

Full Length Research Paper

Consulting the stakeholders on pro-poor market segmentation of maize seed in Kenya

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Market segmentation, while popular in the pharmaceutical industry to reach the poor in developing-countries markets, have so far not been successful in delivering agricultural technology to poor farmers. In this paper, their potential use in Kenya is analyzed, based on information gathered through an extensive stakeholder consultation. Results show that some market segmentation methods are used. Seed companies, some non-governmental and public extension organizations sell smaller seed packages and starter kits, and provide discounts for low-income clients. Stakeholders expressed a strong interest in larger-scale market segmentation mechanisms for maize seed and fertilizers, in areas where levels of maize production and densities of the rural populace are high. Several challenges remain: direct price discounts to low-income clients were not appreciated, stakeholders preferred mechanisms that allow farmers' to choose their preferred inputs such as maize varieties, and segmentation based on geography or technology were considered impractical since the poor and non-poor live in the same areas and use similar technology. A voucher-based approach was generally preferred, with a discount of about 50% on quantities of about 8 kg per farmer, with beneficiary targeting through direct identification or tiered pricing. A pilot study was proposed to study costs and benefits of the two market segmentation approaches in distributing maize seed, and to determine optimal discount values and quantities.

Key words: Market segmentation, maize, poverty, humanitarian use exemption.

INTRODUCTION

Sub-Saharan Africa is the only region in the world where the number and proportion of malnourished children is increasing (Rosegrant et al., 2001). Efforts to lift large numbers of the rural populace out of poverty will depend on their ability to access and apply new agricultural technology (Barrett, 2008). Access to these technologies will depend on the introduction of incentive mechanism that make private investment in agricultural research profitable and sustainable (Naseem et al., 2006). This is particularly relevant with respect to maize, the major food crop in Eastern and Southern Africa.

In Kenya, maize yields increased from 1 to 1.5 tons/ha in the 1960s and 1970s, resulting from successful breeding and extension programs (Harrison, 1970; Hassan et al., 2001) that lead to the widespread adoption of maize hybrids and fertilizer (Gerhart, 1975). Unfortunately, yields have stagnated since the mid-1980s and the maize area also remained constant (FAOSTAT, 2010), while the population is increasing rapidly at 2.9% annually (CBS, 2001), resulting in a similar decrease of per capita maize production. While the human consumption of maize is currently estimated at 95 kg/ person/year (Pingali, 2001), the average production per person over the last 10 years has been less than 80 kg/person/year, requiring average maize imports of 260,000 tons per year (1992-2007) (FAOSTAT, 2010).

Maize breeders, both public and private, develop new

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maize varieties to boost yields and output, but only small amounts reach the small-scale, resource-poor farmers due to weak purchasing power, limited market access, and other constraints. Innovative market incentives and other supporting mechanisms are therefore needed.

One of these mechanisms is market segmentation, whereby royalties for intellectual property rights (IPR) are waived for the poor. These have been called humanitarian use technology transfer (HUTT) (Lybbert, 2002), humanitarian access to innovation (Brewster et al., 2005), or humanitarian use exemption (HUE) (Hansen, 2004). HUEs in the pharmaceutical industry have been particularly successful. Companies have allowed the license-free production and distribution of their drugs against HIV/AIDS and tuberculosis in developing countries, substantially reducing costs and increasing their availability to the poor (Lybbert, 2002).

For IPR holders, the license-free product needs to be efficiently targeted at the poor and its distribution should have limited effect on the increased profit of markets. Therefore, the market needs to be segmented between poor and non-poor with reasonable precision and affordable administrative costs. This is relatively easy in the pharmaceutical industry, where license-free drugs can be provided in targeted countries with a limited market for expensive drugs, or the production of license-free generic drugs, while royalties are charged for branded products in an attempt to target higher income groups.

In agriculture, however, market segmentation is much more difficult. Many developing countries have commercial farmers alongside subsistence farmers, in the same areas and using similar technology. Several HUEs for agriculture have been developed, but none is currently operational for a major crop. For Golden Rice, genetically modified to contain high levels of vitamin A, agreements have been made but the product is not yet in the market (Brewster et al., 2005). Similarly, genes for the GM virus-resistant sweet potato were provided under a HUE to Kenya, but the genes were not effective against the local strain (Qaim, 2001). Papaya has benefited from HUEs in Southeast Asia (Lybbert, 2002), but this fruit is not a major food staple.

In India, an agreement was reached for a HUE allowing public institutes to develop Bt open-pollinated eggplant varieties (Kolady and Lesser, 2006), but the project suffered from a moratorium on GM crops. More recently, private companies have agreed to forgo IPR on GM maize for the Water Efficient Maize for Africa (WEMA) project to develop drought tolerant varieties, and the Improved Maize for African Soils (IMAS) project to develop nitrogen efficient varieties, but these products will take many years to develop.

Apart from HUEs, many governments, including Kenya, have reintroduced agricultural input subsidies. A recent review of maize technology and policies in Africa concluded that such subsidies have their merits, but can "crowd out" the private sector (Smale et al., 2011). The

largest program is in Malawi (Denning et al., 2009), where 65% of rural households received subsidies in 2008/2009. Plot-level data indicate that the program significantly increased maize yields (Holden and Lunduka, 2010b) and generated a positive, but modest benefit-cost ratio (Dorward and Chirwa, 2011). However, there is no clear effect on food security (Dorward and Chirwa, 2011) and little enduring effect on income or wealth (Ricker-Gilbert et al., 2011). Targeting has been problematic, with female-headed and poorer households less likely to receive the vouchers (Holden and Lunduka, 2010a), leading to crowding out or displacement. The overall displacement rate of commercial fertilizer by subsidized fertilizer is estimated at 29%, but considerably lower among the poorer farmers (Ricker-Gilbert et al., 2011). In a similar program in Zambia, the general displacement rate was estimated at 8%, but much higher (88%) where the private sector was already active (Xu et al., 2009). Finally, these programs are very expensive and might not be sustainable. The costs of the Malawi program reached 72% of the total budget of the Ministry of Agriculture, and 16% of the national budget (Smale et al., 2011).

To shed more light on the possibilities of market segmentation and subsidies for maize seed in Kenya and to develop a pilot project, the International Maize and Wheat Improvement Center (CIMMYT), the International Food Policy Research Institute (IFPRI), and the United States Agency project for International Development (USAID) initiated a collaborative research. The project's aim was to conduct a wide consultation to:

- 1) Subject the results of the preliminary analysis to a critical review by stakeholders
- 2) Learn from their experience and
- 3) Develop a consensus for a pilot project to test promising market segmentation approach.

METHODOLOGY

The stakeholder consultation was organized in 2008 by CIMMYT, USAID, IFPRI, and the Seed Trade Association of Kenya (STAK). First, nine key stakeholders were selected from the different sectors, based on their knowledge and importance, drawn from seed companies, input traders, NGOs active in food and seed distributions, and research. Each of these stakeholders was visited individually to discuss their experience with market segmentation and to capture their suggestions.

A formal meeting was called on June 26, 2008 in Nairobi, to which a wide range of stakeholders was invited. These included all maize seed companies, all international NGOs working in seed distribution, known farmer and agro-dealer associations, and all known researchers working in this field. The meeting was attended by 39 stakeholders, including representatives from the seed sector, the NGO community, the Ministry of Agriculture, agro-dealers, and researchers.

The meeting started with background presentations on the support for marketing research in agriculture (by USAID), seed markets in Africa (STAK), public goods and private investments in these markets (IFPRI), and a preliminary analysis of pro-poor seed market segmentation (CIMMYT). A second set of presentations

covered the experience in Kenya, in particular, the National Accelerated Agricultural Inputs Access Program (NAAIAP) (Ministry of Agriculture), market-based vouchers (Catholic Relief Services), and the results of the individual consultations with stakeholders (USAID).

The formal presentations were followed by two group exercises. First, all participating stakeholders were invited to present their experience with providing seed and other technology to the poor at reduced cost. Seven seed companies, two agro-dealers, five NGOs, and four institutes dealing with research, regulation or support made contributions.

Then, a participatory group exercise was conducted to design a market segmentation pilot to test the different options, with key questions:

- 1) Who are the poor?
- 2) How do we identify them?
- 3) What is the product offered?
- 4) Which geographical region should we target and
- 5) How do we organize this pilot?

Finally, participants were asked to fill in a questionnaire, in which 18 responses were received from NGOs (39%), seed companies (33%), agricultural extension (17%) and research (11%). Respondents included all major maize seed companies, all major NGOs involved in seed distribution, and the Ministry of Agriculture.

RESULTS

Options for market segmentation (presentation by the scientists)

The preliminary analysis was first presented. To segment the market, the poor need to be identified, directly or indirectly (Lybbert, 2002). Direct identification requires the establishment of poverty criteria and identification through surveys or through expert opinion. Indirect identification can be realized through geographical targeting, self-selection by targeting farmers who use particular technology (seed package size or varieties) or indirect identification through tiered pricing (each farmer can only buy a certain amount at the reduced price). The study concluded that indirect identification of the poor in Kenya is difficult since poor farmers live in the same areas and use similar technology as the non-poor (De Groote et al., 2011). Targeting low potential areas was also found problematic because of their low population density and the low amounts of maize they produce (Figure 1). Therefore, the two potential options for pro-poor seed market segmentation in Kenya are direct targeting and tiered pricing.

Experience with market segmentation (presentations by participants)

Stakeholders' presentations revealed that many organizations in Kenya are involved in supplying inputs at reduced cost to the poor. They mostly use direct identification, often in a community-level exercise or through

third parties such as schools. The cost of such exercise seems high, although no data or analysis on cost and efficiency are available, and the accuracy of the targeting has not been measured.

The government of Kenya has a longtime experience with providing food aid to the poor, usually through direct identification by government officials. In 2007, the Ministry of Agriculture and the National Accelerated Agricultural Inputs Access Program (NAAIAP) launched an ambitious program to reach 2.5 million farmers. Small input grants (KShs7000) have been provided for poor farmers (with less than 2.5 acres) to cover one acre of land with the inputs of their choice. Grants have been administered through vouchers, issued by a district stakeholder forum, with a group guarantee, and used to purchase inputs from accredited and trained agro-dealers. Agro-dealers redeemed the vouchers from a contracted bank. After two seasons, beneficiaries will graduate to the next level, where they will receive basic inputs at cost, but with subsidized credit.

The NGOs engage in a wide range of activities, including food relief and increasing farmer productivity. Vouchers which are transparent and convenient, are used to provide inputs (especially seed and fertilizer), and are usually sent to poor beneficiaries. Catholic relief services (CRS) has developed a widely used and accepted voucher-based intervention system (Remington et al., 2002; Sperling et al., 2004). It can be used where markets are functioning or easily stimulated. Most NGOs use participatory, community-based beneficiary identification. CRS and other NGOs often use the voucher approach during seed fairs, but also through accredited agro-dealers.

Seed companies have extensive experience in market segmentation, including international markets. In Kenya, several companies reported reduce prices for farmers in low potential areas. Most have used vouchers and provided emergency seed relief. Some provide seed for open pollinated varieties (OPVs) at a lower price, several others give credit to the agro-dealers, to be passed on to farmers. Many companies organize demonstrations while some provide small seed packages for try-outs. One international company had an explicit market segmentation strategy (although not in Kenya), based on geography, price and product and provides a choice between high-end and other products. Seed companies active in Malawi pointed out that input subsidy through vouchers resulted in massive improvement in maize production through subsidized inputs.

All participating agro-dealers have worked with NAAIAP to provide seed and fertilizer with vouchers to the poor and to internally displaced people. They often observe a lack of knowledge by farmers on where and at what time and which varieties should be planted. None of the participants had experience with tiered pricing, although most persons found it an interesting concept, and consider it worth pursuing.

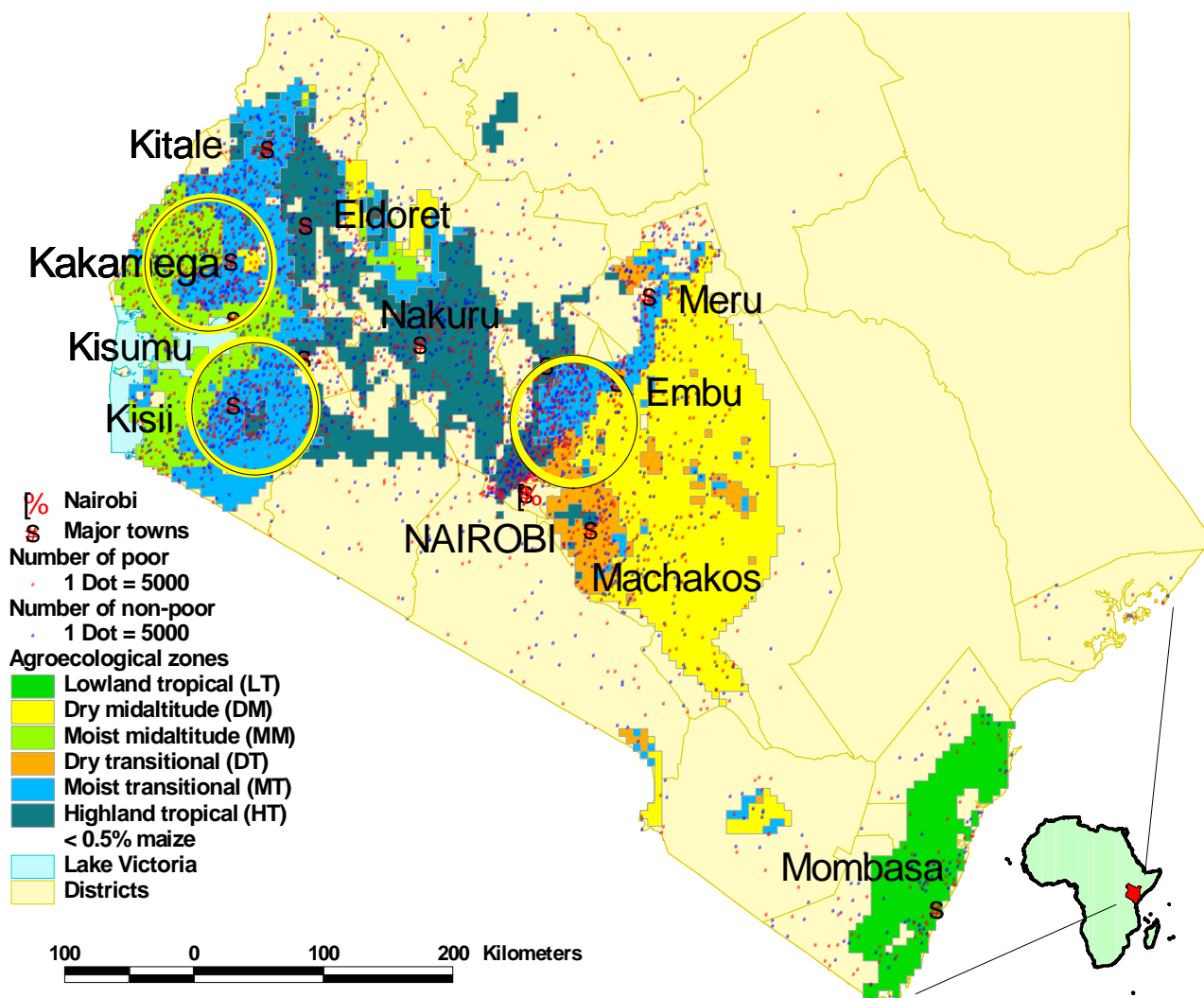


Figure 1. Poverty map and agro-ecological zones in Kenya, circles indicating zones with high density of poor people.

Stakeholders' opinion on market segmentation (group discussion)

All participants agreed that maize seed is a top priority for Kenyan farmers, although most would prefer to include fertilizer in a market segmentation program. Farmers need to be trained to improve their input use and to deal with credit. The right seed package size would also help. Farmers should be allowed to choose their varieties in the program. The project should target areas with high numbers of poor rural populace, with high maize production and with high population density while some favor marginal areas are less interesting to seed companies. Respondents agree that market segmentation by district is not practical.

All participants were in favor of the voucher approach. Seed companies prefer it to the tender system, where companies have to submit bids, or free hand-outs. Many

participants, however, pointed out the weaknesses of and problems with the voucher mechanisms. Seed companies had noticed major leakages to the non-poor, the limited number of participating suppliers in some programs, and the lack of timely information necessary for companies to plan their production and distribution. Many participants have observed the sale of vouchers at reduced prices in secondary markets, and many mentioned the lack of monitoring and evaluation, and the need for impact assessment.

Agro dealers also like the voucher systems, prefer cash-based vouchers to product-based vouchers. Several participants pointed out that agro dealers need sufficient capacity to redeem substantial numbers of vouchers, but the system needs an independent financial organization for efficient and quick redemption of the vouchers. Several seed companies expressed a preference for direct identification of the poor. Several of

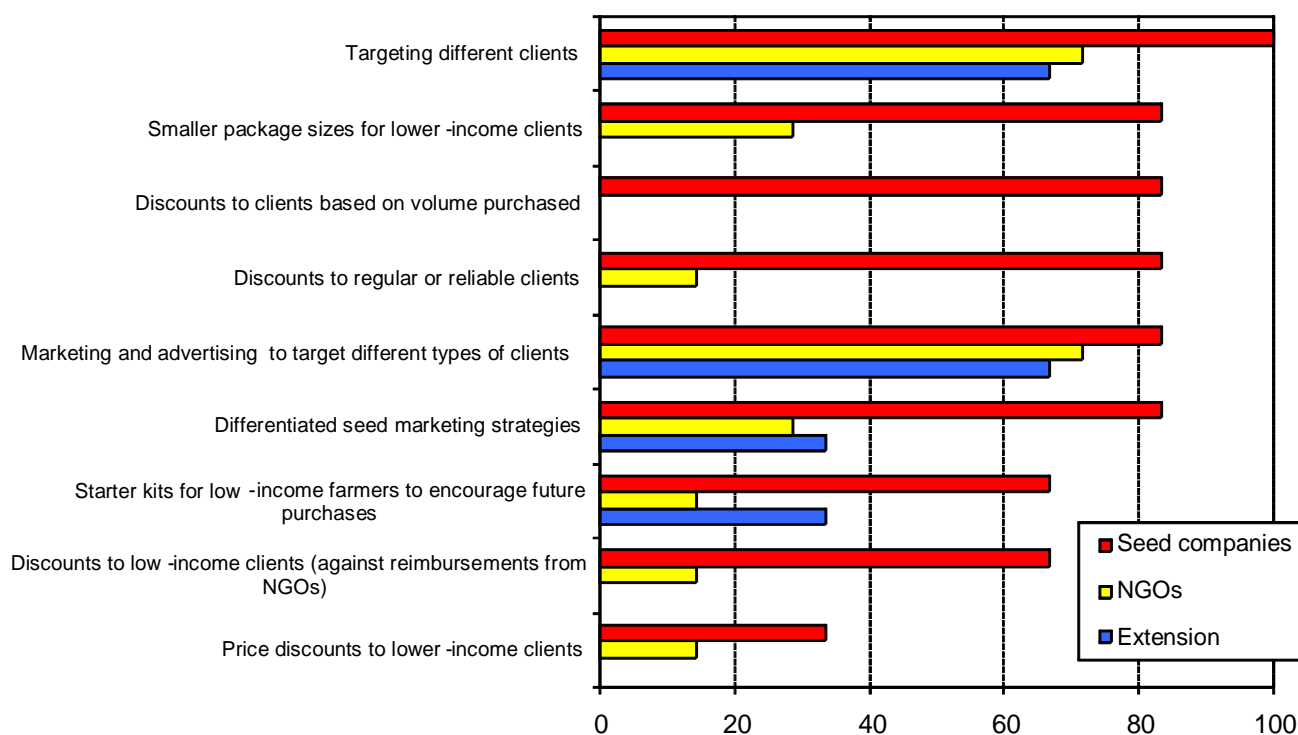


Figure 2. Strategies of market differentiation used by respondents (in % by affiliation).

them expressed an interest in the tiered price system, although they would prefer that a time limit exist, until farmers were familiar with the technology and the benefits it accrued.

Participating scientists generally acknowledged the lack of research in the field, and the need to estimate costs and benefits of different systems. Research should pay attention to appropriate experimental design, and in particular, include different discount levels, different amounts of the inputs provided at reduced costs, and the level and type of information provided.

Expert opinion survey

The formal survey provided insights on the experience and opinion of 18 respondents. Although the number is small, the respondents represent all major maize seed companies (6 respondents), the major NGOs (7) and the Ministry of Agriculture (3) (the total of the respondents does not correspond to the 18 stated). They are responsible for most maize seed sold or distributed.

Results showed major differences in market segmentation strategies (Figure 2). The seed companies used many different strategies: most (80%) targeted different clients, marketed smaller packages of seed for low-income clients, gave discounts to regular clients based on volume, and used differentiated seed marketing

strategies. Two thirds used starter kits, as well as discounts for low-income clients for reimbursements by NGOs or projects. Only one third offered direct price discounts to low-income clients.

NGOs used similar strategies, but few of them did so. Two thirds targeted different clients, in particular, through marketing and advertising. Smaller packages were used by a third, as were differentiated as seed marketing strategies. Of the three extension officers, two used the same strategies as the NGOs: targeting and marketing, one used differentiated seed marketing strategies, and one starter kits.

All seed companies and most other respondents consider starter kits and smaller packages as very effective strategies. Respondents from NGOs think marketing and advertising are very effective, while only half of the other respondents consider them somewhat effective. Price discounts for lower-income clients or beneficiaries are considered very effective by a slight majority and somewhat effective by the others. All respondents from seed companies consider discounts to regular or reliable clients as only somewhat effective, while their opinion on discounts based on volume range from not being effective to very effective.

Respondents most commonly identified the poor based on information provided by the local administration or district development officers, or through a community-based exercise (Figure 3). Other methods were based on

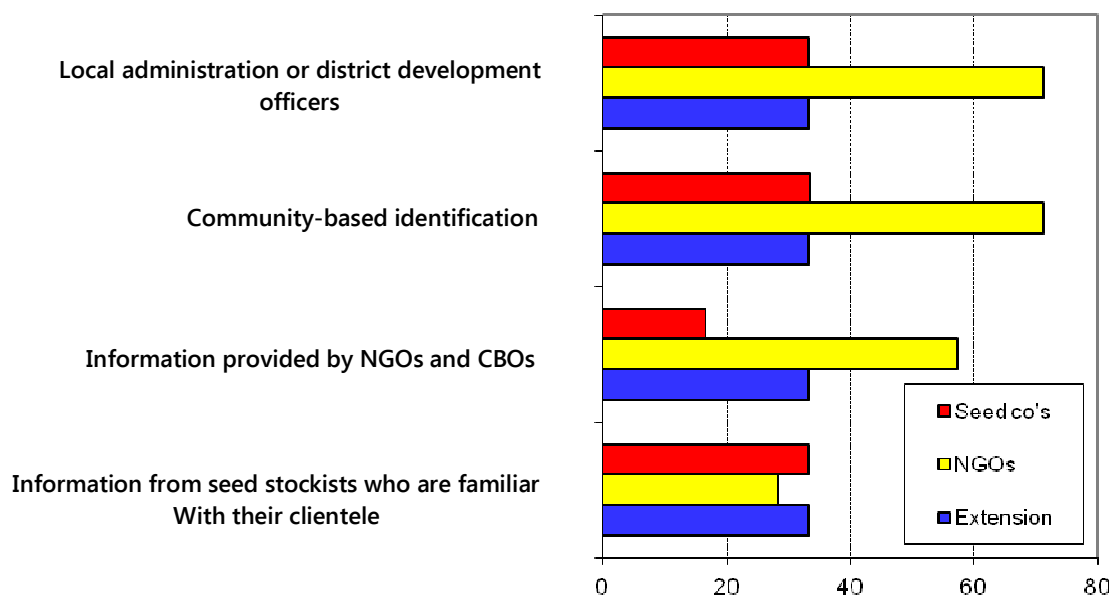


Figure 3. Methods of identification of the poor used by respondents (in % of respondents).

information from NGOs and community-based organizations (CBOs), or from agro-dealers.

More than half of the respondents consider identification of the poor by local administration not or only somewhat effective. Community-based identification, on the other hand, was considered very effective by two thirds of the respondents. Identification based on information from NGOs and CBOs received mixed reviews, while information from the agro-dealers was generally considered only somewhat effective.

Most respondents, especially seed companies and extension officers, considered the sale of seed in small packages to be the best way of providing improved seed to the poor; NGOs were less enthusiastic and the researchers were not convinced. Direct distribution of subsidized seed was the second most appreciated strategy: more than half of the respondents thought it is very or extremely effective. A slight minority (38%) thought that sales at a discount are a very effective strategy, while a large majority considered direct distribution of free seed as not effective or only somewhat effective.

Respondents recommended a wide range of discounts for seed to be offered to poor farmers, from 10 to 100% (average 47%). Seed companies generally recommended higher discounts (57%) than NGOs (38%). Similarly, recommended quantities of subsidized seed per farmer ranged: from 2 to 10 kg (average 8 kg), with three quarters of respondents favoring 10 kg.

CONCLUSION

Most stakeholders consulted are in favor of developing a

pro-poor market segmentation program for maize seed in Kenya. Two market segmentation strategies are considered viable: direct targeting, likely expensive but with limited leakage, and tiered pricing, likely much cheaper but with higher leakage and requiring an arbitration mechanism to avoid people coming back for a second tier. The target group should be the rural poor, those who have insufficient land and food production and cannot meet their basic needs. Vouchers are considered the best vehicle for distributing the subsidy.

Further research is needed to compare the costs and benefits of both market segmentation methods and different implementation options. Respondents are positive about a pilot project to address these issues. Its main product should be maize seed at reduced prices, up to a given quantity per farmer. The study should determine optimal discount rates, and amounts of seed to be provided at a discount.

The main tool for the pilot study would be cash vouchers, to be distributed by an independent agency to beneficiaries identified directly or through tiered pricing, each receiving vouchers for a specified amount. The vouchers would be used by the beneficiaries in the regular distribution network of agro dealers, who will redeem their vouchers at an independent financial institution.

The pilot study should use a community-based, participatory approach for direct identification of the beneficiary, and a farmer identification system based on national ID cards for the tiered pricing. The pilot study should focus on the areas with high potential impact - those with a high density of poor people. The pilot study should include a strong monitoring and evaluation component, with an appropriate experimental design. The

costs should include both administrative and leakage costs, while the benefits should include the number of the poor reached, the change in their use of improved seed, and the effect of that seed on their livelihoods.

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REFERENCES

- Barrett CB (2008). Smallholder market participation: Concepts and evidence from eastern and southern Africa. *Food Policy*, 33, 299-317.
- Brewster AL, Chapman AR, Hansen SA (2005). Facilitating Humanitarian Access to Pharmaceutical and Agricultural Innovation Science and Intellectual Property in the Public Interest (SIPPI), American Association for the Advancement of Science, Washington, DC.
- CBS (2001). 1999 Population and Housing Census. Volume 1. Population Distribution by Administrative Areas and Urban Central Bureau of Statistics (CBS), Ministry of Planning and National Development, Nairobi, Kenya.
- De Groote H, Hall MD, Spielman DJ, Mugo SN, Andam K, Munyua BG, Banziger M (2011). Options for pro-poor maize seed market segmentation in Kenya. *Afri. J. Biotech.*, 10, 4699-4712.
- Denning G, Kabambe P, Sanchez P, Malik A, Flor R, Harawa R, Nkhoma P, Zamba C, Banda C, Magombo C, Keating M, Wangila J, Sachs J (2009). Input Subsidies to Improve Smallholder Maize Productivity in Malawi: Toward an African Green Revolution. *PLoS Biol*, 7, e1000023.
- Dorward A, Chirwa E (2011). The Malawi agricultural input subsidy programme: 2005/06 to 2008/09. *International Journal of Agricultural Sustainability*, 9, 232-247.
- FAOSTAT (2010). Core production data, Vol. 2010.
- Gerhart J (1975). The diffusion of hybrid maize in western Kenya CIMMYT, Mexico City. p. 57.
- Hansen S (2004). Science and Intellectual Property. *Report on Science and Human Rights*, 24, 1-2.
- Harrison MN (1970). Maize improvement in East Africa. In *Crop improvement in East Africa* (ed C.L.A. Leakey), pp. 27-36. Commonwealth Agricultural Bureau, Farnham Royal.
- Hassan RM, Mulugetta M, Mwangi W (2001). Maize breeding research in eastern and southern Africa: Current status and impacts of past investments made by the public and private sectors, 1966-97 Economics Program, International Maize and Wheat Improvement Center (CIMMYT), Mexico. pp. 1966-97.
- Holden S, Lunduka R (2010a). NORAD-Project: Impacts of the Fertilizer Subsidy Program in Malawi: Targeting, Household Perceptions and Preferences. Department of Economics and Resource Management, Norwegian University of Life Sciences, Ås, Norway.
- Holden S, Lunduka R (2010b). Too Poor to be Efficient? Impacts of the targeted fertilizer subsidy program in Malawi on farm plot level input use, crop choice and land productivity. Department of Economics and Resource Management Norwegian University of Life Science, Ås, Norway.
- Kolady DE, Lesser W (2006). Who Adopts What Kind of Technologies? The Case of Bt Eggplant in India. *AgBioForum*, 9, 94-103.
- Lybbert TJ (2002). Technology Transfer for Humanitarian Use: Economic Issues and Market Segmentation Approaches. *IP Strategy Today*, 5-2002, 17-25.
- Naseem A, Omamo SW, Spielman, DJ (2006). The Private Sector in Agricultural R and D: Policies and Institutions to Foster its Growth in Developing Countries. ISNAR discussion paper no. 6. Washington, DC: IFPRI.
- Pingali PL (2001). CIMMYT 1999-2000 World Maize Facts and Trends. Meeting World Maize Needs: Technological Opportunities and Priorities for the Public Sector. CIMMYT, Mexico, D.F. pp. 267-74.
- Qaim M (2001). A prospective evaluation of biotechnology in semi-subsistence agriculture. *Agricultural Economics*, 25, 165-175.
- Remington T, Maroko J, Walsh S, Omanga P Charles E (2002). Getting off the seed-and-tools treadmill with CRS seed vouchers and fairs. *Disasters*, 26, 316-328.
- Ricker-Gilbert J, Jayne TS, Chirwa E (2011). Subsidies and Crowding Out: A Double-Hurdle Model of Fertilizer Demand in Malawi. *Am. J. Agric. Econ.*, 93, 26-42.
- Rosegrant MW, Paisner MS, Meijer S, Witcover J (2001). 2020 Global Food Outlook Trends, Alternatives, and Choices. International Food Policy Research Institute (IFPRI), Washington, D.C.
- Smale M, Byerlee D, Jayne T (2011). Maize Revolutions in Sub-Saharan Africa. Policy Research Working Paper 5659. The World Bank, Washington DC.
- Sperling L, Remington T, Haugen JM, Nagoda S, eds. (2004). Addressing Seed Security in Disaster Response: Linking Relief with Development. International Center for Tropical Agriculture, Cali, Colombia. p. 179.
- Xu Z, Burke WJ, Jayne TS, Govereh J (2009). Do input subsidy programs "crowd in" or "crowd out" commercial market development? Modeling fertilizer demand in a two-channel marketing system. *Agricultural Economics*, 40, 79-94.