This economic assessment generates information useful for directing the future planning and development of input support programme.

METHODOLOGY

Both primary and secondary data were used in this study. Primary data were collected through administration of structured questionnaire. The primary data were collected from beneficiary of the programme and non-beneficiaries to compare the cost of production per hectare between non-beneficiaries and beneficiaries. Multi-stage random sampling technique was adopted for smallholder tomato producers. Mashonaland East province was purposively selected because of high tomato production in the province. The sampling frame was provided by Ministry of Agriculture. In the first stage, tomato growing districts were identified. Out of eight districts, six districts constituted sampling frame. Three districts were randomly chosen for the study. In the second stage, villages were listed considering production of tomatoes. In the third stage, proportional stratified random sampling technique was used to select the smallholder farmers from villages. Households were random proportionally selected from the chosen villages. A sample size of 120 farmers was interviewed. Economic surplus methods were employed for assessing impact of the input programme.

A number of methods including the econometric approach and programming techniques have been used to conduct impact assessment in many *ex-post* studies. However, this study's choice of methodology stems from the fact that the economic surplus approach requires the least data, is relatively easier to use and yields reliable results. The economic surplus method provides a relatively simple, flexible approach to investigating the value of adopting new technologies by allowing for the comparison of the results of situations with and without the use of the new technology. This allows for the comparison of economic surpluses for the community for a situation where a new technology is used and one where a new technology is not used. However, it is worth noting that a few shortcomings have been identified with the economic surplus method (Alston *et al.*, 1995). For example, it has been criticized for: (i) involving implicit value judgments in the process of estimating research benefits and costs; (ii) ignoring transactions cost that arise due to asset fixity (sunk-cost).

Comparisons of the situation before and after programme may be interesting, but they cannot be considered to be valid economic impact assessments as some conditions are constantly changing and can be very misleading. The *ex post* with and without approach was used in this study. Both beneficiaries of the programme and non-beneficiaries were selected in order to compare the production cost per hectare. Thus, in this study, an impact assessment was based on

carefully constructed scenarios of the situations with and without participating in the input programme.

The study assumes models that correspond to a snapshot of one season benefits. Tomatoes are grown throughout the year in the country thus year 2012 was selected for study. This study follows the Alston *et al*. (1995) model and assumes a shift of the supply curve following agriculture input support programme due to adoption of new technology supplied by the government and its partners. It is also assumed that the functional form of the supply curve is unknown. Voon and Edwards (1992) suggested that when the functional forms of the supply and demand curves are unknown, they can be approximated by linear functions. Alston (1995) also showed that especially with parallel shifts, the choice of the functional form has little effect on either the size or distribution of benefits and hence is relatively unimportant.

Basing on economic theory, the study appeals to the intuitive notion that agriculture input support programme causes farmers to adopt the new technology which is either cost-reducing or yield-enhancing generating a rightward shift of the supply curve. As described by Norton *et al.* (1987), the adoption of a new technology generates a rightward shift of the supply curve because of increased output and/or decreased cost. The supply shift may be either parallel or pivotal. Both of these two cases are considered in this study. Another assumption is that there is geographic homogeneity regarding prices, elasticities and the adoption process of the agriculture input support programme. The study assumes a closed economy.

Estimates of tomato supply and demand elasticities were found in the literature. Two different estimates of the supply elasticity for tomato were 0.488 and 0.4 and demand elasticity for tomato was -0.68 (Government of Zimbabwe, 2012). In the case of supply elasticities the first estimate is used in the analysis on the basis of the argument given by in the literature. Alston *et al.* (1995) explained that the choice of a linear supply curve generates an over-estimation of the supply shift and research benefits when supply is inelastic. This over-estimation can be corrected by choosing the highest supply elasticity estimate such that the gross cost reduction per unit of output ÄQ/åQ is adjusted downward and hence the supply shift and research benefits are lowered as well.

This study adopts the following computations as they were used by Masters *et al.* (1996):

$$j = aQ(kg/ha) \times t / Q(kg/ha)$$

where,

j is the proportional shift in production induced by the new technology, as a proportion of total production, ΔQ is the yield change induced by input support programme expressed in terms of physical units (kg/ha), *t* is the adoption rate *(t)*, expressed as the proportion of total area under the inputs acquired through input scheme programme to total area under tomato production in Mashonaland East Province and Q represents the overall tomato yield expressed as Q = Y/A. A is total hectares planted to the crop and Y is total production.

$$c = \frac{\Delta C x t}{Q x P}$$

c = Adoption costs of the new technology, as a proportion of the product price

ΔC: Input cost difference between new and old technology ($/ha)

P: Average product price paid to producers in real terms ($/kg)

k = (j/ε) – c.

where,

k is the vertical shift in supply and ε is elasticity of supply.

==a*Q*=*Q*¦£**k**LE¦H£FI

where,

Δ*Q* is change in the equilibrium quantity produced induced by the new technology and η = is absolute value of elasticity of demand.

The economic benefit in 2012/13 season is estimated as equal to the product of the k parameter, the producer price and the quantity produced minus one half of the product of k, P and the change in equilibrium quantity. Following Masters *et al*. (1996), the annual change in total surplus (TS) and can be calculated as shown below. The second term has been subtracted because this is an *ex-post* study, examining the impact of technologies which have already been adopted by some producers:

a**TS** = ***PQk - 1/2 kP***a***Q*** (parallel shift)

a**TS** = ***1/2 (PQk -kP***a***Q)*** (pivotal shift)

where,

P and Q are initial equilibrium price and quantity, and k is the vertical shift in supply, expressed as a proportion of the initial price, and ΔTS is change in total surplus which is the sum of change in producer surplus and consumer surplus.

ANALYSIS AND DISCUSSION

The summary data for benefit assessment is given below: total tomato production of tomatoes in Mashonaland East province was 67 840 tonnes, recoded under the agriculture input support programme was 37 920 tonnes, total area 3200 hectares, area under agriculture input support programme was 1600 hectares. The production cost per hectare increased by $1250 due to adoption of new technology offered by the programme. The production of

tomatoes has increased to 23700 kg per ha from 18700 kg per ha. The average price of tomatoes fell from US$ 0.74 to US$ 0.45 in the most parts of the country in 2012 (Zimstat, 2013).

The estimated change in production due to contract farming, as a proportion of total production was (j) 0.133. The production has increased by 133 per cent due to input programme. The estimated adoption costs of the new technology, as a proportion of the product price was (c) 0.0742. In this case the study estimated a production cost increase of 7.4 per cent to obtain the production gain of 13 per cent calculated above. Clearly this is a profitable input programme. The estimated k value was 0.0623. The k parameter may be defined as the net reduction in production costs induced by the new technology, combining the effects of increased productivity and adoption costs. The net reduction in production costs as a proportion of the product price. In this case, the combination of 13.3 per cent production increase and a 7.4 per cent cost increase served to shift the supply curve by 21.5 per cent. This formulation shows clearly that due to water scarcity in the country, smallholder farmers can not expand land under production, thus supply is inelastic (is less than 1). In this case the elasticity amplifies the k-parameter (k> j-c). Thus, a given yield increase caused by input programme has a relatively high economic value.

The total change in equilibrium quantity of tomatoes caused by technology from input support programme was 1102.82 tonnes. The increase in equilibrium quantity from input programme was approximately 5.9 per cent of the observed quantity. According to Master *et al.* (1996) this is a relatively small number, because the demand elasticity is small. However, Master *et al.* (1996) indicated that if the percentage is small but coupled with fall of consumer price, the technology can have large economic effect. Since there is fall in consumer price, the input programme could have a very large economic value. It was realised that for a parallel shift the increase in total surplus was about $2925.51 while $1418.31 was the estimated amount for a pivotal shift. The estimated total surplus for the pivotal supply shift was about half that of the parallel shift. The input programme has the potential save the community since the estimated total surpluses are positive. However, the estimated total surpluses are small. The reason could be that this is a snapshot of one sub sector in season and the programme is still at infant stage. Higher adoption rates can generate more total surplus.

Conclusion:

It was realised that for a parallel shift the increase in total surplus was about $2925.51 while $1418.31 was the estimated amount for a pivotal shift. This showed that the programme has the potential to enable graduation of smallholder farmers from one socio-economic group to the next better group. The Government of Zimbabwe can intensify training and raising awareness of the programme among beneficiaries. It is therefore vital that more funds should be allocated to the programme.

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