

A systemic understanding of farmers engagement in market system interventions: An exploration of Katalyst's work in the maize sector in Bangladesh



Report to SDC, DFID and Danida

By

Institute of Development Studies, UK
and
Praxis

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Report authored by:

Danny Burns (IDS)
Dheeraj (Praxis India)
Mar Maestre (IDS)
Mohammad Shahid Ullah (Praxis India)

With contributions from

Elise Wach (IDS)
Sowmyaa Bhadraaj (Praxis India)
Pradeep Narayanan (Praxis India)

Stories translated from Bangla to English by Ahmed Abid, Ajmaeen Faieq, Nayeef Ahsan and Swapnil Tanzim

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Acronyms

BARCIK	Bangladesh Resource Center for Indigenous Knowledge
BRAC	Bangladesh Rural Advancement Committee
CBO	Community-based organisation
CIMMYT	International Maize and Wheat Improvement Center
DAE	Department of Agricultural Extension
Danida	Danish International Development Agency
DFID	Department for International Development
DPP	Deliberative Panel Participant
FAO	Food and Agriculture Organisation (United Nations)
FPR	Farmer peer researcher
IDS	Institute of Development Studies
KKM	Kendrio Krishok Moitree
MDG	Millennium Development Goal
NGO	Non-governmental organisation
RDRS	Rangpur Dinajpur Rural Development Society
SDC	Swiss Agency for Development and Cooperation
SDG	Sustainable Development Goal

Definitions

Types of farmer in the study

In this research we collected narratives from two groups of farmers. The first, who we are calling '**maize farmers**', were reached through the programme (Katalyst) lists. They may or may not still be farming maize but they attended Katalyst training and were at some point farming maize. The second, who we are calling '**general farmers**', are typically growing a mix of crops which might include maize but which is not likely to be substantively maize. These farmers have not been engaged with Katalyst.

Size of farm

Large-scale farmer (7.5 acres +)

Medium-scale farmer (2.5 to 7.49 acres)

Small-scale farmer (farm holdings that have minimum cultivated land of 0.05 acres and a maximum of up to 2.49 acres)

Types of cropping

Mono cropping: The cultivation of a piece of land with one crop which may or may not be rotated across seasons or years

Mono culture: The continual cropping of land without rotation across seasons or years. In contrast, poly culture is multiple crops on the same plot of land at the same time

Inter cropping or poly cropping: The rotation of crops throughout the seasons

Executive summary

Research design and methodology

This research was commissioned to build a systemic understanding of large programmes using market system approaches such as that which has been implemented by Katalyst. It is not an evaluation of Katalyst. By a 'systemic understanding' we refer not only to the components of the 'market system' but all of the issues which are important to the lives and choices of farmers. The research explored issues related to poverty and marginalisation; food security and nutrition; vulnerability and resilience; gender; and environment and ecology.

The research was commissioned by SDC, DFID and Danida and carried out by the Institute of Development Studies, UK and Praxis, India.

The research programme used a Participatory Systemic Inquiry methodology (Burns and Worsley, 2015). Key elements of the methodology included a documentary analysis of Katalyst's maize interventions; the collection and collective analysis of 302 life stories (101 of maize farmers and 201 of general farmers) including: the generation of two large-scale causal systems maps (one for general farming and one for maize farming); a deliberative panel of farmers, agricultural experts and Katalyst staff; and interviews with key actors with relevant agricultural and contextual knowledge. These are explained in the body of the report. The juxtaposition of these different methods was designed to ensure triangulation of the data. The findings of this report are based on this data.

Katalyst

Katalyst is a market systems programme in Bangladesh, in operation since 2002. Its stated aim is to contribute to increased income for poor men and women in rural areas of Bangladesh. It has tried to achieve this by increasing the competitiveness of farmers and small enterprises by facilitating changes in services, inputs and product markets. Katalyst is jointly funded by the Swiss Agency for Development and Cooperation (SDC), the UK Department for International Development (DFID) and the Danish International Development Agency (Danida). It is implemented under the Ministry of Commerce of the Government of Bangladesh by Swisscontact and GIZ International Services. This inquiry has targeted only the interventions related to the maize sector, which is one of several sectors in which Katalyst is working.

Key findings

Based on this study, the Katalyst programme does appear to be reaching small-scale farmers.

There was agreement from all the stakeholders who participated that maize does generate profit, however (a) it is very unclear how many of the smaller-scale farmers are profiting (net income), by how much, and for how long (b) there are other cropping patterns which

provide food security, do less environmental damage and offer the prospect of women's empowerment which also generate profit. These may present a better option for small farmers.

Market price and profit, labour inputs, agricultural inputs, vulnerability to climate fluctuations as well as the crops which grow effectively, all vary radically by region. A one-size-fits-all approach to interventions in one main market system or crop cannot work effectively across this diversity.

Food security emerged as the highest priority for poor farmers. The Katalyst assumption that increased income equates to food security is not supported by the evidence. It is surprising that a programme targeted at poor farmers has not substantively engaged with this issue.

The risks to farmers of maize who are highly dependent on it as a cash crop are unacceptably high and there is no effective mitigation such as insurance in place. Between 15% and 20% of the maize farmers told stories of significant crop damage.

Potential profits for capital intensive crops such as maize for smaller-scale farmers are significantly less than those for larger farmers. Economies of scale in production, the availability of storage, and access to processing are particularly significant to this sector. It was acknowledged by all that distributors have an interest in focusing on larger farmers as they are likely to make more profit from them.

Katalysts' partner companies explicitly state the adverse affects of cultivating the same crop in consecutive seasons. However, despite the fact that Katalyst does not actively promote mono-cropping, we found that in our sample most of the maize farmer's stories referred primarily to maize whereas the stories from the general farmer category were much more diverse in their references to crops and animals.

There is no evidence in this study that women would be empowered as a result of the spread of maize cultivation. Indeed, the evidence suggests the contrary.

The study found that there is a capacity gap in knowledge as the programme cascades out to distributors who talk directly to farmers. While Katalyst-supported farmers receive more training than general farmers, Katalyst staff in the deliberative panel acknowledged that the quality of this training is variable and that quality control is difficult to achieve in practice.

Summary conclusions

Despite the potential for an increased income for small-scale farmers resulting from a shift to maize cropping as promoted by Katalyst, in many localities the potential risks to food security are too high for the small-scale farmer to bear. Instead, their need for increased income can be met by other crops (such as vegetables), which can be more effectively grown alongside paddy, are less environmentally damaging, and which offer the prospect of meaningful engagement of women. These choices are highly context dependent and need to be varied according to local environmental, social and economic conditions. In our

opinion, the original selection of market sector was based on untested assumptions about what is most important to poor farmers.

Taking a systems approach requires us to look both at the assumptions underpinning a programme and at the boundaries that analysts put around a programme. How you construct the boundary around the system that you engage with is a highly political process. In this case, the boundary that has been constructed is around factors and actors that contribute to the development of markets. In terms of the life experience of the farmer, only their additional income is included in the system of analysis used by Katalyst; food security is not in the system, risk is not in the system, and so on. Furthermore, non-beneficiary farmers are not included in the analysis. Yet shifting the pattern of cropping across a locality is likely to have impacts on all farmers and households in any given area. It is difficult to see how it would be possible to test assumptions about whether it was in the interests of farmers to shift to maize cultivation unless these other aspects are brought within the system boundaries of the intervention. Looking beyond Katalyst, the market systems community needs a much better understanding of the local realities of where they are working, including issues such as food security, environmental impacts and gender equity, if it is to genuinely benefit people living in poverty.

Introduction and framing

What is this research and what is it not?

This research starts with the farmers themselves rather than with the functioning of the market system. It was designed to look at their needs and concerns (as articulated by them) and to assess whether these coincide with benefits ascribed to market system programmes. Using Katalyst's intervention in maize in Bangladesh as an example, the research assesses whether the underpinning assumptions and theory of change of the intervention are congruent with farmers' realities and consequently the extent to which people living in poverty benefit from these programmes. It also looks at the unintended consequences which impact on human well-being, gender and the environment.

Katalyst is considered by many in the market systems community as a flagship multi-donor development project in the areas of agriculture and rural market development. Its stated aim is to increase the income of poor men and women across Bangladesh. It has been operational since 2002 and it is often presented and referenced as an example of a programme using innovative methods to assess systemic change and identify scalable solutions. Together with the Springfield Centre and Donor Committee for Enterprise Development (DCED), Katalyst and its staff have played a leading role in developing thinking around what systemic change means within the market systems community (Taylor et al. 2016). Furthermore, as the longest-active market systems programme, it allows the research to assess multidimensional effects that started 15 years ago, and a good case through which to understand the logic of this type of large, multi-donor, multi sector initiative.

This work is neither an evaluation nor an impact assessment of Katalyst. Even if we had wanted to assess the direct impact of Katalyst's maize intervention we would have faced serious difficulties with attribution, as the environment is also impacted by other private sector players, government interventions, BRAC and others. Furthermore, market systems approaches operate indirectly, often through partners, making it challenging to establish direct attribution for changes in the system.

The work was originally framed by SDC as a 'beneficiary assessment'. However, in our proposal, we suggested a multi-dimensional assessment which could appraise impacts on the poorest and most marginalised and on the environment. In order to understand the issues being faced by farmers as they made choices about what crops to grow, it was necessary to engage with both farmers who plant input-intensive maize and those who have chosen not to. For Katalyst, the ultimate impact measure is higher farmers' yields and income (we assume that income – as measured by Katalyst – refers to the net income for the farmers, after all costs), assessing these at farmer level (Ruyter de Wildt et al. 2013). Our work was designed to build knowledge on labour, income and profit, as well as on other critical factors including:

- Food security and nutrition
- Vulnerability and resilience to risk
- Ecological impacts
- Gender

Poverty in this assessment was viewed primarily through the lens of income and food security but also takes well-being into account. Nutrition was raised as an issue but did not feature strongly in the evidence. Considerable evidence was generated on risk and the environment. We also learned about the experience of women farmers. One reflection made by the Swisscontact representative we interviewed was that the increased market access to maize facilitated by Katalyst represented an option for farmers and that it would be particularly interesting to know what factors made farmers take up that option or not. The research was able to provide clear answers to this question.

The research is largely qualitative although we engaged with a large number (302) of farmers to collect their life stories. This gives strong credibility to the findings.

The draft report was circulated to Katalyst and Swisscontact who provided detailed comments in response. This final version includes both quotes from their response and our analysis of this response.

What is Katalyst?

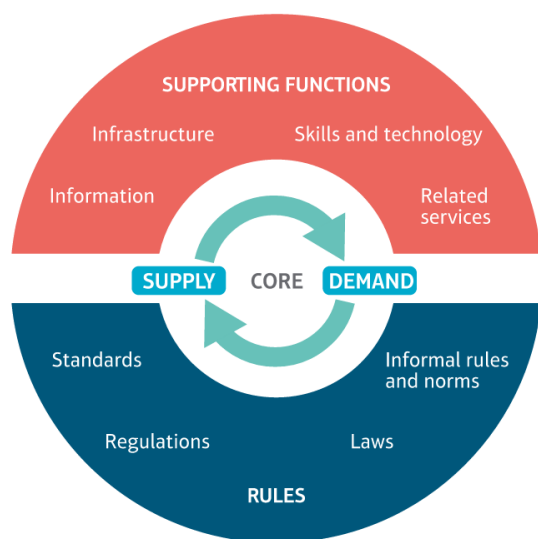
Katalyst is a market systems programme, designed to support the development of the maize sector in Bangladesh.

It aims to contribute to increasing the income of poor men and women in rural areas by 'making services, inputs, and market products more accessible for the rural population, which in turn increases the competitiveness and income of farmers and small enterprises'. Katalyst is co-funded by the Swiss Agency for Development and Cooperation (SDC), the UK

Department for International Development (DFID), and the Danish International Development Agency (Danida). Phase 3 has been implemented by Swisscontact under the umbrella of the Ministry of Commerce, Bangladesh. The programme has had three different phases, each working on different but related sectors.

Market systems approaches aim to reduce poverty by transforming an economic system

Figure 1: The Market systems diagram



Source: Springfield Centre (2014)

(market system) in which poor households could or do participate by buying or selling goods, services or labour. As shown in Figure 1, a market system as conceptualised in the Making Markets Work for the Poor (M4P) approach is a series of interconnected *supply and demand transactions* (the core market system) where goods or services are exchanged, which are supported by *functions, resources and infrastructure*, and by formal and informal *rules* that influence how market exchanges take place. Depending on how the market system functions, it will have a different impact on the lives of poor women and men. The target group (producers, consumers, employees) will always be part of the core system, as supply

or demand (maize farmers in the case of Katalyst’s intervention) (The Springfield Centre 2014).

For example, in the case of Katalyst’s maize intervention, a market systems theory of change aims to facilitate the maize market by making it more financially attractive and more accessible for marginalised communities (to grow the crop). It seeks to do this by tackling the root causes of market failure identified by a market analysis and leveraging the incentives and capabilities of system actors to achieve long-term change using systems thinking to guide the implementation of interventions. These programmes work using facilitation approaches, which means that the programme will implement activities and interventions that provide temporary support (rather than direct solutions), partnering with local actors (such as private companies or local governments) to build the conditions for the market system to work better. The approach aims to leverage and strengthen market actors’ capabilities to work in these new ways in the future.¹

The Katalyst theory of change for the maize sector is based on the logic that in Bangladesh the supply of maize for animal feed has been insufficient to meet demand, meaning the country had to import most of its maize while its farmers were missing out on profit-making opportunities. This was identified by Katalyst as the symptom of a poor market performance. The underlying constraints identified for this were related to different spheres

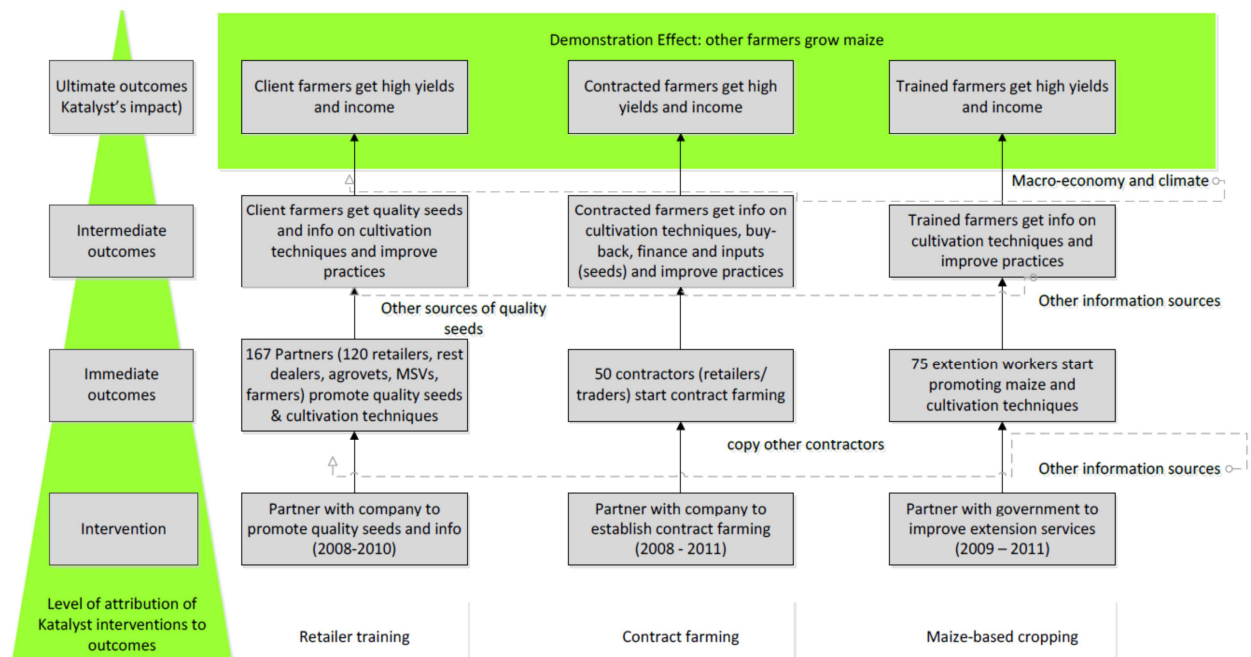
¹ For further information on what market systems approaches are, please refer to www.beamexchange.org

of the market system. Related to supporting functions, Katalyst identified: **low market information**, at supply and demand level, about this opportunity and how to use it – i.e. fertiliser or seed retailers, production practices, technologies available or skills; **lack of retailers** selling maize or high quality inputs to produce it; and no **market linkages** between the few actors selling or producing maize. Regarding the market rules, the programme identified behaviours and practices of farmers who were not used to growing maize (Taylor et al. 2016; Katalyst and Edge Consulting 2014).

Based on this analysis, Katalyst designed a series of interventions to specifically target these areas, aiming for large-scale, sustainable and systemic change, working indirectly through partners (retailers, local government and input providers) in order to provide new opportunities for farmers in Bangladesh. Underpinning this theory of change is a framework called ‘adopt, adapt, expand and respond’ (AAER) (Taylor et al. 2016). This framework supports programmes to articulate their vision and monitor it, in order to respond to unexpected changes. In the case of Katalyst, its aim was initially to facilitate partners (private companies) to adopt new practices of maize promotion (**adopt**) and support their partners to **adapt** the innovations introduced to their business models (new seeds, training), **expand** the intervention to other maize seed companies (beyond their partners), and observe other actors in the system who may **respond** to new behaviours (such as new financial products for maize farmers) (Taylor et al. 2016).

Katalyst aims to contribute to increased income for poor men and women in rural areas of Bangladesh. It does so by increasing the competitiveness of farmers and small enterprises by facilitating changes in services, inputs and product markets. It argues that by showing companies the opportunities for working with farmers on sectors with high potential for growth, both companies and poor farmers can benefit, with companies making higher profits and poor people increasing their income, thus contributing to the reduction of poverty.

Figure 2: An example of Katalyst results chain for their maize intervention



Source: Ruyter de Wildt et al. 2013

Katalyst's theory of change assumes that by linking private input companies with government extension services to promote maize-based cropping patterns, by supporting seed companies to increase distribution networks in remote areas, by partnering with companies to establish contract farming with farmers, and by supporting banks to design and test credit lines for maize contract farming, farmers will start growing maize, and hence attain higher yields and income, leading directly to poverty reduction. Recently, Katalyst piloted a new framework for measuring systemic change looking at transformational change ('change in the way of 'how things are done'), scale ('whether the spread of changes in behaviours and attitudes of different system actors is reaching a critical mass') and institutionalisation ('signs that indicate that the changes are embedded in the institutions of the system') (Jenal 2016). Still, the patterns reported with this framework show evidence only at the level of the embedded assumptions mentioned above. This assumes a direct link between income and poverty reduction without assessing any broader multidimensional changes that may have positive or negative impacts on the farmers, both targeted and not targeted by the programme.

The following describes the nature of the activities implemented by Katalyst:

Katalyst partnered with two seed companies, KBP and CP Seeds, in order to pilot a contracting model whereby the seed companies would take on the main responsibility for training, developing and sustaining the contractor relationships. In doing so, Katalyst sought to move contract farming, like the retailer training programme, to be an intervention that exploited the scale potential of change intermediaries. The partner in this new 'super-contracting' model is the seed company, and the target beneficiary is the maize farmer, but the benefit relies on an intermediary actor (the maize contractor) to deliver the change. (Taylor et al. 2016, 75)

From seed production companies, the most common distribution relationships are arm's length, with inputs often going through multiple levels of dealers (8,000 registered) or wholesalers before reaching retailers. Retailers, generally multipurpose retailers, sell seeds and sometimes fertilisers and pesticides in many rural areas. In reality, however, these retailers are likely to be located in small towns rather than villages and many people have no access at all to these inputs. (Taylor et al. 2016, 23)

[Transformation] From a farmer's perspective, support is becoming more balanced in terms of accessibility, relevance and quality. A better balance arguably makes the provided service more effective... Farmers value trust, but also need to see a potential to improve income when choosing service providers. There is a visible shift from reliance on trust or potential to increase income alone to the need of balancing both... (Jenal 2016: 7)

As mentioned above, the aim of this research is to look at the wider systemic issues faced by farmers beyond the market. These include food security, vulnerability and resilience to risk, ecological impacts, and gender. Our aim is to explore these and to see how they shed light on Katalyst's theory of change and espoused aspiration to benefit the poor through market systems interventions.

Katalyst maize interventions in Bangladesh

Katalyst state that 'in phase 1 (April 2003- September 2007), maize was selected as a core sector of the project since it was one of the potential cash crops that could well fit into overtly rice-based cropping patterns, diversify the crops and replace crops like tobacco. The objective was to fit maize cultivation in the existing cropping patterns of various regions so that farmers could have some cash income (which was not coming from rice cultivation alone). Maize had a huge industrial demand within the country particularly in making poultry feed. Due to limited maize production in the country, institutional buyers for maize heavily relied upon maize imports from neighbouring countries. Katalyst then was mandated by the development partners and the Government of Bangladesh to promote a non-rice crop which will diversify the cropping pattern of the small farmers and allow them to have greater cash income.' They also point out that their rationale for working in the maize sector was in line with ministry of commerce thinking on reducing reliance of the Boro rice, a water crop grown in Northern Regions (e-mail dated 27/04/17).

During the first two phases of the project, Katalyst focused its interventions on two aspects of maize production: the promotion of contract farming, and knowledge dissemination on particular maize cultivation practices which entailed the use of inputs (including pesticides, certain seeds, chemical and organic fertilisers). The programme worked mainly in the northern regions of Bangladesh, predominantly in the *chars* (an island of silt within a river) where incidence of extreme poverty is high. Katalyst began its promotion of contract farming (Phase 1, 2003-08) with an intervention in four markets involving 30 maize buyers and input retailers. To promote maize in the *chars*, Katalyst worked in tandem with

international agri-business Charoen Pokphand (CP) and the seed company KBP to promote company-produced seed and intensive maize farming practices. As we will see in the discussion that follows, the theories of change that underpin these interventions are contested.

Table 1: Katalyst project history

	Phase I	Phase II	Phase III
Donors	DFID	DFID	DFID
	SDC	SDC	SDC
	SIDA	CIDA	DANIDA
		The Netherlands	
Implementers	Swisscontact, GTZ-IS	Swisscontact, GIZ-IS	
Duration	Oct '02 –15 Mar '08	16 Mar '08 – 15 Mar '13	16 Mar '13 – 31 Mar '17
Budget	CHF 26 million (USD 25.7m)	CHF 51 million (USD 50.6m)	CHF 32 million (USD 31.8m)
Line Ministry	Ministry of Commerce	Ministry of Commerce	Ministry of Commerce
Approach	Innovating, testing and proving the methodology	Reaching greater scale in sectors	Consolidating and anchoring in the Bangladeshi context

Note: CHF/USD conversion rate based on 12.05.2017 rate

Source: Chakraborty, S. (n.d)

Katalyst began working with eight contractors who had strong pre-existing connections with *char* farmers. Katalyst approached CP, which recognised the potential of the model to ensure import independence of their poultry feed mill by 2015. By the beginning of 2013, 55 contractors were collaborating with CP in the northern region of Bangladesh, reaching approximately 8,000 farmers, most of them on the *chars*. Katalyst asserts that in phases 1 and 2, five of the leading private input companies strengthened their maize distribution network and promoted better service bundles for farmers in the north-western part of Bangladesh. By 2017 it expects that eight private input companies with over 75% of the combined market share will also have strengthened their distribution network and be offering improved service bundles to small-scale farmers in north-western Bangladesh. Katalyst argues that the market for winter (*rabi*) maize in these districts is more robust than in the southern and south-eastern regions of Bangladesh, and the infusion of a greater number of input companies offering value-added services will further improve farmer access to quality inputs and information. This will ensure a sustainable mechanism through which farmers will continue to realise increased income through maize cultivation.

Research design

The research was commissioned by SDC, DFID and Danida and carried out by the Institute of Development Studies, UK and Praxis, India.

Value chain and locality selection and identification of CBOs/NGOs

It was agreed with SDC and Katalyst at an early stage that the resources available for this research would only realistically permit us to work on one sector or value chain within the wider Katalyst intervention portfolio. In dialogue with Katalyst we selected maize as our focus because it was one of the more established interventions within Bangladesh, it covered different regions including the *char* areas which comprise more small-scale farmers, and as a cash crop it allowed us to see how changes in type of livelihood would have an impact on the lives of poor farmers.

Three localities were selected to ensure enough diversity but not dilute our resources. To select the study locations and identification of CBOs/NGOs, a preliminary meeting/workshop was held with Katalyst project personnel in the Head Office and Field Office in Rangpur. Following the meetings, primary field visits were conducted in Katalyst intervention areas in Saghata upazila of Gaibandha district and Birganj upazila of Dinajpur district; meetings/discussions were held with different levels of stakeholders, farmers, company agents, company dealers at union and upazila level and with the Katalyst field facilitator.

Three locations were selected following the field visit using criteria such as different phases, actors, vulnerability, risk of disaster, remoteness and poverty, type of facilitating agency, access to market and ecological conditions.

Table 2: Characteristics of the three study locations

	District	Upazila	Union	Phase	Characteristics	Katalyst Partner
1	Gaibandha	Saghata	Holdia	1,2,3	<ul style="list-style-type: none"> • <i>Char</i> area • Isolated • River erosion 	Company
2	Kurigram	Ulipur	Thetrai	2	<ul style="list-style-type: none"> • Poverty-prone • <i>Char</i> • Remote area 	Government agency (DAE)
3	Manikganj	Saturia	Dhankora, Hargaj and Saturia	3	<ul style="list-style-type: none"> • Plain land • Three crop cycle • Less vulnerability • Near Dhaka city and better market access 	Company

In **Gaibandha**, stories were collected from Holdia union of Saghata Upazila (sub district). Holdia is a *char* area, quite isolated and faces adverse effects of river erosion and floods. In the dynamics of erosion and accretion in the rivers of Bangladesh, the sandbars emerge as islands within the river channel, or as attached land to the riverbanks. These often create

new opportunities to establish settlements and pursue agricultural activities on them. Once vegetated, such lands are commonly called *chars*. *Chars* can be categorised in two types: mainland *chars* (attached to mainland) and island *chars* (totally isolated). Sometimes the island and attached *chars* appear to be less productive than adjacent mainland areas. The major part of the Holdia union is island *char*. The main problem of charland is poor infrastructure and road communication; the primary method of commuting to the mainland is boat which leads to poor market access. Rice, potato, chilli, and various vegetables are commonly cultivated in the charland. Farmers also cultivate sugarcane, sweet potato, groundnut, chilli, *khesheri*, and legumes. Rearing livestock in the Charlands is traditionally one of the major productive activities. Fishing is an important but not dominant economic activity. Private companies implemented the Katalyst intervention in this area across three phases.

In **Kurigram**, stories were collected from Thetrai union of Ulipur Upazila. It is also a charland; flooding and river erosion are major problems in the area. According to local farmers, the intensity of flooding has been decreasing. Rice, wheat, and jute are the major agricultural crops of the area. Farmers also cultivate vegetables, potato, nut, and maize. Farmers can grow rice mostly in one season - aman or boro. Rearing cattle to sell milk is also a livelihood option for farmers. Communications and market access in this area is poor. Government agencies such as the Department of Agriculture Extension and banks implemented extensive maize expansion in this area during phase two of the programme. This area is a *char* area, which is quite remote, and is poverty stricken.

In **Manikganj**, data was collected from Dhankora, Hargaj and Saturaia union of Saturaia Upazila. It is a rich agriculture area in terms of its diversity: rice, maize, and vegetables are cultivated. Vegetables are profitable here; traders can easily sell vegetables bought here in Dhaka city. There is good marketing facility in the area; within one kilometre there is a big market for agricultural products; and farmers can sell their product easily. Farmers can cultivate three to four crops a year in this area. They can cultivate maize in *rabi* and *kharif* seasons and also can cultivate rice in the *Aus* season and vegetables. The Katalyst intervention in this area was initiated in partnership with private companies during third phase. This area is characterised by plains and a three-season crop cycle. Compared to other areas it is relatively less vulnerable and being closer to Dhaka has better market access and access to diverse livelihood opportunities.

Meetings and discussions were held with the NGOs and CBOs of these areas in order to identify and select the probable CBO and NGO partners and farmer story collectors. Meetings and discussions were held with the senior management personnel and central leaders of Bangladesh Bhumihiin Samity (Bangladesh Association of Landless), Nijera Kori, Karmajibi Nari (KN), Rangpur Dinajpur Rural Development Society (RDRS) and Kendrioya Krishak Maitry-KKM (Farmers Federation). In the discussions, the interventions of NGOs/CBOs, the nature of involvement with study area farmers, and the availability, capacity and willingness of the organisations to be part of the study were ascertained.

CBOs and NGOs were selected as study partners on the basis of three criteria: having a strong presence in the area and working with the local community; working on agriculture and farmers; and having the capacity and willingness to be part of the study. The organisations KN, RDRS, and KKM were selected. Other organisations that were considered

but not chosen included Nijera Kori, whose field office was occupied at that time for another study, and Bangladesh Bhumihin Samity, which does not have a strong presence in the selected areas.

RDRS (www.rdrsbangla.net) works with the poor and their organisations in the northern region of Bangladesh in order to build their capacity to advance their empowerment and improve access to opportunities for the poor to realize decent lives free from poverty and distress. It provides development opportunities and services to 1,940,785 landless and marginal families in 15 districts, and works with 385 community-based organisations (federations) seeking to empower their grassroots members.² The farmers' forum and youth volunteer group of RDRS were responsible for collecting farmers' stories in Saghata Upazila under Gaibandha district.

Kendrio Krishok Moitree (KN) is a federation of farmers. KKM was founded in 2009 as an outcome of a project titled Food Security for Sustainable Household Livelihood (FOSHOL) funded by the European Commission and ActionAid Bangladesh for 2005-2009. KKM has been working in seven districts of Bangladesh: Noakhali, Sunamganj, Patuakhali, Satkhira, Khulna, Kurigram and Dinajpur. The objectives of KKM are to realise the rights of the deprived and marginalised farmers, ensure food security, realise the dignity and recognition of women farmers, promote sustainable livelihoods, and promote pro-farmer policies through strengthening the organisation and coalition of farmers in Bangladesh. KKM was responsible for Ulipur Upazila, Kurigram.

The Krishi Sramik Adhikar Mancha was responsible for Saturia Upazila of Manikganj district. Krishi Sramik Adhikar Mancha is facilitated by Karmojibi Nari (www.karmojibinari.org.bd), a civil society advocacy group promoting the rights of agriculture workers.

Selection of story collectors, training

Thirty story collectors were selected with the support of RDRS, KN, and KKM central management/committee, ten for each area. Among them 25 were male and five were female, and the age range of the story collectors was 21 to 51. The criteria for selection of story collectors were that they should be a member of the CBO, live locally, have a direct relation with and understanding of agriculture, and be able to read and write Bengali.

The story collectors were oriented in two stages about methods and techniques of story collection. The first was a two-day residential training on 4-5 June 2016 at RDRS Training Centre. After the training, a second one-day practical orientation was held separately in the

² See www.rdrsbangla.net

three areas. Of the 30 story collectors, 26 were selected to go and collect stories from farmers after the first training.

Farmers' story collection and quality control

In this research we collected narratives from two groups of farmers. The first, who we are calling '**maize farmers**', were farmers reached through the Katalyst lists. They may or may not still be farming maize but they attended Katalyst training and were at some point farming maize. The second, who we are calling '**general farmers**', are typically growing a mix of crops which might include maize but which is not likely to be substantively maize. These farmers have not been engaged in any way with Katalyst.

Type of farmers selected for story collection

Table 3: Breakdown of stories by type of farmer

	Location	Number of life stories (Total)				Total
		Beneficiary / Maize farmers	General farmers			
			Male/female farmer ³	Women farmer ⁴	Sharecropper /landless	
1	Saghata, Gaibandha	38	41	14	25	118
2	Saturia, Manikganj	37	45	14	25	121
3	Ulipur, Kurigram	26	22	5	10	63
	Total	101	108	33	60	302
		33%	36%	11%	20%	

In Gaibandha and Manikganj, the lists of names of maize farmers were collected from compilations provided by Katalyst-supported partners. In Kurigram, a list of farmers was collected from the DAE office, Ulipur.

The non-maize farmers, women farmers and sharecroppers were selected purposively as people who were known to the story collectors and who were interested in sharing their story.

A pilot set of stories from three locations was checked, reviewed and revisited in order to ensure their quality. A total of 315 farmers' stories were then collected. After collection,

³ Includes five women farmers who are not head of household.

⁴ Women farmers where women are head of household.

stories were categorised into four types: good, average, not enough information, and rejected. Among the 315 stories, 13 were rejected – leaving 302 for analysis. Of these, 101 of these were from maize farmers, and 201 were from general farmers.

Methodology

The methodology used for this assessment is a Participatory Systemic Inquiry process (Burns and Worsley, 2015). This involved a combination of different elements

- 1 Collection and collective analysis of life stories of farmers
- 2 Analysis of critical issues by farmer's peer research group – including clustering, ranking, causal mapping and dialogic analysis
- 3 A deliberative panel of diverse stakeholders
- 4 Supplementary appraisal of Katalyst documents
- 5 Interviews with agriculture and food experts

Life stories provide a way of understanding the situations that farmers find themselves in without prompting particular issues. A life story is typically between one and two typed pages long. Training for the life stories involves people understanding causes and consequences and learning to ask specific types of questions:

Deepening questions – e.g. What did that lead to? Did she get help?

Causality questions – e.g. what happened next? Why did that happen?

Encouraging questions – e.g. That's interesting! Tell me more?

The use of story prompts as opposed to semi-structured interview questions fulfils four important functions. Firstly, it means that the content that emerges is not directed by researcher questions and is therefore likely to be important to the story teller. Secondly, by focusing on the story teller's life rather than a set of issues, it takes people away from a natural tendency to tell the interviewer what they think the interviewer wants to hear – especially where there are actual or perceived resources at stake. This is particularly important in a 'beneficiary' assessment where there is often a strong power relationship between providers and recipients. Thirdly, we find that people like to tell their stories, so they are likely to be less 'guarded' in their answers. Fourthly, stories are much more likely than interviews to elicit the causalities that have led to issues and events in people's lives.

A total of 302 stories were analysed: 101 stories from maize farmers and 201 stories from general farmers with other crop mixes. This is a very large amount of qualitative data. So we are able to see clear patterns in relation to 'what' is happening, and to understand a great deal of 'how and why it is happening' – for example, why people make a choice to plant or not to plant intensive maize crops. Qualitative data on this scale would typically be taken away and coded and analysed by a professional researcher. This has three disadvantages. Firstly, the analysis is not done in real time so it is often too late to act on by the time the results come back, Secondly, it is not subject to real-time contestation and thirdly, the analysis is not constructed by the farmers themselves, so it is strongly subject to researcher bias and it is not owned by local people.

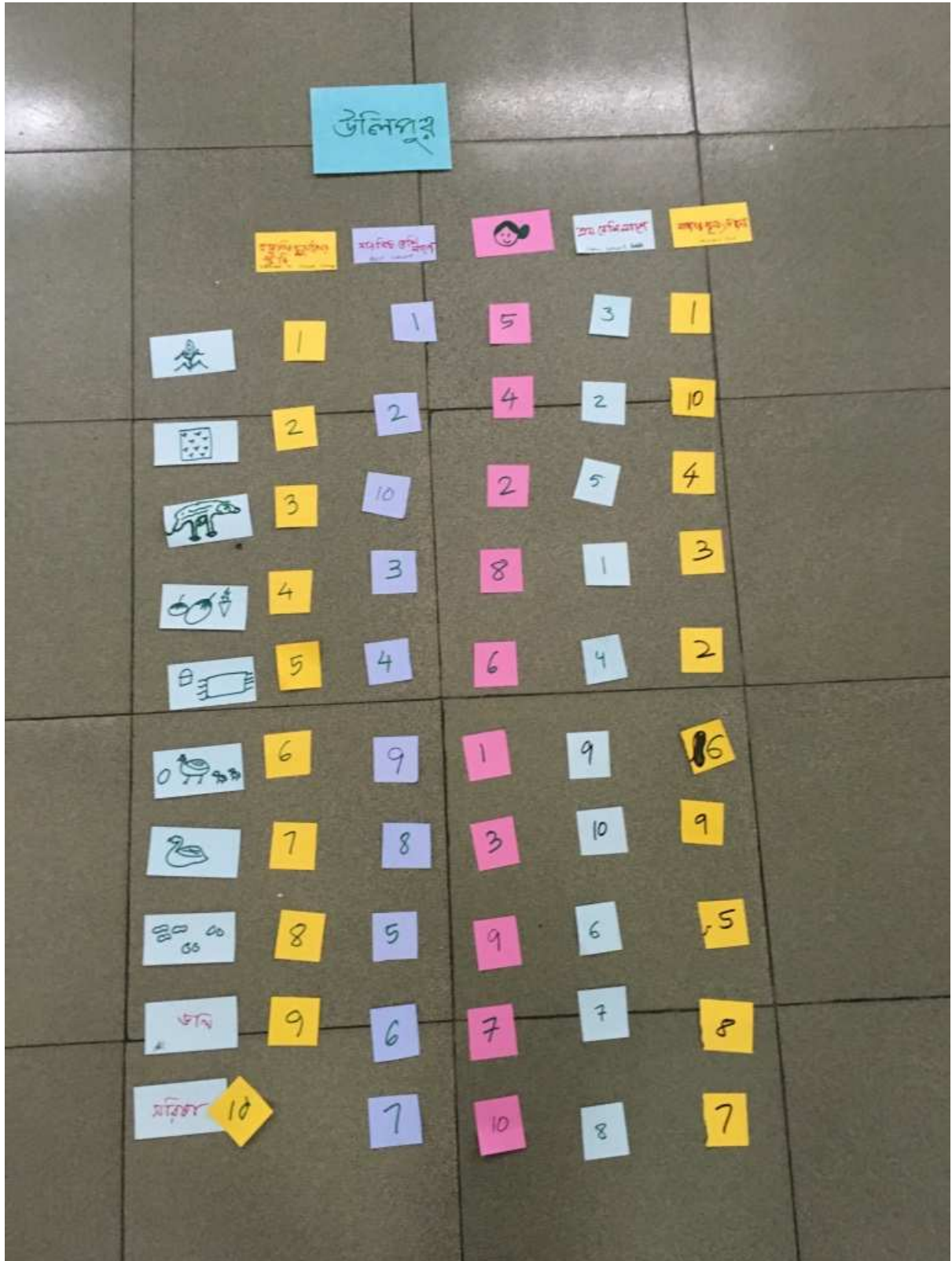
We brought together the participant research team for a four-day long analysis workshop. Researchers were paired and each pair analysed around 20 stories over a period of a day to a day and a half. As they analysed each story they were asked to produce a small system map of the story showing the causal links and other relationships, and to identify on sticky notes the three most important messages articulated in the story. We told them that they could be a combination of positive or negative factors but gave people different coloured sticky notes to distinguish them. We asked them to describe this relationally. In other words, they should not just say 'rice' but rather 'rice leads to profit' or 'wind leads to crop destruction'. Each sticky note had the code for the story written on it so that we could link actual stories to groups of issues. The sticky notes were clustered and generated a range of different issues, which were seen as priorities based on the analysis of the stories. The sticky notes highlight the most important factors in each of the stories, they do not tell you the total number of stories that raise that issue. We identified the numbers that had information on each of the issues in the mapping process.

Figure 3: Participant researchers working on ranking with the cluster analysis behind them



The small maps generated for each story were used as a starting point to create two very large system maps which depicted the broader pattern of system dynamics. We produced one system map from the 101 maize stories, and one system map from the 201 general farming stories. These turned out to be very different and the comparison between the two was very revealing. Once the map of relationships had been produced, participants identified links that were present in a large number of stories. Participants were only allowed to put onto the map relationships which were evidenced in the stories, and for every significant linkage on the map all participants were asked to go back and check their stories in order to verify how many stories depicted this link. This allowed us to thicken the lines on the big maps and add a number to show how many stories it represented. During the story analysis workshop, participants were asked to rank/prioritise different crops in relation to opportunities (such as income) and hazards (such as climate change).

Figure 4: A completed ranking exercise



The final phase of the research involved bringing together a deliberative panel. This was a group of six farmers (general farmers and maize farmers), six agricultural experts (see

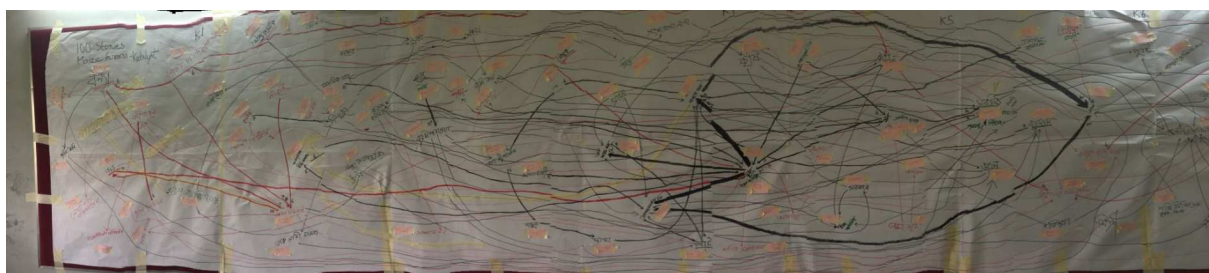
Appendix 2) whose views ranged across a spectrum of support for input-intensive agriculture on the one hand and agro-ecology on the other, and four members of the Katalyst team (see Appendix 2). This group met for two days, focusing their discussion on issues of food security versus profit, gender, and the environment issues that arise from the production of maize. A deliberative process allows people time to examine the evidence which relates to an issue and explore it properly, probing areas of uncertainty and disagreement. Time to process the issues typically enables people to develop their thinking based on evidence and to have their opinions challenged in real time. This makes the process generative rather than consultative as most focus groups tend to be.

All of this work was supplemented with interviews with experts within the agricultural sector. These were also divided among people who were broadly supportive of input-intensive agriculture and those were more oriented to a traditional agro-ecological approach to ensure a balance of perspectives. We did not attempt to engage everyone who might have something to say on these matters but rather to ensure enough diversity of experience and opinion to enable us to triangulate the knowledge that was being generated from the ground.

Figure 5: Map of system dynamics derived from 201 general farmer stories



Figure 6: Map of system dynamics derived from 101 maize farmer stories



Findings

In the following section, we explore the key findings under the following headings:

Labour, income and profit
Food security and nutrition
Gender
Environment and ecology

Labour, income and profit

There is some evidence of profit made by the maize farmers identified through Katalyst's participants list in the study but details are not clear from our study - it is not clear how much additional income, to whom or for how long.

In response to our draft report Katalyst shared a summary of their internal monitoring data entitled 'calculation of maize beneficiary numbers from Katalyst MRM'. They claim that this data shows clear additional profit being made from the maize crops. However the summary does not include the source data; assumptions behind the profit calculations; nor the sample frames or methods for this data analysis. We do not know how they compared data from one period with another. Furthermore, Katalyst calculates 'profit per decimal', but this does not take into account different land sizes, potentially disguising lower net income per decimal on smaller farms relative to larger farms. Regardless, even if this data (which is not publicly available) is verifiable it does not tell us how the maize intervention would compare with other 'profitable' cropping patterns identified in our sample of 200 general farmers (see section below). Other factors that would need to be taken into account would be the cumulative costs of crop or yield loss (sometimes with catastrophic outcomes such as being forced to sell land) during several seasons, changing costs of inputs or market prices.

In addition, in our interview of February 2017, Katalyst and Swisscontact were clear that they focus on only two measures at the level of the farmer; the number of beneficiaries of their interventions, and net additional income⁵ – 'we only see changes at the income level.' Their analysis does not look beyond a period of two years following the intervention. This is important, because even if people were initially making a profit, they may no longer be doing so after a few years of high and increasing costs. There are many stories within the sample of people who started maize cropping and then abandoned it. While Katalyst acknowledge this, they argue that they are 'observing the wider picture' for example 'maize is still increasing in Bangladesh'. This may be the case but it is not at all clear who this is

⁵ The external impact evaluation we have had access to, by Rutter de Wildt et al. (2013), measured changes in farmers' income and yields for three maize-related interventions from 2009 to 2011. 'Impact' is defined as 'a change in farmers' income.' This was measured by multiplying yield increases by average market prices, and applying a 35% ratio for the final net income. Yield increases were calculated by comparing before-and-after yields, where before they relied on recall. The 35% ratio is the average calculated from the in-depth interviews and survey. The calculations rely on assumptions that do not take into account changing land sizes, different cost between years, nor erosion of income due to smaller land sizes or changes in climate conditions among others. It also does not differentiate between male and female farmers.

benefiting - for example whether this increase is accompanied by an increase in the number of larger farmers at the expense of smaller farmers, and this still does not address the risk issues discussed in the next section.

Findings from the stories, clustering and mapping

Overall, the stories indicated that many of those that were currently cultivating maize thought it was profitable – at least in the early years.

Story 18 – The quality of maize grain varies and so there is fluctuation in price. But even at the lowest price, he feels maize cultivation is more profitable than rice cultivation as it is less labour- and cost-intensive. However, damage due to storms increases the risk of cultivating maize.

Out of 101 maize stories, 65 highlighted the profitability of maize in the clustering exercise. Indeed 25 of the non-maize group also highlighted the profitability of maize. However, the narratives were also very clear that – perhaps with the exception of large farmers who could absorb the costs – profits may decrease over time because of the increase in fertiliser required as a result of depletion of the soil and the increase in pesticides required resulting from a diminishing biodiversity.

Story 3 – Not happy with maize, despite the middling cost of cultivation, because price has fallen greatly. He faced loss as a result. Storm greatly damaged maize in 2016. Flooding, hailstorms, drought and thunder storms have damaged crops and have made farming very challenging. They are forced to continue farming in order to maintain household livelihoods despite difficulties.

Story 27 – He cultivated maize three years earlier but could not make any profit and the crop was not very good, so he did not continue. There is a lot of risk in vegetable cultivation, including problems of insect attack. He feels rice is lower risk. While rice is less profitable, he has peace of mind and can cover loss from rice from cultivating potato and cabbage.

Story 28 – He has been cultivating maize since 2008. He has lower vulnerability as he has been attached to a small business since he was 20 years old. He feels that while the productivity of maize is increasing the costs, diseases and problems are also increasing.

Findings were also clear that maize was highly vulnerable to damage by weather – in particular high winds.

Story 9 – He cultivated maize with neighbour in last season on 40 *decimal* of land. Maize plants die without irrigation. Did not face insect attack and plants grew well. But wind of *Falgun* month destroyed 50% of maize plants. He was only able to break-even but overall he made loss from farming that year and so has chosen not to cultivate maize this year. Low tolerance of risk is common to most small-scale farmers.

This not only has the immediate effect of loss of income. Some farmers who have borrowed money for inputs have had to sell land in order to pay the debts. This means that over time, significant numbers of farmers can lose their livelihoods. One might reasonably assume (although the stories do not provide evidence for this either way) that this land is then bought up by large farmers which is likely to further reduce crop diversity across the locality. The problem of soil degradation is much less acute in parts of the *char* areas where flooding has refreshed the organic quality of the soil, meaning that it requires less fertiliser input.

Many of those who cultivate maize do so because it is seen to be less labour-intensive:

Story 1 – He farms maize as there is no hurry/pressure on it. Only 3–4 rounds of irrigation, a little weeding and a small amount of fertiliser. Therefore, good harvest with little work. He cultivates jute and nut after maize and this is his protection against facing loss. Maize returns fund jute cultivation and jute also has a good price.

Story 5 – Maize is less hazardous work and is easy compared to other crops. Jute grows well after maize as not much fertiliser is needed and he makes a profit.

From our analysis, the main issue of concern is not so much profit but risk. 18 out of 101 stories showed crop loss resulting from wind damage. A further six had lost crops through insect damage, etc. Katalyst is aware of the risk:

Katalyst interventions have geared towards minimising such risks. For example, Katalyst promotes dwarf variety of maize in areas where wind occurrence is higher. Katalyst has promoted Integrated Pest Management Practise to tackle the pest and diseases. However, the project acknowledges that much more is needed to do to reduce the risks of the farmers, particularly to the small holders (Katalyst response to draft report, 27/04/17)

Yet the reporting of incidents in our stories has occurred despite these interventions. Thus, even where a small-scale farmer might be able to make a profit, few would be inclined to risk a 15%+ chance that they would lose their crop and the economic impact which would follow. In a Western context, this could be considered as the equivalent of investing money in high-risk bonds which have the potential for higher returns but also hugely damaging losses. This might be a rational choice for people who have spare money to invest, but it is not rational to take this sort of risk with your basic livelihood. The reality of this is exemplified by some of the stories which also illustrate that a shift to maize may be temporary until the costs and risks are experienced:

Story 12 – Variations in crop quality of maize and damage due to natural calamities like excessive rain and thunder storms make it difficult to make a regular profit from maize and increase the risk of loss. The cost of cultivation is increasing all the time.

Story 14 – maize cultivation is costly and requires irrigation in sandy lands. As a poor share-cropper, he does not have a shallow machine and can't bear the cost of hiring at Tk.100 per hour. Maize crops get damaged if not irrigated on time. Maize plants

get broken by *Kalboishakhi* storms. The risks are too high for a sharecropper like him and he does not have enough wealth to bear them.

This in turn raises the question of insurance, and why what is perceived to be a high-risk cropping strategy was introduced without considering how insurance might be made available to these farmers – although this would in turn raise the question of whether poor farmers could afford insurance.

Furthermore, while everyone agreed that a profit could be made on maize, 66 out of 201 general stories highlighted the profit that could be made from vegetables, and even a quarter of maize farmers highlighted that profits could be made from vegetables. 35 of 200 highlighted the profitability of animal rearing and 11 of 100 of maize farmers indicated the same. 19 of 200 highlighted the profitability of jute – due to the low cost of inputs and relatively low labour costs. 15 stories even highlighted the profitability of rice, which corresponds with the ranking below, which shows 50% of income in Manikganj being derived from rice.

Findings from the ranking

In the following chart, farmers were asked to identify the typical percentage of income that a household in their locality would receive from the sale of different crops.

Table 4: Percentage of income contributed by different crops

Ranking	Income source	% of income		
		U	M	G
1	Paddy	5	50	10
2	Maize	20	10	20
3	Vegetable	5	20	10
4	Jute	20	5	15
5	Nuts	30	-	15
6	Animal rearing	20	15	30
U = Ulipur; M = Manikganj; G = Gaibandha				

Farmers in Manikganj said that paddy contributed 50% of their income. In Gaibandha, animal products contributed 30% of their income while in Ulipur nuts contributed 30% of farmers' income. Animal products, maize and paddy in different contexts were found to be major contributors to income.

Table 5: Ranking of which crops which require a greater area

Ranking	Income source	Area		
		U	M	G
1	Paddy	3	1	3
2	Maize	4	3	1
3	Vegetable	5	2	5
4	Jute	2	4	2
5	Nuts	1	5	4
6	Animal rearing	-	-	-
U = Ulipur; M = Manikganj; G = Gaibandha				

In terms of areas under various crops, in Manikganj respondents ranked paddy at number one while in Ulipur and Gaibandha, nuts and maize were ranked top, respectively. Interestingly, though, while maize was top in terms of area in Gaibandha, it was not considered to contribute more than 20% of farmers' income.

Table 6: Ranking of which crops are most input intensive and labour intensive

Ranking	Income source	Input intensity			Labour intensity		
		U	M	G	U	M	G
1	Maize	1	2	2	3	3	2
2	Paddy	2	3	1	2	1	1
3	Animal Rearing	10	-	10	5	5	6
4	Vegetable	3	1	4	1	2	7
5	Jute	4	5	3	4	4	5
6	Poultry	9	0	0	9	6	10
7	Duck	8	0	0	10	9	9
8	Nuts	5	-	8	6	-	8
9	Pulses	6	6	7	7	8	4
10	Mustard	7	4	6	8	7	3
U = Ulipur; M = Manikganj; G = Gaibandha							

Maize was top in terms of inputs required for cultivating the crop at Ulipur, while in Manikganj and Gaibandha it was at number two. Paddy was top for input requirements in

Gaibandha while vegetables were top at Manikganj. Nuts, pulses and mustard were relatively less input intensive and so was the case with animal-related livelihood options.

While paddy is generally recognised as the most labour-intensive crop to grow, it is important to note that the ranking shows maize as second.

Table 7: Ranking of market price for different crops

	Income source	Market price		
		U	M	G
1	Maize	1	4	9
2	Paddy	10	8	10
3	Animal Rearing	4	3	1
4	Vegetable	3	1	6
5	Jute	2	2	4
6	Poultry	6	7	5
7	Duck	9	9	8
8	Nuts	5	-	2
9	Pulses	8	6	3
10	Mustard	7	5	7
U = Ulipur; M = Manikgan; G = Gaibandha				

When looking at market price again there is a huge variation by area. Maize, animal products and vegetables were ranked as top across three locations in terms of market price. These rankings suggest that while maize is profitable, there are other crops that are equally or more profitable and these crops demand less inputs in terms of both labour and fertiliser and/or pesticides, and they take up less land. Vegetables and pulses demonstrate this most clearly.

Analysis from the deliberative panel and interviews

The overall view from the deliberative panel was that maize production leads to more income but also more costs. What is not clear is whether the increasing costs over time (particularly outside of the *char* areas where soil quality may be refreshed) mean that profit becomes less and less significant. Experts supported the view of farmers that the price of seeds and fertilisers is high. The Deputy Director of Agricultural Extension for

Manikganj, Alimuzzaman Mia, highlighted the problem that ‘farmers are trapped by seed companies’.

Once you start using hybrid seeds your costs go up. We put fertilisers three times. Greed for more gets us into this. Hybrid means more costs. (KKM Women – DPP)

Marketing facility is good, but intermediaries are getting more profit. (Alimuzzaman Mia, Deputy Director, Department of Agricultural Extension, Manikganj, External Interview)

During the deliberative panel, it was pointed out that it was important to know the size of the maize farms. We checked our sample. We were able to personally contact 42 of the 100 farms by phone and ask them about farm size. This exercise showed only one large farmer (7.5 acres +), 10 medium-sized farmers (2.5–7.49 acres) and 31 small-scale farmers (less than 2.5 acres). While this is not in any way statistically significant, it does support Katalyst’s assertion that while generally they have had difficulty in reaching small-scale farmers, they have had some success doing so in the *char* areas.

Furthermore, as we can see from the tables above, the profitability of maize is highly dependent on the locality. As one panel member pointed out:

In our area, if it is profitable why are farmers not doing it? Two reasons - one is environmental vulnerability and two cycles of maize lead to reduced fertility of soil and therefore farmers don't take up maize cultivation. (Hybor Ali-DPP)

Profit is required in order to have some disposable income to buy goods and other foods. However, panellists were clear that it was often a better option for men to get this additional income by working in the city (see evidence below).

Risk factors include weather damage, insects which cause damage (which it is argued have increased in number), and crop failure resulting from -among other factors -weather and seed adulteration. These will be discussed in more detail in the section below on food security.

Reflections and conclusions on income and profit

It seems likely from the evidence of this research that the Katalyst programme is reaching small-scale farmers. Their data suggests that the programme has led to an average overall increase in income. What we are not able to verify is what that increase looks like if it is disaggregated by the size of farmer, or the extent to which it is offset by increasing costs over time and indeed whether the associated decline in profit over time is faster and steeper for smaller-scale farmers. The evidence clearly suggests that larger farmers have the potential to make significantly greater profits for a variety of reasons including their access to storage, threshing machines and other agricultural technologies, as well as their ability to absorb the higher costs of inputs. The critical issue is not so much profit as risk. Maize is seen to significantly increase the risk of crop loss with huge negative implications for those who have to face this. Katalyst acknowledge the risks to maize crops and consequently 'promote dwarf varieties of maize', however the evidence from this study suggest that crop damage is still a major issues for these farmers.

Food security and nutrition

Food security is a major issue. In this section we discuss the definitions, the issues and the risks involved in attaining food security through different cropping patterns. Definitions have changed significantly over time as illustrated by the following narrative in an FAO report of 2003:

The initial focus, reflecting the global concerns of 1974, was on the volume and stability of food supplies. Food security was defined in the 1974 World Food Summit as:

"availability at all times of adequate world food supplies of basic foodstuffs to sustain a steady expansion of food consumption and to offset fluctuations in production and prices"^[25].

In 1983, FAO expanded its concept to include securing access by vulnerable people to available supplies, implying that attention should be balanced between the demand and supply side of the food security equation:

“ensuring that all people at all times have both physical and economic access to the basic food that they need”^[26].

In 1986, the highly influential World Bank report “Poverty and Hunger”^[27] focused on the temporal dynamics of food insecurity. It introduced the widely accepted distinction between chronic food insecurity, associated with problems of continuing or structural poverty and low incomes, and transitory food insecurity, which involved periods of intensified pressure caused by natural disasters, economic collapse or conflict. This concept of food security is further elaborated in terms of:

“access of all people at all times to enough food for an active, healthy life”.

By the mid-1990s food security was recognized as a significant concern, spanning a spectrum from the individual to the global level. However, access now involved sufficient food, indicating continuing concern with protein-energy malnutrition. But the definition was broadened to incorporate food safety and also nutritional balance, reflecting concerns about food composition and minor nutrient requirements for an active and healthy life. Food preferences, socially or culturally determined, now became a consideration. The potentially high degree of context specificity implies that the concept had both lost its simplicity and was not itself a goal, but an intermediating set of actions that contribute to an active and healthy life.

The 1994 UNDP Human Development Report promoted the construct of human security, including a number of component aspects, of which food security was only one^[28]. This concept is closely related to the human rights perspective on development that has, in turn, influenced discussions about food security. (The WIDER investigation into the role of public action into combating hunger and deprivation, found no separate place for food security as an organizing framework for action. Instead, it focused on a wider construct of social security which has many distinct components including, of course, health and nutrition^[29]).

The 1996 World Food Summit adopted a still more complex definition:

“Food security, at the individual, household, national, regional and global levels [is achieved] when all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life”^[30].

This definition is again refined in The State of Food Insecurity 2001:

“Food security [is] a situation that exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life”^[31].

As we will see below, many of these concepts are reflected in stakeholders’ own definitions. However, it is worth noting some differences in emphasis. While all groups involved in the research highlighted the issue of sufficiency, many of the farmers were particularly

concerned with safety, ability to control their own food production (self-sufficiency) and taste. Even though it is argued that maize is not designed for human consumption this is far from the reality as people are: using it for popcorn; feeding it to poultry; or in some cases using it directly for food (wheat flour is often mixed with maize – around 30% maize to 70% flour). Katalyst, on the other hand, pointed to the importance of nutrition and the potential of households to get access to diverse sources of nutrition if they have cash. This would be the case if alternative sources of good nutrition were available for poor farmers and if there is enough profit to generate it. Both of these assumptions appear to be untested.

Findings from the stories, the clustering and the mapping

The clustering exercise highlighted the different dimensions of food security identified by the farmers, including:

- Cultivating vegetables in order to ensure demand of nutrition
- Producing unadulterated food to ensure food security
- Fulfilling the whole year's demand for food with rice production
- Achieving the food security of the family through the cultivation of rice
- Cultivating rice and vegetables in order to ensure protein and nutrition

Even though it was recognised by all that the labour inputs required to produce rice were much greater than for maize (and other inputs can also be costly), small-scale farmers still made a rational choice to grow rice. This story explains clearly some of the reasons why:

Now a day's cultivation of rice is less profitable. As the expenses are higher than the selling price – the profit goes down. However, I cultivate rice to fulfil the food demands of my family. I used to get 60-70 mands rice in a year. After keeping the amount that I need for the meal of family in a year, rest of them I sell in the market. The cultivation of vegetable addresses the need of my family. Apart from fish and beef/meat, I do not need to buy a lot of things from the market.

I do not need much profit. I could not kill my livelihood assets. As we are farmers, if our lands are alive, we can live. That is why I care for my land and do not cultivate maize. I produce rice, though it is less profitable, but I have peace of mind. In addition, I can cover the loss of rice from the cultivation of potato and cabbage.

Story Code 61: Manikganj, Sauria, Hargaj

The story of a larger farmer who can afford equipment is different:

I cultivate maize on my land every year. With the money I made from selling cattle added to this, I purchased a maize-thrashing machine. I can earn per day Tk.300 to Tk.400 thrashing my neighbours' maize; I do it along with thrashing my own. With this money I can bear the expenses of my family smoothly. The price of one mand of nut is Tk.2,200; with this money I can purchase 4–5 mand of rice. If I cultivate only rice, I have to sell my land to collect food for my family members and it will not be

possible to bear the expense of our children's education. To survive in char, I have to continue to cultivate maize.

Story 288: Kurigram, Ulipur, Thethrai union, GodaiPiyar Char

These stories illustrate why the rational choice of a farmer managing food security issues relates very much to scale.

Perhaps the most significant finding of the whole research was that **97 out of 201 general-farmer stories raised the issue of rice as providing food security in response to an open-ended prompt.** Food security did appear on the maize map but again only related to rice. Most significantly, no relationship was drawn on the maize map between profit and food security. This very strong message was strongly supported by rankings carried out by the farmer research group.

Findings from the ranking

As with the tables above, in the ranking that follows, participants assessed (by locality) the extent to which different crops provided food security.

Table 8: Ranking of crops which provide the most food security

	Income source	Food security		
		U	M	G
1	Paddy	1	1	1
2	maize	4	4	4
3	Vegetable	2	2	2
4	Jute	-	-	-
5	Nuts	5	-	5
6	Animal rearing	3	3	3

U = Ulipur; M = Manikgan; G = Gaibandha

Paddy was regarded by respondents from all three locations as providing the most food security, while maize and nuts were ranked at number four and five, respectively. It is evident that in terms of food security, farmers as well as other local data collectors found paddy, vegetables and animal products more relevant than maize. Interestingly, there was complete consistency across the localities.

Analysis from the deliberative panel and interviews

Participants in the research analysis and the deliberative panel were probed to determine what was meant by food security. They highlighted a range of factors:

- Food in my belly for me and my family today
- Food availability for the whole year round

- 'My house, my food' and 'food from my production'
- Food which I can trust because I grew it myself

This latter point reinforces the importance of 'food safety' in people's perception of food security. The way in which the small-scale farmers articulated the relationship between subsistence and cash cropping was that they needed both food security and cash. As articulated in the deliberative panel, the balance that people want is:

'to be able to cultivate enough food for the family to consume'
'good food for health'
'selling beyond food security'
 (DPP)

Quality of life is important: 'if we have food at home we can think about other things. If I have money I have to pay attention' (DPP). Essentially, what is being said here is that cash cropping brings worry because it involves a greater level of risk. Another factor was taste. Some said:

For taste, it is necessary to cultivate paddy even if it is at a loss.

Maize – the taste is bad.

Being in 'control' of your own food production is perceived to increase the chances that you will get enough safe and nutritious food. This is very closely related to the issue of seed reproduction. Because farmers can't preserve maize seeds, they become totally dependent on the market. A range of quotes from panellists highlighted concerns:

Earlier we used to store seeds at house, now we buy for 250 Takka per Kg. Using fertiliser is leading to loss. (Nurul-DPP)

People go for hybrid seeds as they promise higher returns or yield. They give produce in 90 days while taste and nutrition is not good. (Women KKM-DPP)

Many seeds are completely lost. By eating hybrid people are becoming hybrid. (Safi-DPP)

Farmers [are made] dependent on economy of companies. Traditional seeds are getting lost. (Khan-DPP)

The strong feeling from the farmers (maize and general) was that this type of maize farming required mono-cropping. Unlike other crops, it could not be combined with rice to create a mixture of cash profit and food security.

We used to do holistic farming – mixing rice and dahl and uncultivated plants. We have to consider all of these together. Local varieties of dahl used to be sown alongside paddy, and this involves no additional work. With maize other crops can't grow. (DPP)

Local varieties of lentils were with paddy. There was no labour investment. With hybrid seeds this is not happening, as it requires alluvial soil. (DPP)

Cash could be provided by other crops, or by the men (mostly) taking other jobs in the urban centres. People also felt that men taking jobs in the city was more likely to generate cash than small-scale farming:

It is difficult for a farmer if he doesn't make a profit from the farm. If I have a brother in Dubai and a brother in a store in Dhaka. If there is no external income I cannot stand as a farmer. We need other sources of livelihood as well as farming. (DPP)

Given that maize is a male-dominated crop, men cannot be both working on the maize and working away. This creates a stronger imperative to seek food security through growing crops that women engage in.

Leaving aside the risk factors that relate to the environment, participants also said that profit does not equate to food security because 'you can have money but food is not available in the market'. Given the logic of Katalyst's maize intervention – to change the markets that farmers sell into through contract farming for animal-feed markets – the intervention could potentially cause further decreases in the quantity and diversity of foods available in local markets.

During the panel, the Katalyst team questioned the general farmers about the profit issue intensely. They proposed to the farmers that given maize required less intensive labour inputs and generated profit, it would be rational to choose to plant maize. The farmers were adamant that they would always chose food security over both labour and potential profits for the reasons given above. This represents a strong challenge not only to the assumptions underpinning Katalyst programming, but the working assumptions of the current Katalyst staff team.

Reflections and conclusions on food security and nutrition

What is striking about these findings is how food security emerged unprompted as the critical issue for small-scale farmers in half of the stories. It is clear from the deliberation that for small-scale farmers, potential profit is usually offset by the risks involved in losing the crop. This could mean losing your land or simply not having anything to eat if you have no money. Farmers are also aware of the danger of diminishing profits and land that becomes infertile. All these factors threaten food security.

From a systemic point of view, it is important to look at the wider impact of maize production for poultry feed as it is likely that if more and more land is taken up in maize production for poultry then the availability of local vegetables and pulses will decrease and the prices increase.

There seem to be many reasons why small-scale farmers would choose not to plant maize, but assuming that they are prepared to take the risks then it is our view that there is a duty

of care (perhaps articulated in Katalyst's 'do no harm' framing of its work) to ensure that insurance is available and affordable in order to mitigate the risks.

Ecology and environment

Bangladesh is a disaster-prone country and farmer narratives were full of instances of challenges faced as a result of sudden changes in climatic condition as well as weather related occurrences.

Flooding, hailstorms, drought and thunder storms massively damage crops. Considering all these, nowadays farming is very difficult. We are farmers: we have to cultivate to maintain our household livelihoods. (Story 261)

This section looks at how the climate and weather impact on choices that are available to farmers, it also explores the impact of maize on the soil and biodiversity and other environmental factors that impact on farmers' lives and livelihoods. Finally, it touches on the broader impact of intensive input-based cropping on the environment itself.

Findings from the stories, clustering and mapping

The stories highlighted a number of impacts maize production has on the local ecology. Intensive maize production is heavily dependent on the use of chemical fertilisers and pesticides. These have long-term environmental implications which include decaying of the land and reduction in soil quality. Among the maize farmers' stories, ten related the production of maize to fertiliser use.

I cultivated maize three years earlier on my 2.5 pakhi of land. However, I could not make any profit. Actually, the crop was not very good!. That is why the next time I did not cultivate maize on my land. In addition, growing maize causes decaying of land. Land turns non-productive. Because of that, I did not try maize again. (Story 61)

My observation from maize farming that as much fertiliser and water I could add in farming, it increases the growth of crops. (Story 265)

At present, organic fertilisers are very rarely used. Pesticides and chemical fertilisers are used in large amounts. (Story 217)

Six farmers highlighted the connection between maize production and the use of insecticides.

Maize was also found to be very water-intensive and heavily dependent on irrigation, particularly in sandy areas, which puts a lot of stress on available sources of water.

Maize cultivation is costly and for cultivating it we have to irrigate in sandy lands. The crops damages if irrigation does not happen in time. The maize plants broke

down with Kalboishakhi storms. Having these risk I stopped cultivation of maize. I am a sharecropper and I do not have much wealth of my own. (Story 291)

While most of the general farmers were planting multiple crops the maize farmers in our sample had significantly less diversity. A reduction in crop diversity appears to be a systemic effect of the intervention despite Katalyst advice against mono cropping. This both hampers food security and environmental sustainability.

Perhaps the most striking finding from the stories was the extent to which maize is vulnerable to serious wind damage. 18 out of 101 maize farmer stories highlighted crop failure as a result of wind damage:

By the wind of Falgun month, 50% of the maize plant were broken down and it was just before the maize was to grow. (Story 301)

Maize was found to be particularly susceptible to damage by storms in the *Kalboishakhi* season. This is a finding of great significance because it shows that more than 15% of the maize farmers had suffered major crop loss.

Findings from the ranking

Table 9: Ranking of crops that are most vulnerable to climate change

	Income source	Vulnerability to climate change/ climatic occurrences		
		U	M	G
1	Maize	1	3	1
2	Paddy	2	2	2
3	Animal rearing	3	7	10
4	Vegetable	4	1	4
5	Jute	5	8	3
6	Poultry	6	9	8
7	Duck	7	6	9
8	Nuts	8	-	6
9	Pulses	9	5	7
10	Mustard	10	4	5
U = Ulipur; M = Manikgan; G = Gaibandha				

In the ranking exercise, participants from two out of three locations considered maize as the crop most vulnerable to climate change. Participants from all three locations saw paddy as

the second most vulnerable crop. Crops such as pulses, mustard and nuts were found to be relatively less vulnerable to climate variations. This was also found true for animals and poultry. Interestingly, participants from Manikganj considered vegetables to be the most vulnerable crop. Farmers felt that the risk of losing a maize crop was more severe than for a paddy crop.

Analysis from the deliberative panel and interviews

In the stories above, the **destruction of soil fertility and soil health** was seen to result from this type of maize cultivation:

...there should be 20 basic ingredients in the soil. We are applying nitrogen, phosphorous and potassium. Due to gradual decrease of the basic ingredients, we are now applying zinc, sulphur, and boron also; if this situation will continue, we have to apply 20 ingredients. We do not have that capacity. At that time soil will lose its quality completely. If the organic matter content of soil is less than 0.8%, it is not fit for agriculture. It is alarming that at present the organic matter content of our soil is close to 1%. Gradually we are getting to the danger level. Due to cultivation of exhaustive crops in some areas of our land, the organic matter content has gone below 0.8%. In 1950s, it was 3–5%. The maize has exhausted soil so much, which endangers our future more. (Dr M.A. Sobhan, Research Consultant, Policy Research for Development Alternative – UBING).

If you test the soil of maize field, after eliminating the upper layer of soil you will find a thick oily layer, like a plastic cover. This hinders germination of other crops; and also creates obstacles for fixation of nitrogen and the gas exchanges. I also could not find algae, lichen and fungi in the maize field. ...maize damages the fertility of land; after 2–3 times cultivating maize, it damages the fertility of land. (Shahidul Islam, Agronomist Executive Director, Unnayan Dhara)

...[Cultivation of maize] reduces the fertility of soil if farmers continue cultivation of maize on the same land; maize is a deep-rooted plant and rice is a flash-rooted plant. [Maize] consumes more the soil nutrients, that's why it depletes soil fertility. We are advising framers to rotate crops, but it does not work. (Alimuzzaman Mia, Deputy Director, Department of Agriculture Extension (DAE)).

The excessive use of fertiliser and pesticides has been destroying soil fertility due to cultivating these imposed seeds supplied to rural women by the NGOs. ...Our common water resources are being polluted ...We are destroying our soil fertility; fertiliser and pesticides are being controlled by the market. Land is being abandoned or made barren due to the decrease of fertility. We know that every year, 1% of cultivable is decreasing due to commercial and industrial use but we don't know how much land is being abandoned as there are no statistics on it. (Rezanur Rahman, Nijera Kori)

Maize's heavy dependence on fertilisers and pesticides takes a serious toll on the soil.

Rice, wheat and maize are all from Grass family (Gramineae) and have common pest range. In case of rice and jute the pest and weeds both are different; this is because rice is monocotyledonous and jute is dicotyledonous crop. They are standing on two different poles of the plant kingdom. If farmers cultivate crops from the same family one after one, it will increase opportunity of food for pests. It needs spraying pesticides /poison. These poisons mix with soil, food and water. Rice or maize consumes 30-35% of the chemical fertiliser applied; the rest mixes with water and soil and goes to rivers and affects fish. It endangers the ecological system, bio-diversity and food safety. It will not happen if farmers cultivate jute, rice and pulse as pest and weeds both are different for rice and jute. (Dr M.A. Sobhan, Research Consultant, Policy Research for Development Alternative – UBING).

The preparation of land for maize cultivation is severely destructive and violent as it destroys other microbes and herbs ...To prepare land for maize cultivation, farmers use herbicides...

In the soil, there are different layers and there are canopies. Different types of worm and insect remain, collecting food from different layers of soil. In traditional/indigenous maize cultivation, it was possible for all layers of microbes and worms to collect food, strengthening mutual harmony, dependency and sustainability. Maize cultivation destroys soil eco-systems caused extinction of different worm and insect/vermin. These are Kecho (Earth worm, worm), Bang (Frog), Moumachi (honey bee), Kakra (crab), Kuiccha (eel fish), Shamok (Snail), Projapati (Butterfly), Finge(Swallows) and Harichachamoch(Black drongo) etc. (Pavel Partha. Researcher, Ecology and Biodiversity Conservation, BARCIK)

The Deliberative Panel discussion explored the dependence of maize on insecticides and the negative implications of this on ecosystems and biodiversity.

There are five billion micro-organisms per square centimetre. Now, with chemicals, this is getting disturbed. The field has become a factory. Now it's assessed in terms of inputs and outputs. Earlier 5% of micro-organisms were there, now it is 1%. If this comes down below 0.8%, it would not be good for agriculture. (Shoban in the DPP)

In maize for the last 2–3 years there has been a particular kind of worm, which is under the soil and cuts seedlings from below. It is because of a change in weather. Spraying of insecticides was severe in rice but now also in vegetables and maize in the month of Karthik. (DPP)

In Kurigram, the number of friendly insects has come down severely and is decreasing. The number of birds, earthworms, vultures and spiders is low. The ecosystem is disturbed. ...Due to use of chemical pesticides the weather has changed. The crop system has also changed due to changes in practices. (DPP)

Experts indicated that preparing the land for intensive maize cultivation involves repeated and intensive tillage and ploughing and the usage of herbicides. This destroys vital micro-organisms in the soil, damages soil structure and eliminates uncultivated plants (which provide valuable ground cover, biodiversity, food for pollinators, as well as subsistence food and herbs for people) and contributes to the greenhouse effect by the emitting more CO₂.

Besides, the intensive tillage of soil with tractors increases greenhouse effects by emitting more carbon dioxide; these 4–5 inches of intensive tillage badly affect soil health. (Dr M.A. Sobhan, Research Consultant, Policy Research for Development Alternative – UBING)

Deep ploughing is also affecting, soil retains nutrient value until six inches. Now it is losing content. Also severe use of fertiliser is being done without taking into account the status of soil. (DPP)

The current over-dependence of maize on chemical fertilisers and inputs is also illustrated by the fact that farmers are no longer able to use the maize plant and its roots as an organic fertiliser as the soil is unable to absorb the maize plant and roots.

Traditionally, farmers use the roots of crops as a source of organic fertiliser; it mixes with soil and increases the fertility of land; in the case of maize, it does not happen. The soil can't absorb maize plant or roots after harvest. (Interview – Pavel Partha. Researcher, Ecology and Biodiversity Conservation, BARCIK)

Farming practices increase soil fertility. After rice cultivation of pulses and legumes helped providing decomposed material. It was a natural practice which has now been disrupted. (DPP)

It was noted above that in some parts of the *char* areas the problem of soil infertility was less problematic because annual flooding regenerated the soil, yet there are other factors inhibiting this mitigation:

Earlier the floods brought in alluvial soil and increased soil fertility. Duration of flood was also longer. Now infrastructure development has hampered. (DPP)

The heavy dependence of maize on irrigation also has far-reaching negative impacts.

The modern irrigation system with shallow machine by deep tube well, creates arsenic problems in our country. At presents 62 districts out of 64 are affected by arsenic. It is not only in drinking water: tomatoes, fruit and rice also are also affected it. Besides, having constant wetting by irrigation causes zinc to be unavailable to plants. Zinc makes 300 enzymes in the human body and prevents diseases. In the wetted land, zinc transforms as zinc phosphate, a solid molecule, which soil can't absorb, thereby creating deficiency of one important ingredient of soil. (Dr M.A. Sobhan, Research Consultant, Policy Research for Development Alternative – UBING).

This is contributing to water scarcity and reducing the water table where it is being cultivated.

The compression of tractor on soil also creates obstacles of natural recharging of rainwater into the underground water layers. The flood water is not recharging the underground water layers as it should; rather it is going to the sea through the rivers. (Dr M.A. Sobhan, Research Consultant, Policy Research for Development Alternative – UBING).

Wind damage

As identified in the stories, damage to maize crops due to winds and storms was seen as a major challenge. This was attributed by some to cultivation in the wrong season.

Sometime maize plants broken down due to storms/heavy wind. (Interview – Aramat Hossain, Assistant Agriculture Officer at union level)

Paddy and maize are both susceptible to harsh winds, but with paddy, you can recover at least something; once maize falls, it is a complete loss. (DPP)

For eight years I have been growing maize. If there is good amount of urea, then the plant grows very tall and we are happy, but once there is even a small gust of wind, it falls down. (Manikganj Male Farmer – DPP)

Katalyst argues that addressing seasonality issues can minimise wind damage:

It is important to know the time you can grow maize when the maximum profit can be taken. Based on that, loss due to winds is avoidable. Floods and monsoon happens in kharif, in winter maize is safe. ...There are seasonality-related issues to consider. It is kept in mind for each crop. We focus on winter maize and kharif maize. We engage with private companies for this.

But this is dependent on good training and dissemination of knowledge throughout the system and, as we shall see later, this is frequently not happening.

Loss of traditional farming practices that ensured sustainability

The Deliberative Panel discussion emphasised how maize cultivation is leading to the demise of more sustainable multi-cropping farming systems and the loss of more resilient indigenous seeds.

In Barishal area, Paddy is cultivated during monsoon and for this the larger tuber variety is used, which delays Rabi. In the north, timing is late September or Early October. In Barishal, being a coastal region, the chances of maize damage is high. If one goes for shorter T-amon rice, it has a shorter cultivation period. (DPP)

There are many local/indigenous varieties of paddy which can help in matching the maize cultivation period. They are harvested in Karthik month. BRI also has varieties of 100 days. (Shoban – DPP)

Intercropping and mixed cropping with maize, cowpea, pulses should be promoted. Farmers can also grow tomato, radish, potato, watermelon, green leafy vegetables, lentils and sweet potato. (Shoban – DPP)

Some saw the threat to indigenous seeds as lying with corporate vested interests:

In the packet of maize seeds of giant MNCs [multi-national companies], there is a disclaimer written in a very small size: it is difficult to read (you need a magnifying glass) and says there are no GM particles in the seeds. Our farmers have no idea about GM crops and there are no checks from any government agencies about it and what is in the seeds. These giant companies produce terminator seeds and they have herbicide-ready crops. Our fear is that they are doing a field trial of these seeds. I have found that in many areas where herbicides were used, other maize varieties can't germinate. I can't specify this but we found it in the field visit. (Pavel Partha. Researcher, Ecology and Biodiversity Conservation, BARCIK)

To make farmers dependent on the economy of companies. Traditional seeds are getting lost. (DPP)

Some of the key crops seen to under threat as a result of maize cultivation are potato, sweet potato, onion, garlic, chilli, nut, pulses, wheat, mustard, *teel*, *tishi*, *kawon*, jute, brinjal, cabbage and *kachu*.

Mitigation?

The opponents of maize cultivation argue that maize should not continue to be cultivated – that it has already resulted in far-reaching negative ecological changes and that it to be banned immediately. Those who are in some way associated with the cultivation of intensive maize, while acknowledging the negative ecological impacts, propose measures to mitigate it. Dr Thakur Prasad Tiwari of the International Maize and Wheat Improvement Center (CIMMYT) said:

In technical terms, we call maize a voracious plant, which needs more fertiliser than rice and wheat, but we are trying to incorporate residue, and also by integrating legume in maize-based system so that soil health is maintained. ...Some farmers rely completely on fertiliser, which will destroy soil fertility. To address this, we are importing new machines from China and India and asking farmers not to plough completely. Machine will sow seeds and fertiliser. Adopting this technology, farmers need not plough 4–5 times, but rather do one small tillage. Things are not moving fast; it will not change overnight. There are other factors also.

The problem with this is that even if it was able to mitigate the problem, small-scale farmers will not have access to this technology. A representative from one of the leading seed

companies in Bangladesh felt that there was a need to apply both organic and inorganic fertilisers and that there is no problem rotating maize with rice, as maize is a dry-land crop.

We advise farmers to apply organic fertiliser, vermin compost, and the Integrated Pest Management (IPM) system, use more local and indigenous seeds and not always depend only on the hybrid seeds. We also advise them to adapt with climate changes; cultivate some advance crops of short duration in order to avoid risk and problems. (Aramat Hossain, an Assistant Agriculture Officer)

According to Emdadul Haque, an Upazila Agriculture Officer from Maikganj, the underlying issue lies with the chemical fertiliser. This applies to many crops but is amplified in maize because of its high demand for inputs:

Maize is a deep-rooted plant; it effects the soil fertility. To address this problem, we advise farmers not to cultivate maize more than twice in same land. We also advise farmers to sow legume plants like daincha (Sesbaniaacannabina) after maize cultivation. Traditionally, daincha has been cultivated in this area. Yes, there is a problem of more use of chemical fertiliser in maize, but it is not only the case with maize. This problem is related with vegetable and rice cultivation as well. To address the overuse of chemical fertiliser and pesticides, we are advising farmers to use more organic fertiliser and also to cultivate more leguminous plants. This is not the problem maize or other crops, it is a problem of management of chemical fertiliser – how to manage the problems of chemical fertilisers.

Katalyst interviewees also offered this advice. The problem lies in the availability of organic fertiliser for small-scale farmers. However, this does not account for other issues mentioned above such as the impact of diminishing crop diversity, loss of traditional crops, and problems from irrigation.

Training and capacity development

More generally, the research highlighted that there is still a strong knowledge gap among farmers and in some cases a lack of capacity among trainers. The Katalyst team themselves raised this difficulty.

Some staff are not as capable. They lack capacity. We try to build their capacity with staff training programmes etc. These are some ways in which we try to influence the set of information, but we are not present at each event. (Katalyst – interview)

There are only 12 to 15 people in Katalyst and many companies are involved. We have limited capacity to check and find out the authenticity of the trainings being done. Cases where companies are found not to be working as per our mandate, we do take action.

It was also raised by others:

The capacity of each staff member is not the same. ... what they share is not even right.

This was amplified in deliberative panel discussions that highlighted, for example, that a lot of farmers were planting in the wrong seasons, which made them more vulnerable to environmental damage. This lack of capacity can be distorted by a vested interest in selling: 'it is in the interests of companies that sell pesticides. They just sell ...but they are ignorant. They are applying insecticides to control bacterial blight!' (DPP). This theme of lack of knowledge was reinforced across the study:

Different seasons have different seeds. The retailers have no adequate knowledge about the season. Sometimes retailers sell seed to farmers which are not suitable for the respective season. (Representative from one of the leading seed companies in Bangladesh)

Farmers are ignorant about pesticides and actual usage. This makes them dependent on companies. Many farmers ignorantly use insecticides for bacterial leaf blight. (DPP)

If an intervention cannot guarantee the quality of training and information that is required once it has persuaded people to change crops, then it might be regarded as breaching its 'do no harm' principles. A programme on this scale cannot be driven only by a theoretical logic but also by the realities of implementation.

Reflections and conclusions on ecology and the environment

Despite the fact that mono-cropping is not promoted by Katalyst, varieties of maize promoted through the interventions are typically cultivated as part of a much less diverse portfolio of crops than is found amongst general farmers, and maize would typically be the dominant crop. This has serious negative implications for long-term soil quality and health, biodiversity and overall functioning of the ecosystems of the area. Being a deep-rooted crop heavily dependent on irrigation, chemical fertilisers and pesticides, maize contaminates water bodies, drains the soil of vital nutrients, destroys non-pest organisms, reduces the water table and, overall, imbalances agro-ecological systems. The entire process involved in the cultivation of input-intensive varieties of crops like the maize promoted by Katalyst works against a system of sustainable agriculture involving the cultivation of a wide mix of other vital species. Some solutions to the negative impacts of maize cultivation that could be further investigated involve multi-cropping and rotational cropping with legume-based crops, and greater use of indigenous and open-pollinated varieties of maize.

Gender

While women's empowerment was not part of the rationale for choosing maize as a sector, it is nevertheless one of the indicators used by Katalyst in its monitoring and evaluation process, and it is very important to donors. In order to integrate and empower women in any system, particularly within market systems approaches, we have to actively influence the system to change in this direction, explicitly targeting women. Women's roles, access

and agency, gender dynamics must be considered from the beginning. It is important to understand gender because even if there is an increase in income for a household, this does not necessarily translate into an increase in income for women and a shift to maize may lead to a differential impact on the quality of life.

Findings from the stories, the clustering and the mapping

Out of the 33 stories collected from female-headed households, very few talk about maize cultivation. We find a number of references to the fact that traditionally women were engaged with rearing cows, goats, chickens and ducks at home.

My wife rears cows, goats, chickens and ducks at home. With this income and adding my daily labour earnings, I took lease of dhona [dhona = 22 decimal] of land in 1999. (Story 103)

The shift to intensive maize production is seen to be undermining this traditional work, with impacts not only at a household level but also on the local ecology:

The scope of rearing chickens and hens at family level has been decreasing. It is affecting the natural food system of commoners, and also has been decreasing access to natural resources. The vested groups are doing business on it and government has no control over it. The destruction of natural-based food system is mostly affecting women and children. (Rezanur Rahman, Nijera Kori)

Women are increasingly economically dependent on agricultural labouring, but they have to do this on much lower rates of pay than men:

For the past 6–7 months, I have been going to the char regions and working as a day labourer. The male farmers there receive Tk.70–80 more than the female farmers. We receive a minimum wage of Tk.120 to a maximum of Tk.150, but the male farmers receive wages of up to Tk.250. We are paid less whereas we do the same amount of work. But I still have to do this or else I wouldn't be able to feed my son and myself and bear the expenses of his education. Many women of my village have taken up the occupation of day labour following my footsteps. (Story 137)

Findings from the ranking

The ranking data corroborates that story analysis. Women were most engaged in paddy and poultry. They were also involved in duck and animal rearing. Maize was ranked as moderate to low for engagement of women across all areas.

Table 10: Ranking of crops which most support women's engagement

		Engagement of women
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Ranking	Income source	U	M	G
1	Maize	5	6	8
2	Paddy	4	1	4
3	Animal rearing	2	3	3
4	Vegetable	8	4	6
5	Jute	6	8	9
6	Poultry	1	2	1
7	Duck	3	5	2
8	Nuts	9	-	10
9	Pulses	7	9	7
10	Mustard	10	7	5
U = Ulipur; M = Manikganj; G = Gaibandha				

Analysis from the deliberative panel and interviews

Where women were coming into agriculture, there seemed to be two underlying reasons. Panel members said that wages for employing men in agriculture had increased so opportunities were being made available to women in order to keep wage bills down:

Wages are 200 taka for men and 150 taka for women. (DPP)

During the sowing and harvest seasons when work is more, the wages are as follows: 500 taka for men (working from 9am to 4pm) and 200-250 taka for women. When the work is less, the payment for men is 200 and for women is 120-150. (DPP)

In Southern Bangladesh, men get 400 taka per day while women are paid 200 taka per day. Both are provided with three meals. Women have to do additional work at land owner's house like cleaning, washing utensils. (DPP)

Also, with increased road connectivity and opportunities in urban centres, men in the family have started migrating to urban centres to look for jobs, which means that women have to take care of the fields. This is important because if men are going to the cities, then it is unlikely that maize will be the crop of choice for the women who are left behind to farm.

Harvesting maize – cutting and carrying of bundles – is done by men while collection is done by women. (DPP)

Men usually come during sowing and harvesting, otherwise women take care of the fields. (DPP)

If I work with other men in family, I save the wages and in a way save the cost that would have been incurred on labour. (DPP)

Women are much less likely to be involved in cash crop commodity markets than men:

Farmers go to dealers' shops and get dealers' advice. This leads to expansion. Sometimes DAE also advise and push for expansion. But that outreach mostly extends to men. (DPP)

Maize is sold by men in the market; women don't go to market for this. (DPP)

In Manikganj, storage of seeds is women's domain while men take produce to the market and control the money. This increases their bargaining power. (DPP)

Storage facilities are under the control of traders. This is different from rice, where control of storage remains with farmers, which gives more scope for women's involvement.

In rice there is more work as farmers keep a buffer; they sow, harvest, threshing is done and also stored for preserving. In maize, there is less engagement as after threshing, farmers just dry and sell. In maize, storage-related skills are not with farmers. (DPP)

It was discussed that in terms of scale of production, it is always beneficial for the trader to deal with large farmers as aggregation of produce becomes easier. But mechanisation at large farms tends to side-line women. (DPP)

If the field is as big as 2–4 acres, machines are installed for threshing. In smaller fields, it is manual and is mainly done by women. (DPP)

Women are less involved in mechanised farming. If it is machine work then men do it. (DPP)

The effects of the micro-credit market in converting women into mere recipients was further reiterated during one of the interviews:

A large portion of rural women are recipients of micro-credit from different NGOs, and these NGOs have their agricultural activities. They distribute seeds to rural women and women are bound to receive these seeds as a condition of remaining in the micro-credit groups/samities. It is mandatory; women have no choice. Women are not participants/actors in micro-credit-based development process: they are just recipients. (Rezanur Rahman, Nijra Kori)

All of these drivers combine to undermine the traditional roles of women in agriculture:

We know traditionally women preserve seeds. Traditionally, seed is the woman's right; the hybrid seeds take these roles away from women. In case of maize, seeds women can't preserve the seeds. Seeds are now under the control of giant MNCs like Monsanto and Syngenta. Women in general are disempowered in this case. (BARCIK)

In traditional rice cultivation, women's major roles are seed preservation, showing/planting seeds, drying rice after harvesting and also preserving fodders from rice plants after harvesting. And in every stage of cultivation, there was role for

women and there remained the scope for discussion at family or household level, and they also had scope to take joint decisions at family level. These have been replaced by the technology-based modern agriculture. It is now separated from family and being controlled by the market and company. (Rezanur Rahman, Nijra Kori)

Women's role has been decreasing due to the handover of traditional family-based knowledge agriculture to commercial-company based agriculture.

Katalyst staff pointed out that in some areas, some women were beginning to go to the market for purchasing and selling. However, access to the market is still a huge gap. Similarly, extension services almost only reach out to men, although panel members pointed out that as there are some women block supervisors and sub-assistants in the agriculture department, they have started reaching out to women farmers. Training also goes almost entirely to men. When asked why we don't see women in participant lists or in training programmes, the Katalyst team acknowledged that,

No women have been part of the trainings organised by Katalyst. Facilitators are usually the company staff who have also received training from the Department of Agriculture Extension. (DPP)

Reflections and conclusions on gender

The promotion of market chains such as maize offers limited potential for empowerment of women in agriculture. On the one hand, women's traditional roles have been undermined, on the other hand new opportunities available to them are relatively poorly paid and unstable. Finally, women's potential will be restricted by their lack of control over the income being made by the crop, reduced mobility and limited access to markets. Women are heavily constrained by gender specific barriers (mobility, time poverty, negative social norms) when selecting the type of crops they can grow. Often they will select crops with less input requirements, with a quick turnaround or that requires less technology.

If a core objective of the donors is women's empowerment, maize production does not seem to be a natural choice, given the high level of mechanisation and reliance on external seeds among other characteristics. Katalyst acknowledges that gender was not a dominant factor in the selection of maize sector⁶:

⁶ In 2014 Katalyst commissioned a gender study of the maize value chain, completed by EDGE Consulting. They concluded that 'the contribution of women in maize value chain is enormous'. However, when they explain in detail the role that women have within the chain it is not at all clear how they are being empowered:

- The only female maize farmers are female headed households
- Married women often 'help' their husbands on the fields at no cost, hence carrying the tasks but having no control over the money or decision-making power within their household

The overall problem was that production was not rising quickly enough to meet the escalating demand, meaning that farmers were missing out on the opportunity to profit, and the feed processing industry was rendered dependent on imports. This problem represented the symptom of poor market performance: (Taylor et al. 2016, 73)

Katalayst addressed the gender dimension later, by introducing a vegetable intervention among others, targeted to women specifically. We are not in a position to assess whether this changed focus has improved the lives of women in these intervention areas, but the evidence suggests that, at least in the maize interventions, women have not benefited from increased empowerment, on the contrary, there is a risk that traditional unequal structures have been strengthened.

Synthesis of Findings

As we clearly stated at the beginning of this paper, this is not an evaluation of the Katalyst programme. It is evident that within its own programme logic, the Katalyst maize programme has succeeded on some fronts (e.g. reaching small-scale farmers) and failed on others (e.g. constructively engaging women). Nevertheless, the research has generated questions for the programme as well as the wider market systems community.

Labour, income and profit

- Women work as paid labourers. Wage labour in agriculture is often the least paid and hardest job, seasonal, informal and with no security, health benefits or economic security

These conditions are highlighted by the quotes below, where the report mentions the gender gap and unequal roles that women and men play within the sector (Edge Consulting 2014:31):

...the typical jobs women perform costs less to the farmers and traders compared to if performed by men and thereby provides a cost advantage to the finished goods to compete against imports.

More engagement of women can increase the efficiency of the sector and result in higher productivity and cost competitiveness

There is no evidence in the report that any of the roles women currently have in the maize chain (except for the female headed households – resulting from an absence of a male presence) would lead to women's increased empowerment.

The Katalyst programme does appear to be reaching small farmers especially in the Char areas.

There was agreement from all the stakeholders who participated that maize can and often does generate profit, but it is unclear how many of the smaller-scale farmers are profiting (net income), by how much, and for how long and if that profit has compensated for the costs across years. Farmers said that (a) other crops (such as vegetables) also produced significant profit while contributing to food security as well as other imperatives of the donors such as women's empowerment, and (b) the relative profitability of crops was highly context dependent. For example, in Ulipur (one of the areas of intervention), nuts contributed the highest amount of household income, and in Gaibandha (another area of intervention) maize was ranked 9th out of 10 income sources.

Farmer-level evaluation of income by Katalyst has thus far been based on relatively small samples, it is not clearly disaggregated by farm size, it does not appear to take into account losses from crop damage, and it is only assessed on the first or second year of engagement with Katalyst training or distributors (according to the documents reviewed). The log frame indicates that any changes in income for 'farmers and micro, small and medium enterprises' are measured up to two years after the end of an intervention. This was confirmed in our interview with the Katalyst team on 6 February 2017 where it was explained that most of these assessments are done very soon after any intervention. This raises some concerns. It was agreed by all parties that soil nutrient depletion was a real problem with maize and it was reported strongly by farmers that there is a pattern of relatively low fertiliser and pesticide input in the first couple of years, but this ratchets up radically in the following years. This could have a significant impact on any additional profit that farmers – and especially small-scale farmers, are making, both because of the costs of these inputs as well as because of changes in the production potential of the land. The Ministry of Agriculture and the CIMMYT say that maize should not be produced more than two years in a row and also that they encourage intercropping but it is not clear that this is being effectively communicated by Katalyst trainers. It is also unclear whether clearer communication about the risks of monoculture or mono-cropping of maize would effectively reduce its practice if there exist systemic drivers (e.g. leasing land, the need for minimum quantities for sale) which encourage these practices to occur.

Specifically, it is clear that as a process, increased cultivation of maize is likely to benefit large farmers more than small-scale farmers. While this principle also applies to many other commoditised crops, its effect is amplified in the maize sector. This was clear from our interview with Katalyst/Swisscontact:

'maize has to be produced in a bulk amount – maize cannot be cultivated at a homestead level and sold'..

'maize is more capital intensive'

'small farmers don't invest'

The reality is that small-scale farmers *can't* invest, and without insurance the risks are too high. Large farmers have the possibility of introducing some elements of mechanisation; they are more likely to keep livestock so have the advantage of being able to more easily

add organic fertiliser to their crops; they are also more likely to have the cash flow that would allow them to cover high and increasing costs of fertiliser as soil quality depletes; they are in a position to take greater risks as they often have other sources of income to offset crop losses; and, critically, they are likely to have storage facilities which (a) protect the crop from damage and (b) mean that they can take it to market when the price is optimal. Farmers also reported that there was no processing centre for people who have a small amount of land (DPP). For all of these reasons potential profits for capital intensive crops such as maize for smaller-scale farmers will be significantly less than those for larger farmers.

Food security and nutrition

Food security emerged as by far the highest priority for poor farmers. The Katalyst assumption that increased income equates to food security is not supported by the evidence. Food security emerged unprompted as the critical issue for small-scale farmers in half of the stories: 97 out of 201 general farmers highlighted the critical importance of rice in safeguarding food security. On the maize map there was no link made between profit and food security and subsequent discussions showed that people did not equate profit with food security. It is clear from the deliberation that for small-scale farmers, potential profit is usually offset by the risks involved in losing a crop. This could mean losing land or simply not having anything to eat if there is no money. Farmers are also aware of the danger of diminishing profits and land that becomes infertile. All these factors threaten their food security. Under close questioning, farmers were adamant that they would always chose food security over both labour and potential profits for the reasons given above. This represents a strong challenge not only to the assumptions underpinning Katalyst programming, but the working assumptions of the current Katalyst staff team. While the nature of the programme is to intervene at the market level, it is nevertheless surprising that a programme targeted at poor farmers has not engaged with this issue.

The risks to farmers of maize who are highly dependent on it as a cash crop are high. Around 15-20% of the maize farmers told stories of crop damage – particularly as a result of wind (18%). Other significant risk factors include:

- Soil depletion from heavy fertiliser use that results in reduced profit year on year because of the high inputs of fertiliser needed to maintain productivity. It was widely recognised that in the long term it would not be possible to buy inputs to rebuild soil fertility and that eventually they would either have to be rebuilt through bringing in large amounts of organic matter or abandoned. Some farmers reported that the loss of income would force them to sell their land. Katalyst staff recognised that the issue of soil fertility is a problem and has pointed out that they recommend ‘a balanced combination of macro, micro fertilizers and organic compost’ however this balance was not evident amongst the 100 farmers in this study. The reasons for this lack of balance in practice could include: the costs of fertilizers; the difficulties in creating change through trainings; and the fact that small farmers tend not to have easy access to organic compost as they have few or no livestock.
- Insect damage resulting from the ecological imbalances that develops as crop diversity reduces - leading to high inputs of pesticides.

- Adulterated seeds – which places farmers at risk of losing their income once they have become dependent on cash crop income. While Katalyst has worked with its partners to reduce adulteration through branding, better packaging and a ‘Unique Tagging Number system’ the evidence from farmers suggests that this is still a significant problem.
- Lack of storage and threshing facilities – resulting in crop damage and/or the need to sell more quickly at less than optimal market price.
- Reductions in market price for poultry and for maize.

Ecology and Environment

All of the experts said that maize depletes the soil and was not sustainable

In their promotional events, Katalysts’ partner companies explicitly state the adverse effects of cultivating the same crop in consecutive seasons. However, despite the fact that Katalyst does not promote mono-cropping or monoculture, we found that in our sample most of the maize farmer’s stories referred primarily to maize whereas the stories from the general farmer category were much more diverse in their references to crops and animals. This suggests, at worst a tendency toward mono-cropping and/or mono-culture, and at best a significant reduction in crop diversity which cannot simply be addressed by advocating mixed cropping. This has serious negative implications for long-term soil quality and health, biodiversity and the overall functioning of the ecosystems of the area. Being a deep-rooted crop heavily dependent on irrigation, chemical fertilisers and pesticides, maize contaminates water bodies, drains the soil of vital nutrients, destroys non-pest organisms, reduces the water table and on the whole imbalances the agro-ecological systems of the areas in which it is cultivated. Input-intensive varieties of crops like the maize promoted by Katalyst work against a system of sustainable agriculture involving the cultivation of a wide mix of other vital species. However, there are ways to mitigate the negative impacts of maize cultivation that could be further investigated. These involve poly-cropping, rotational cropping with legume-based crops and greater use of indigenous and open-pollinated varieties of maize. Katalyst told us (response to draft report) that they “work closely with organisations such as CYMMIT and Bangladesh Agriculture Research Institute (BARI) who are promoting sustainable maize production in the country. According to these organisations, even though maize is a nutrient heavy crop, a balanced use of fertiliser, proper cultivation methods, appropriate residue management and cropping system will provide long term sustainable income from maize without deteriorating soil quality.” We did not see evidence that this is what is actually happening on the ground.

Large scale programmes which operate at a system level inherently face a challenge in ‘getting their message to the ground’. There can be a capacity gap in knowledge as the programme cascades out to distributors who talk directly to farmers. While Katalyst-

supported farmers receive more training than general farmers⁷, Katalyst staff in the deliberative panel acknowledged that the quality of this training is variable and it is difficult to quality control. Furthermore, if wider systemic barriers to implementing their messaging (e.g. factors which encourage mono-cropping of maize) are not addressed, improvements in communication networks will not be effective at changing these practices.

Gender

Katalyst's theory of change explicitly talks about poverty reduction for men and women. Yet Katalyst is very open that it has struggled to constructively engage women in its programme.

The evidence from this research is clear that the spread of maize reduces the engagement of women in work which will improve their well being, and more generally undermines women's traditional agricultural work so it is hard to see why maize is being supported. Katalyst argues that their vegetable (and other) interventions address the gender question, but this is not always in the same locations, and in any case does not change the basic fact that maize is unlikely to support women's empowerment.

Given the decision to choose the maize value chain, could Katalyst have done more to engage women? Katalyst team members said that very few women have attended Katalyst training events. It is widely recognised that women face multiple and overlapping barriers to realising their full potential in terms of access to education, information, decision-making power and earning power (among other factors). Because of this, unless specific efforts are made to empower women, interventions will rarely benefit them.

Reflections for the donor and market system community

Taking a systems approach requires us to look both at the assumptions underpinning a programme and at the boundaries that analysts put around a programme. The M4P Operational Guide (The Springfield Centre 2014) defines systemic change as: 'a change in the way core functions, supporting functions and rules perform, that ultimately improves the poor's terms of participation within the market system' (Taylor et al. 2016). In our view, this conceptualisation of a market system is extremely narrow. One of the key dimensions of systems thinking and systems approaches is the idea of boundaries. How you construct the boundary around the system that you engage with is a highly political process. In this case, the boundary that has been constructed is around factors and actors that contribute to the development of markets. These boundaries are often designed after the market

⁷ Few general farmers got any training. Receipt of training was only mentioned by one of the 201 farmers in the general group (although there was some mention of advice from NGOs, government officers and other farmers)

analysis that the programmes carry out, defining the sector and the target group the interventions would focus on. The boundaries selected will affect how the system changes and the impacts that it has on the lives of people. In the existing framing of systems, only the additional income for farmers is included in the system, but their broader life experiences, food security, risk and so on are not in the system. Furthermore, non-beneficiary farmers are not included in the analysis. Yet shifting the pattern of cropping across a locality is likely to have impacts on all farmers and households in any given area. It is difficult to see how it would be possible to test assumptions about whether it was in the interests of farmers to shift to maize unless these are brought within the system boundaries of the intervention, and arguably put at the centre of the systems analysis, as opposed to a commodity being at the centre.

The Making Markets Work for the Poor (M4P) or market systems approach is generally based on an assumption that improved access to market opportunities leads to profit which in turn equates to improved quality of life for farmers and their families – including food security. As we have seen above, this is not a robust assumption for a programme of this scale to make. Indeed, it appears to be strongly contradicted by this research. We are specifically concerned that a programme promoted as being focused on the poor could be designed and commissioned without any reference to food security.

There is a growing body of research that is trying to expand market systems boundaries – looking at how social norms, household dynamics and power dynamics among others interact with market systems (Jochnick 2012; Maestre and Thorpe 2016; Markel et al. 2016). When programmes understand the market system to only include activities directly associated with commodity exchange, the key insights that should be derived from a systems approach – infrastructure, households, norms and institutions, among others, outside the market – are lost (Maestre and Thorpe 2016).

The aim of market systems interventions is to achieve systemic change ‘at scale.’ Yet market price and profit, labour inputs, agricultural inputs, vulnerability to climate as well as what grows effectively where, all vary radically by region. A one-size-fits-all approach to interventions in one main market system or crop cannot work effectively across this diversity. While we are aware that Katalyst worked with other crops in different localities (and in some cases the same localities), maize is one of their longest and most widespread intervention. One of the dangers of market systems approaches is that because they operate at such a high level, based on assumptions of how the changed market will impact the poor, the interventions designed often fail to recognise local realities. For example we saw in the rankings above how radically different the market price and profitability of different crops is across just three localities.

The Katalyst programme could be seen as a programme ‘of its time’. It is strongly resonant with the Millennium Development Goal (MDG) agenda, which can be characterised by a desire to generically increase economic growth in order to benefit the average population of low - and middle-income countries. Successful MDG programmes typically lifted some families out of poverty but left the poorest and most marginalised untouched or damaged. A Sustainable Development Goal (SDG) agenda focusing on leaving no one behind has a different imperative and demands benefits for the poorest. Aside from the fact that market

system programmes of the type described in this report seem designed to benefit bigger farmers, they do not take into account the complex intersectional inequalities faced by the poorest (Burns et al. 2013). A programme designed to respond to SDG imperatives would not look like the current market systems programmes.

It would seem highly contradictory to the ‘do no harm’ principle to promote maize when a significant proportion of those transferring to maize are vulnerable to loss of crops with highly damaging impacts for their households. To introduce changes on this scale into the system without considering issues such as insurance schemes for poor farmers to mitigate crop damage is also troubling.

Programmes of this type need to be far more certain that those who are facilitating on their behalf have the capacity and knowledge that is required. Messages about diverse cropping patterns and organic inputs for example are not always reaching the intended recipients. It is important to be sure what is being communicated – not to simply hope that what is being communicated is what was intended. It is also essential to understand the systemic factors—such as incentives for bulk cropping—which may further prevent messages from being implemented as intended.

Recommendations

We would advise that before starting any major intervention, a much deeper systemic context analysis should be carried out which starts from farmers’ perspectives and is broadened out to include economic activities, labour and/or markets, but also household and community relations, institutions, environment and so on. Similarly, an intervention which has involved spending \$150 million needs a robust assessment of its wider social impact through research and evaluation which is framed in relation to the priorities of poor farmers and assesses the impacts on poor farmers (both beneficiaries and non-beneficiaries). This needs to be done on a significant scale and to take into account the radical differences between localities. While this research goes some way toward highlighting some of the wider systemic consequences of this programme, we still need to know a lot more.

Serious consideration should be given to the actual conditions faced by the potential beneficiaries of these programmes as well as other populations which may be affected. For example, the risks which flow from widespread seed adulteration, or vulnerability to global grain and poultry markets. Some of these risks are acknowledged in Katalyst’s own literature:

Adulteration of seeds, for example, is a common practice and so the productivity of what is supposedly an improved variety will not live up to expectation. Storage of inputs, too, is poor and causes the products to degrade and their efficacy to decrease. (Taylor et al. 2016, 24)

Despite acknowledgement, the problem remains. While initiatives of this type potentially offer some profit to the majority, they may lead to destitution for a significant minority. We

are concerned that this ‘opportunity’ has been opened up without attention to issues such as insurance. If we encourage people to cash crop with the prospect of additional profit but expose them to a high risk (15-20% in this study sample) of their livelihood being destroyed by climate with no insurance, one might regard this as an abdication of responsibility – which has the potential to undermine the ‘do no harm’ principle.

When balancing issues like profitability, food security, women’s empowerment and environmental issues, maize will often not offer the best balance. Other scenarios – probably different for each area – are likely to provide a better balance. We saw, for example, that vegetables combined with paddy might be more environmentally sound, offer real employment to women, provide food security and make a profit. These issues need to be prioritised when value chains are selected.

It is important for large-scale agricultural related programmes not only to consider the short-term benefits for farmer income but the long-term sustainability of the soil, water and wider ecosystems. This should be reflected in choices of sector, mixes of crops proposed, and the extent to which crops rely on high levels of non-organic inputs and irrigation. It is not enough for the programme to advocate for these things, they have to understand and respond to the systemic drivers that push the system toward unsustainable outcomes.

Finally, we advocate for a participatory discussion to set the boundaries and assumptions of the programme from the beginning and on an ongoing basis, ensuring that all perspectives, and in particular male and female farmer’s perspectives are included. Ideally, the priorities and realities of the people who would be affected by such programmes should be at the centre of any intervention, as opposed to a commodity or market exchange. This would help better ensure that the programme measures and understands multidimensional elements of programme impacts while it is ongoing, and is capable to adapt and respond to unintended effects (positive or negative) experienced both by those directly targeted by the programme and those not targeted but belonging to the community, particularly the most marginalised. Including mechanisms for accountability to the most marginalised throughout implementation may also facilitate improved responsiveness to the multidimensional effects of these programmes.

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Appendix 1: Sample Stories

The following are complete sample stories from farmers which illustrate many of the themes that are explored in this work.

Story : Manikganj, Saturia, Hargaj

Sample type: Maize Farmer

Theme: Food security and nutrition

Name: Asif

Story Code: 61

I am Asif. I'm approximately 50 years old. I grew up in a needy family; I could not study. I had many siblings; the whole family was in hardship. However, I managed to pass secondary school certificate (S.S.C.) in 1994. I could not continue study as I had to address all the needs of family. I got married 20 years ago. Now I have one son and one daughter. My daughter is studying Intermediate level (H.S.C) and the boy is

in the seventh grade of school. I started cultivation when I left my education and took responsibility for my own family. I have been leading my separate family life for the last 12 years. And I used to cultivate on 120 *decimal* land. In addition, I raise cows.

Mainly I yield rice on my lands. Rice is the main crop of my agricultural products. In addition I grow cauliflower, chilli, potato and maize. I cultivate these crops in parallel with growing rice. In 2–2.5 *pakhi* of land I used to cultivate winter vegetable cauliflower and cabbage. I cultivate chili and potato on rest of the lands. If the market price is good then I can get good income from producing chilli and potato. In addition, cabbage and cauliflower bring good money. I can sell more than Tk one lakh (Tk100,000) cauliflower / cabbages that I grow on 2–2.5 *pakhi* lands. I have to spend Tk.30,000–40,000 for growing this vegetable. If the weather is good and there is no attack of insects, I do not need to worry at all. But in 2014 and 2015 my cauliflower/cabbage was affected by insects and the plant started rotten. Unfortunately I lost Tk.60,000–70,000. It was a great loss for me and it almost turned me into a beggar. I had to work hard to recover from this. I took a loan of Tk.50,000 from Bangladesh Kriasi Bank and sold one of my cows. I got Tk.25,000 from selling the cow. I cultivated rice again on my lands with that money.

Now a day's cultivation of rice is less profitable. As the expenses are higher than the selling price, the profit goes down. However, I cultivate rice to fulfil the food demands of my family. I used to get 60–70 mands rice in a year [1 *mand* = 40kg]. I keep the amount that I need to feed my family for the year, the rest I sell in the market. The cultivation of vegetable addresses the needs of my family. Apart from fish and beef/meat, I do not need to buy a lot of things form market.

I cultivated maize three years earlier on my 2.5 *pakhi* lands. However, I could not make any profit. Actually, the crop was not very good. That is why in the next time I did not cultivate maize on my land. In addition, growing maize causes decaying of land. The land turns non-productive. Because of that I did not try maize again. Syngenta included my name in their training. They informed me about their maize seed. But I have decided not to cultivate maize any more.

I do not need much profit. I could not kill my livelihood assets. As we are farmers, if our lands are alive, we can live. That is why I care for my land and do not cultivate maize. I produce rice, though it is less profitable but I have peace of mind. In addition, I can cover the losses from rice from the cultivation of potato and cabbage. At present there is no peace in agriculture. We used to produce crop without fertiliser and pesticides. Now we could not even imagine doing that. In addition, everywhere there are hybrid seeds. And they do not have any taste and nutrition. However, there is no way out. That is why we are forced to continue cultivation. On the top of that, agriculture is my passion. I think if the agriculture and farmers survive, the country will remain alive – the people of the country will live as well.

Story: Kurigram, Ulipur, Thetrai

Sample type: Sharecropper, Maize Farmer

Theme: Poverty and marginalization, vulnerability and resilience

Name: Faraz

Story Code: 291

My name is Faraz. I am 40 years old. My father is the late Junaid. I am from the village of Darikishorpur. Among the children of my father I am the second eldest. I am a farmer by occupation. My father had two acres of land. I am illiterate. I have been doing agricultural work from a very young age. The name of my birth place is Juan Shotora. When I was only one year old, my house was eroded into the river. We became homeless. We had nothing to eat. We migrated to my grandfather's house in Darikishorpur, riding on my father's shoulders. We constructed our new house there. My brother and I used to work in other people's houses to meet our hunger. We were only given food in return, nothing else. When I was 16 years old my home eroded into the river again. We had to come back to Juan Shotora after this. We made a house on the *char* there. I fulfilled my needs by working as a labourer in other people's houses. When *char* developed on the river, the two acres of land of my father was ready for cultivation again. I got married when I was 19 years old. After my marriage, poverty struck our family and my father separated me and my wife from the family. We had no food in our home. After starving for a night, I went to other people's house in search of food. I started working as a day labourer in Jalil's uncle's house from the next day and I received one kg of rice and Tk.25 in return. I passed my days in this way for the next 2-3 months. After this, I took two *dhons* land from Sultan peon on the basis of sharecropping. I cultivated *Amon* and Scheme rice (IRRI with irrigation facility) on that land. I work as a day labourer on other people's lands. My wife and I worked together on our own land. After harvesting the rice, we used to take two-thirds of the rice for ourselves. We gave the remaining one-third to the owner of the land. We became self-sufficient in this way.

Five years later my wife gave birth to a baby girl. Unfortunately after that, my house eroded in the river again. Being destitute, I came back to Darikishorpur with my wife and my daughter. We had no food there. The MP there at that time, Fardeen, helped us out by giving us wheat *rotis*. We survived on those *rotis* for two days. Then I started working as a day labourer on other people's houses and raised cows on share system. I maintained my family in this way for two years. *Char* developed in my father's land again. This time, I cultivated nuts, maize, wheat and *Kheshari* on that land. Last time I cultivated garlic and maize. The garlic and maize yielded a loss; that's why I have not cultivated these again. Instead, I cultivate onion in this season. Maize cultivation is costly and for cultivating it we have to irrigate in sandy lands. I do not have a shallow machine of my own. I cannot bear renting a shallow machine from others, paying them Tk.100 per hour. It needs irrigation when maize crop grows. The crops get damaged if not irrigated in time. The maize plants broke down with *Kal Boishakhi* storms. With these risks, I stopped cultivating maize. I am a share cropper and I do not have much wealth of my own.

At present, I cultivate nuts, onions and rice as well as jute. My wife and I both work on the land. The nut crops were good this time. The nuts have to be picked from the land but we did not hire any labour to do it. We did the work ourselves from dawn to dusk, and dried the nuts in the sunlight. The market for nuts is good this time and we also harvested onions. But virus attacked the onions and many of the crops rotted. I think I might suffer a little loss for the onions.

I raise cattle. I will cover the loss of onions with the profit earned from cattle. I have to bear great hardship and maintain the expenses of my children's education from these. I have never taken any loans from any NGOs. I have not mortgaged my crops to the land owners for money either. Sometimes I borrow money from other people and pay it back to them through the wages I receive from my work as a day labourer. My family runs in this way. I do not feel like talking about my sorrow and I feel that my present home might also be eroded into the river someday soon. My house is only a hundred meters away from the river. I wonder which *char* I will have to go to next when my house eroded. The river has made me destined for such a life.

Story : Manikganj, Saturia, Hargaj

Sample type: Maize Farmer

Theme: Food security and nutrition, vulnerability and resilience

Name: Babbar

Story Code: 220

I am Babbar. I mainly work as a farmer. Now I am 30 years old. I grew up with my mother, father, brother and sister. My sister is now studying in class 7. We do not have farm land of our own. I saw from a very young age how my father leased other people's lands or sharecropped and did agricultural work. Half the crops yielded on sharecropping land have to be given to the owner of the land. We barely got through our days with the remaining crops. Poverty always followed us around. Things are no different even today. I often have to live my days in poverty. Amongst all these, I married 4 years ago. I also have a baby boy now. The expenses of my family have increased as well. I lease around 50-70 *decimal* of land per year and cultivate crops on them. In addition to that, I work for Thai Aluminium to meet the extra expenses incurred by my family. But this work is not regular. I pass my days in a lot of hardship.

I mainly cultivate rice on the land that I have leased. I mostly cultivate the IRRI variety as its yield is high. More yields mean I have to worry less. When there is rice at home it becomes easier to collect other things. The amount of rice I cultivate in a year is enough to meet the needs of my family. In an average year I grow around 20-25 *mands* of rice per year. I somehow pass the year with this.

I have been completely engaged with agriculture for the last 15 years. Planting rice, applying fertiliser to the land, getting rid of weeds, I do all this work alone. I hire labour when I plant the rice. I have to pay them Tk.400–500 per day in addition to

two meals. I also recruit labour during harvesting and for thrashing the rice. The labour wage are same at that time. On top of that, there is the labour of me, my father and other members of our family. Considering all these aspects, we found out that cultivating rice costs a lot. I have to spend around Tk.22,000–23,000 in the IRRI season. But it costs me less when I plant *Ropa Amon* paddy. This is because the land remains soft at that time due to rain and flood waters. The land does not even require irrigation at that season. Although the yield of rice is lower at that time, the cost is less; it is about Tk.5,000–7,000 is enough to cultivate rice at that season. There are some disadvantages too, on the other hand. If there is too much flooding, the plants go under water; the risk of loss prevails. But I have not faced such consequences yet. I am very lucky in this way.

I cultivate mustard on some portions of my land, which could be around 30 *decimal*. I cultivate this as *Chaitali* crop. However, I am unable to do this sometimes. This is because, when floods waters drain later than expected, the sowing of the mustard is delayed. As a result, the sowing of rice is also delayed. It costs me Tk.3,000–4,000 to cultivate mustard. I get the returns if the yield is good. I could yield around 5–7 *mands* of mustard on the 30 *decimal* land that I cultivated it on, and the price per *mand* of it ranges from Tk.700 to Tk.1,200. I store the amount required for my family and sell the rest.

I cultivate maize on around 1 *bigha* of land. The yield is good. Besides, the cost and labour needed to cultivate maize is lower. It is costly at first but later on there is not much cost. I can get some people in the neighbourhood for harvesting and thrashing the maize. In exchange, they get some maize plants and cores of maize. It saves on the cost of cultivation. The maize can also be thrashed using a thrasher but this is costly. It costs Tk.50 per *mand* to thrash with the thrasher, and the grains are affected too. That is why I prefer human labour. Monsanto imparted training on maize cultivation last year. They trained us on maize seeds and about pesticides. This is encouraging for us. If the grains are fine, maize can be sold at around Tk.600–700 per *mand*. If the grains are not of good quality, the maximum price is Tk.500 per *mand*. Regardless of this, it is more profitable than rice cultivation as it requires less labour and less cost. Unfortunately, many crops were damaged due to storms last season and, as a result, the yield was less and I could not make much profit from maize cultivation.

The main need of me and my family is for food and I do agricultural work to meet this need. Besides, this occupation gives me happiness and pleasure. All these things motivate me to do agricultural work.

Story : Gaibandha, Shaghata, Holdia, North Digalkandi

Sample type: General Farmer

Theme: Poverty and marginalization, Food security and nutrition

Name: Sohail

Story Code: 148

I am Sohail and I am 26 years old. My father's name is Mohammad Saidur Rahman. I am from the village of Gobindopur under Haldia Union of Shaghata upazila of Gaibandha district. We are a family of five, which includes a brother and sister of mine. I got separated from my family in the year 2010. I did not have the opportunity to study. I have been helping my father in his agricultural work from a very young age. I have seen my house erode away into the river four times in my lifetime. When I used to live with my family, I stayed with my dad in *Jelebari char* and *Hatbarir char* and I helped him with his agricultural work. I caught fish from the river and sold them too.

I separated from my father's family in 2010 and I started doing agricultural work on my own since then. Initially I started cultivation on 3.5 *bigha* of land. I sowed B-28 rice seeds on 1.5 *bigha* of land in the *Boro* season. I collected 10 kg of seeds which were prepared to be sown, from my father, and so I did not need to purchase them. The *char* lands are very grassy. I had to work very hard to prepare the land for cultivation. I ploughed the land with my father's cows with my own effort, and me and my wife worked together to plant the seeds into the ground.

In addition to my own efforts, there were also other costs which incurred while cultivating crops of rice on the 1.5 *bigha* land. Irrigation cost me Tk.2,200, and I also bought 15 kg of TSP fertiliser, 10 kg of MP fertiliser and 30 kg of Urea fertiliser. The total cost of all these for the 1.5 *bigha* of land was Tk.4,100. I yielded 23 *mands* of rice from it. Rice had a market price of Tk.800 then, and I sold the crop for Tk.18,400. The 23 *mands* of rice I sold at that time made sure I would not starve for the next five months. I also cultivated chilli on 1 *bigha* of land in 2010. When the flood waters drained in the month of *kartik*, I ploughed the land. Then I applied cow dung, TSP fertiliser, MP fertiliser, Urea fertiliser and pesticides to the land and prepared it for cultivation. I collected chilli seeds from my home. Besides chilli, I cultivated onions, coriander, radish and red spinach on the same land together, some of which I ate myself and sold the rest in the market.

A lot of weeds grow on the land of chilli cultivation. I needed 4 weeders and 25 day labourers in addition to my labour to clear the weed. The wage rate per labour was Tk.150 then. The land was irrigated four times. The fertilisers and the timely application of irrigation resulted in the chilli crop being good. But the winter was too cold that year and it damaged the chilli crops. Half the chilli plants became white.

I sprayed medicine on the land four times but some of the crops grew white and rotted in the middle. The yield of chilli was not as expected, so I suffered a loss. I got 2 *mands* of chilli from the rest of the plants that were left on the land. It cost me around Tk.6,000 to cultivate those 2 *mands* of chilli on the 1 *bigha* land. I sold each *mand* for Tk.3,000 and so I could just about recoup the cost of cultivation, not considering my own labour.

I cultivated wheat on 10 *kata* of land in 2010. I had the seeds in my possession so I did not have to buy them. I ploughed the land three times and applied cow dung, 10 kg of TSP fertiliser and 15 kg of Urea fertiliser and then planted the seeds. I also used the weeder once and irrigated the land twice and therefore the total cost incurred to prepare the land was Tk.2,200. The yield of wheat was good as the weather was favourable, and I harvested seven *mands* of wheat. Each *mand* of wheat had a market price of Tk.800 then, so I sold all of it for Tk.5,600.

I have also raised cows and sheep since that time. I sell one of my cows every year during Eid to keep the family's income flowing in. I go and catch fish from the river during flood. I

keep some for myself and sell the rest in wholesale and get Tk.300-400 per day. In these ways, I bear the expenses of my family and send my children to school.

The land in which I cultivated rice was low-lying and so I could not cultivate jute on it. But the land I cultivated chilli and wheat on was on higher grounds and as a result, I cultivated *Tosha* jute on it. Jute cultivation earns a good profit each year. On 1.5 *bigha* land, little fertiliser is required to cultivate it, but purchasing seeds and weeding is costly and I had to spend around Tk.2,500 on these. The yield of jute was good and I harvested 11 *mands* of it and sold it all for Tk.17,600, as each *mand* had a market price of Tk.1,600.

Later in 2015, I cultivated B-28 rice in *Boro* season on 1 *bigha* land. I bought the seeds from the market. I ploughed the land three times initially, and I irrigated the land and ploughed it twice more, which cost me Tk.1,000. In addition to this, I had to hire five labourers to plant the seedling at wage rate of Tk.200 per labour. Then irrigation was required which cost of Tk.2,000 and I also had to buy 20 kg of TSP fertiliser, 25 kg of Urea fertiliser, 15 kg of gypsum fertiliser and grass killer medicine. All these fertilisers and medicine, two packets of Khuravan pesticide and weeding twice on 1 *bigha* land, cost me Tk.2,000. The total cost incurred was Tk.7,500. After the rice dried, I had about 18 *mands* of it. The market price of per *mand* was Tk.600 and hence I was able to harvest Tk.10,800 worth of rice.

Cultivation of rice is not earning us any profit in this way. We, the people of the *char* get more profit from the cultivation of *Rabi crops*, chilli and jute. The farmers are near to danger level due to cultivating rice, as harvesting it costly and it earns a very low profit. We, the farmers, will die if things go on this way.

Story: Manikganj, Sauria, Dhankora

Sample type: Landless Farmer/ Sharecropper

Theme: Poverty and marginalization

Name: Raees

Story Code: 96

My name is Raees. I do agricultural work and I am a farmer. I have no lands of my own. I sharecrop on others' lands. The homestead land is my only asset. I am from a very poor family. My father was a very poor farmer. I did agricultural work from a very young age with my father. When I was very little and saw father working on other people's land, I used to ask him why we did not have a land of our own. My father used to reply that all this land was ours. Nevertheless, I started doing agricultural work with my father. Ploughing the land, weeding, sowing the seeds into the ground, applying fertiliser etc., I learnt it all from my father. My father is my teacher and mentor of my agricultural work. My father used to work on others' lands and I used to go with him to help him out.

I was only 25-26 years old when my father passed away. I took the responsibilities of my family on my shoulders when my father died. I was the only child of my parents. My economic condition was not very good, as I came from a very poor family. I merely passed my days in hardship. Due to my father's poverty I could not study at school. I wanted to go to school but there was no way for me to. I had to go to work instead. For 6-8 years I worked as a labourer in other people's houses. I got married

when I was 28–30 years old. I am illiterate that is why the years that I am stating are all estimated. It can differ from 2–4 years from my original age.

After my marriage, I took around 20–30 *decimal* of land on sharecropping. Except rice, no other crops grew well at that time. I used to cultivate rice and jute. A few more years passed in this way. The members of my family began to increase, in other words, my children were born. Now I have one son and two daughters. I could not make them study due to my poverty. I want to mention something, which is that during rainy seasons, there is a lot of flooding in my region. My father used to run a boat during flood season, renting it from others. I have also run boats for 30 years. Initially, I rented too. I saved money gradually and later bought a boat of my own. My family income started to rise after that. I cultivated crops in the summer. In rice, I usually cultivated IRRI, *Holud Jiron* and *Rajbhog*. At present, rice cultivation is more difficult than before. This is due to the fact the cultivation costs have increased a lot. The cost is more than the income. The costs of fertilisers, seeds, water, electricity and diesel have increased a lot. I cultivate jute after rice. There was a time when jute cultivation was very profitable. I would earn a lot of money from it and the prices of things were lower too. I could buy a few *hilsha* of fish by selling only one *mand* of jute, and also few groceries for my family. The price of jute has increased but the cost of production also increased. Now, selling a *mand* of jute can hardly buy me one good cloth.

I am very aged now. My son and I cultivated vegetables together. I do not cultivate other crops like wheat rice, jute, maize, mustard etc. anymore. I just cultivate vegetables all year round at present. In winter, I cultivate bottle gourd, beans, cucumber, eggplant, bitter gourd, red spinach, palong shak, drumsticks etc. In summer, I cultivate eggplant, bottle gourd, pumpkin, potol, dhundol, pui shak etc. Vegetables grow all year round and I cultivate them on 30–40 *decimal* of land. In winter, vegetables grow well and I earn a lot of profit too. In summer the cost of producing the vegetables is high but they also have a good market price. Vegetable cultivation has increased the income of my family. I have married my children off.

But sometimes vegetable production makes me suffer loss. Fertilisers, seeds and pesticides are very costly. Sometimes pests attack and damage the crops. Excess rainfall, droughts, hail-storms, winter etc. also harm my vegetable production. In spite of all these, vegetable cultivation has turned things around for my family, by the grace of Allah. I am poor so I have to do agricultural work, and do not have a choice of occupation. Agriculture is my life and my only occupation.

Story : Manikganj, Sauria, Khunirtek

Sample type: Maize Farmer

Theme: Vulnerability and resilience, Poverty and marginalization, ecological change

Name: Kashif

Story Code: 208

I'm Kashif. My father is a farmer. In my childhood I used to go to school and at the same time I helped my father in agriculture. When I was a student of class five, my father got sick and he was unable to work anymore. Then I had to leave school and started agriculture on five *bigha* of lands. I started working in agriculture in 1984–85. During that time, in *boro* season, I cultivated IRRI rice on three *bigha* of land out. In each *bigha*, the cost of cultivation including my own labour, ploughing, fertiliser, seeds and pesticides was Tk.1,500–2,000. I used to get 18–19 *Mands* rice per *bigha*. After harvesting IRRI, I cultivated *Aman* rice on the same land. The cost of cultivating *Aman* per *bigha* was small, Tk.700–800. I used to get 4–5 *mands* of rice in each *bigha*. In the other two *bigha*, I cultivate different crops in different seasons; these are jute, wheat, and mustard. I also cultivate spinach and vegetables around my house. I rear two cows as well.

I used to sell cows' milk and that helped me meet the cost of cows, including fulfilling some needs of my family. Vegetables and spinach I grow around my house, providing nutrition and food to my family. Somehow I was running my family by cultivating rice in two seasons and cultivating jute, mustard, wheat, vegetables around the house and also by earning from two cows. However, the cost of cultivation has been increasing by the day. Even in 2004, we had to wait in a long queue for getting fertiliser. However, we were not able to get the amount of fertiliser that we need. In addition, we have to face natural calamities (regularly). Some time we cannot cultivate jute due to drought. Even the B11 rice that we planted in July could be washed away by unexpected flood water. To cover up such losses I had to work as a daily labourer in addition to my own farming. In such way I was leading my life.

In 2007 I did maize cultivation for the first time on 45 *decimal* lands. For planting to storing finished maize at home, the total cost was around Tk.6,000. And, I got 35–36 *mands* of maize from 45 *decimal* lands. I get around Tk.18,000 by selling maize in the market. After harvesting maize I planted jute on the same land. I spent Tk.4,000 per *bigha* for cultivating jute. I got eight *mands* of jute from 45 *decimal* lands. Selling this jute in the market I got Tk.6,000. However, due to lack of regular flood, fragmentation (rotting/decomposing) of jute is really a problem and a hard task.

On then rest of three *bigha* of land I cultivate rice in two seasons. During the season of *boro* I used to cultivate IRRI rice and in the month of *Srabon* (monsoon) I used to cultivate B11 rice. To cultivate each *mand* of IRRI rice, I have to spend around Tk.400. And I can sell a *mand* of rice at the rate of Tk.500. In addition, cultivating B11 rice during monsoon is a risk as well. Unexpected floods damage rice plants. In 2007, my B11 rice plants were damaged. That's why I increased the land for maize cultivation in 2008 and cultivated maize on two *bigha* of land. In spite of all the expenses, I made a profit of Tk.15,000–16,000 from. As maize cultivation is less laborious and more profitable, I decided to cultivate the maize in two seasons of the year. I cultivated maize in March–April, during the second season of the year. However, the crop was not good in that season, so next time I will cultivate maize in one season. In 2012, 50% of my cultivation of maize in two *bigha* of land was damaged due to

excessive rain and thunder storms. And the yield was less than 50%. Therefore, the amount of maize on two *bigha* was all together around 22 *mands*. After selling them in the market, it did not even meet my expenses. However, I am continuing cultivation of maize.

In 2015, I cultivated maize on 50 *decimal* lands. The yield crop was good, 40 *mands* altogether. However, I had to spend around Tk.18,000 on this. And I sold per *mand* at the rate of Tk.450. So, I could hardly meet my expenses. If it continues like this – the cost of cultivation rising and agricultural product prices falling – then how will farmers survive?

Story: Kurigram, Ulipur, Thetrai

Sample type: Maize Farmer

Theme: Poverty and marginalization, vulnerability and resilience

Name: Tariq

Story Code: 237

My name is Tariq. My father's name is Shahabuddin. I am 56 years old. I live in the village named South Dighol Kandi Char in Haldia Union. This is under Shaghata Upazila, Gaibandha district. I am a maize farmer. In addition, I have been attached to a small business since I was 20 years old. We are five brothers and three sisters. I am the second son of my father. My father owns 70 *bigha* of land. I got nine *bigha* as my share. I lived with my parents until 2006. During that time I used to run a clothes business and my father cultivated land. I have three sons. I do not have any daughters. My eldest son is in class 10 in school. My second son is in class 4 and my youngest son is in class 1. My wife was working in the tailoring trade for a while. My parents take care of my family. cAfter working in small business for many years, in 2008 I decided to cultivate maize. Then I asked for my father's opinion about cultivating maize on two *bigha* of land. My father responded that he was old and did not want to work hard, but that I could do whatever I thought was good for us. Then I collected seeds of maize from *Saghata* (sub-district area). I prepared the land for planting for two days. My father, mother and sons helped me. I didn't work in the field before. In 2008, I first worked in the field. I followed the advice of my father and worked accordingly. I ploughed the land three times first by machine. Then I broke solid soil to make it plain. Then I mixed TSP, urea and cow dung on the land. Then I ploughed the land once. I added 80 kg of TSP fertiliser on two *bigha* – that cost Tk.3,000. The amount of urea was two bags and the price was Tk.1,800. Then I needed 8 kg of seed for two *bigha*. And when the plants were one month old I arranged spraying with medicine as well to make sure that the plantation could not be affected by crickets or insects. I had to do four irrigations to get healthy grains. At last, the time came to harvest maize. I engaged two labourers to harvest maize from the field. In addition, me and my two sons and father worked in the field. I got 50 *mands* of maize from two *bigha* cultivation. I sold 48 *mands* at the rate of Tk.600 and got altogether Tk.28,800. I kept two *mands* for our own food. Maize powder is nutritious.

Since then I have cultivated in parallel with my business. My father will not live forever. I need to learn the cultivation process – which crop will be good in which season – from him before he passes away. Now I do all kind of crops. Such as rice, jute, chilli, onion according to the respective season. Sometimes I do produce *Kaun*, nuts, *Kalo zira* and potatoes as well.

Besides, I have four cows: two give milk. Among them, one gives 3 kg of milk and the other 2 kg. We consume 2 kg in my family and rest of the 3 kg we sell in the market. The price of one (1) kg milk is Tk.50. It is no hassle taking care of cows. Cows can get grass from the field for the whole day. It is easy to make more profit with less labour through raising cows.

I have been cultivating maize since 2008. I have not taken on any debt. I run my business and do farming as well. Between 2008 and 2016, there was one season when I could not make a profit from maize cultivation. It was in 2012. During the time the maize spur matures there were rains and storms. The plants broke down and its grains could not grown well. I got 35 *mands* of maize from two *bigha* of land. In 2012 the price of maize was Tk.700/*mand*. Now the amount of crop is growing. However, the expenses grow as well. The diseases and problems grow as well. In earlier times, we could get crops with less labour. We did not need to apply fertiliser on soil. Farmers used to plough the field by cows. The irrigation were been done from the water resource of rivers, lakes and cannels. Even crops were been cultivated by rain water. There were not many machines for irrigation – one or two in a locality. People did not work hard.

I saw my father work in the field all the days. However, he did not get sick or catch diseases. Sometimes he got a fever but he did not take medicine. After 2/3 days he recovered automatically. There were no contamination on food, whatever we ate tasted good. Now foods are tasteless. When I was in business, my health was good. Now I have to work more and physical conditions are not good. Sometimes I get sick, my wife and kids are worried about me. I take medicine, but do not see any improvement. The need for money has been increasing by the day as my sons are in school. I think my eldest son will not continue study after attending his (secondary school certificate) examination. I will set him up in business.

Worries are endless. There are lot of dreams as well in my mind. I would like to provide a good education for my sons. Now, Allah almighty is the hope.

Appendix 2: List of interviewees

- 1 Parvel Partha, Researcher, Ecology and Biodiversity Conservation, BARCIK
- 2 Thakur Prasad Twoari Ph.D. Country representative. The international maize and Wheat Improvement Centre (CIMMYT) Bangladesh
- 3 Gopinath Saha, Monsanto dealer
- 4 M.A Sobhan, Research Consultant, Policy Research for Development Alternatives (UBING)
- 5 Alimuzaamn, Deputy Director, Department of Agricultural Extension (DAE, Mankganj District
- 6 Shudhir Chandra Nath, Programme Head, Seed and Agro Enterprise, BRAC
- 7 Rezanur Rahman, Nijera Kori, an NGO has been facilitating the landless poor women and men to develop their independent organization in order to establish their rights over the institutions that decides about allocation of resources and services for the poor
- 8 Alamgir Hossain, Proprieter, Asaduzzaman Enterprise, Syngenta dealer
- 9 Aramat Hossain, Assistant Agricultural officer
- 10 Emdadul Haque, Upazila Aggricultural Officer, Staturia, Mankganj
- 11 Sahidul Islam, Agronomist, Executive Director, Unnayan Dhara (www.unnayandhara.org). - an NGO dedicated to popularising sustainable agriculture practices and establishng farmer rights through introducing sustainable, low risk, low cost agriculture with low external inputs. They work with small, marginal, sharecropper, small-scale and land-less farmers
- 12 Katalyst and Swiss Contact group interview
- 13 Markus Kupper: Head of Monitoring, Result and Knowledge Management, Swiss Contact
- 14 GB Banjara; Head of knowledge and capitalisation
- 15 Tamjid Ahmed Ananda: Senior business consultant
- 16 Marhiha Tahsin ; Katalyst maize team
- 17 Jannat adib Chowdhury : Katalyst maize team manager
- 18 Mehjabin Ahmed: Acting head of sector portfolio division

Appendix 3

Response from Swisscontact-Katalyst Project to the report

**'A systemic understanding of the choices farmers make to engage or not
with market system interventions: an exploration of Katalyst's work in the
maize sector in Bangladesh'***

*(prepared by the Institute of Development Studies, UK, and Praxis Institute of Participatory Practice, India)

Katalyst Project Fact Sheet

The Agribusiness for Trade Competitiveness Project (ATC-P), branded as Katalyst, is a market development project which aims to contribute to increasing the income of poor men and women in rural areas of Bangladesh. It does this by facilitating changes to services, inputs and product markets specifically designed to increase the competitiveness of farmers and small enterprises. The project's current phase (Phase 3) began in March 2014 and ends in March 2018, and is co-funded by the Swiss Agency for Development and Cooperation (SDC), the UK Aid, and the Danish International Development Agency (Danida). It is implemented by Swisscontact under the umbrella of the Ministry of Commerce, Government of Bangladesh. Along with funding from SDC and DFID, the previous two phases were also co-funded by the Embassy of the Kingdom of the Netherlands (EKN), the Canadian International Development Agency (CIDA) and the Swedish International Development Cooperation Agency (SIDA).

Over the lifetime of the project (2003-17), Katalyst has directly benefited 4.69 million farmers in Bangladesh, of whom 374,000 were women, generating a net additional income of USD 689 million. The actual amount invested by donors during the three phases is around USD 97.55 million .

In the maize sector, the total number of beneficiary farmers during this period was 330,100 resulting in a net nominal income for maize farmers of USD 65.66 million.

Before engaging in a sector, Katalyst conducts a detailed sector and stakeholder analysis. One of the major market analysis criteria considered before launching any intervention is the pro-poor relevance of that intervention. Katalyst uses the Progress out of Poverty Index™ (PPI)⁸ tool to target and assess the impact on poor farmers for whom the interventions are designed. The PPI status of potential participants (in this case, farmers) provides valuable information regarding their poverty status.

In Phase 3, the poverty profile of Katalyst's beneficiaries indicates 76% below USD 2.50/day. This means that 76% of Katalyst beneficiaries live in households with a per capita income below the poverty line of USD 2.5/day. This is also known as the poverty headcount, that is, the percentage of households living below a certain poverty line. In Phase 2, Katalyst's beneficiary poverty profile was 70% below USD 2.50/day. This shows Katalyst had done better in phase 3 in terms of reaching poorer sections of the society.

Across its three phases, Katalyst has worked in numerous sectors, spanning agriculture, service and manufacturing sectors.

The table below provides an overview of Katalyst's sector engagement portfolio in phases 1, 2 and 3.

⁸ The Progress out of Poverty Index™ (PPI) is a tool used to measure the poverty likelihood of households targeted by poverty reduction projects or programmes. Based on the data from the Household Income and Expenditure Survey (HIES), it uses ten indicators to estimate the likelihood that a household's expenditure is below a given poverty line.

Phases	PHASE 1	PHASE 2	PHASE 3
Duration	2003-08	2008-13	2014-18
Sectors/ key input/ overarching theme	Maize	Maize	Maize
	Vegetable	Vegetable	Vegetable
	Fish	Fish	Fish
	Fertiliser	Fertiliser	Fertiliser
	Seed	Seed	Seed
	Information and Communication Technology (ICT)	ICT	Information Channels
	Media	Media	Women's Economic Empowerment (WEE)
	Rural Supply	Rural Supply	Local Agribusiness Network (LAN)
	Rural Distribution	Rural Distribution	Forward Markets
	Improving Local Governance Service (ILGS)	ILGS	Capitalisation
	Furniture	Furniture and Crafts	
	Tourism	Tourism	
	Irrigation	Irrigation	
	Packaging	Packaging	
	Potato	Potato	
	Prawn	Prawn	
	Jute	Jute	
		Plastics	
		Private Healthcare	
		Poultry	
	Floriculture		

Katalyst’s key interventions related to the maize sector are as follows:

Katalyst interventions related to maize sector
Interventions related to soil health, ecology
1. Improving homestead composting technology through promotion of trichoderma
2. Promotion of balanced application of fertiliser through private input companies
3. Improving the production and distribution network of compost companies
4. Assisting in the production and promotion of organic compost fertiliser for improving awareness of balanced fertiliser application
5. Promotion of balanced application of fertiliser through private input companies focusing on increase usage of micronutrient fertiliser
6. Improving quality of production of compost companies
7. Engaging with agro input companies and micro finance institutions (MFIs) to promote innovative business promotion models which provide embedded services focused on optimising cropping patterns
Interventions related to i) risk mitigation for farmers, and ii) productivity gain
8. Promoting maize cultivation through increasing farmers’ awareness and improving their access to information and quality inputs
9. Improving summer maize cultivation in suitable areas by improving farmers’ access to information and post-harvest technology
10. Extension of maize contract farming in new areas through seed companies and feed processors
11. Improving access to finance for maize farmers
12. Promoting maize-based cropping patterns by introducing short duration <i>T-Aman</i> rice
13. Promoting integrated pest management (IPM) in Bangladesh
14. Introducing unique number tagging (UNT) to detect and discourage seed adulteration
15. Facilitating the broadcast of audience-driven agro programmes and news through television and radio
Nutrition and gender-related interventions
16. Development of maize-based extruded products for human consumption to encourage alternative uses of maize
17. Strengthening gender inclusive contract farming system for women maize farmers

1. Background: what is this response about?

This paper represents Katalyst's response to the report, "A systemic understanding of farmers engagement in market system interventions: an exploration of Katalyst's work in the maize sector in Bangladesh" prepared by the Institute of Development Studies, UK, and Praxis Institute of Participatory Practice, India.

We appreciate that the IDS and Praxis study attempts to introduce the perspective of farmers on the wider issues surrounding maize cultivation in Bangladesh. Using beneficiary assessment as a new tool to understand these issues in the agriculture sector at the user level is a novel approach. It contains a mixture of worthwhile insights into the potential and actual broader impacts (positive and negative) of maize with smallholder farmers, which certainly requires more analysis. It is of importance that the report confirms that Katalyst's longstanding engagement in the maize sector has resulted in higher income for small farmers in the study locations. In addition, some of the other findings in this study corroborate Katalyst's earlier findings. For example, Katalyst had been aware that wind shock was a major problem for maize farmers, particularly in the summer season, and the study has captured that. Also, the emphasis on the issue of crop insurance reconfirms the project's understanding of the need for such risk mitigation mechanisms to encourage further commercialisation of agriculture in Bangladesh, particularly among small farmers.

However, the study has made some strong assumptions related to Katalyst's approach, which in some cases it has misrepresented. As a result, the researchers have drawn undue conclusions regarding the effectiveness of the project interventions (although the study was not intended to be an evaluation of Katalyst as a project). If these issues are not discussed and resolved, the study runs the risk of presenting speculative findings on the project's activities based on inadequate evidence.

In addition, the methodology of the study did not properly fit the objective, which is stated as 'to build the systemic understanding of large program using market system approach such as that which has been implemented by Katalyst'. The study method of drawing sector and project's approach level conclusion, from interviewing a limited number of farmers and the deliberative panellists (most of who are not directly involved and sufficiently familiar with Katalyst interventions) is not convincing. Focus on only three small geographical areas (two of which are communities with extremely small landholdings) meant study failed to identify broader benefits to the farmers from Katalyst maize sector interventions for representative farmers, most of which are spread across many other regions in the country. In the report, lack of understanding of role of Katalyst and role of farming system stakeholders (farmers, private companies and government extension system) involving maize, led to deficient and incomplete findings. Merging of Rabi (winter) and Kharif (summer) maize means overemphasis on risks associated with maize crop as a whole. However, issues raised mostly related to wind loss, pest loss pertain to summer maize, which makes up only 15 % of total maize grown in the country. In this report, it appears, the position of Maize in the overall cropping system in Bangladesh has been viewed from a pre-conceived negative notion, without considering the economic realities of the country.. Quotations from experts appear to be driven by their ideological positions about the maize crop rather than the evidence on the ground or on research backing. Also,

on closer examination, some of the findings in the report are interpreted incorrectly as the interconnectedness of crop production system and the food production system has not been analysed properly. For example, ranking of the women's involvement in maize sector is low (e.g. viz a viz rice) but their involvement in poultry and animal rearing is highest, which relies on maize grain as both homestead poultry and small dairy cows use maize as feed at household level.

Our overall view is, perhaps this study team should have conducted the broader beneficiary assessment, covering more areas and sectors of Katalyst. Also, geographical coverage is inadequate to draw nationwide conclusion.

Additional research on crop patterns and sustainability in the areas such as application of short-stature, wind and storm resistant hybrids, ways to reduce costs associated with summer maize, and impact of maize on soil fertility need to be further examined.

In the following sections, we attempt to provide a broader response which includes Katalyst's rationale for engaging in the maize sector, and its approach and interventions in the sector, in the context of Bangladesh. It also presents Katalyst's view on the key focus areas of the study i.e. farmer's income, social inclusion (women's engagement), food security and maize sector's impact on ecology.

This response is an effort to reiterate how maize sector activities fit into the overall sector portfolio of Katalyst and its contribution to achieving the overall project outcome as mandated by project's donors and the Government of Bangladesh, as well as our awareness on the need for promoting sustainable agricultural growth in Bangladesh. Understanding of this context and the approach is important to ensure that the study fairly presents Katalyst's effort and accurately attribute observations to the project's activities.

For the reader's benefit, at the end of this response section we have also included a fact sheet regarding the Katalyst project.

2. Katalyst's context and rationale for engaging in the sector

To begin with, the study needs to consider the context of the project and its rationale for engagement in the maize sector to assess how small farmers and maize cultivation fits into the overall agricultural sector growth in Bangladesh.

In phase 1 (April 2003-September 2007), Maize was selected as a core sector of the project, as it was one of the potential cash crops that could fit well into overtly rice-based cropping patterns, diversify the crops and replace crops like tobacco. The objective was to fit maize cultivation into the existing cropping patterns of various regions, particularly in Northern districts of Bangladesh, so that farmers could have some cash income (which was not coming from rice cultivation only and tobacco cultivation was the main source of cash income for farmers). Maize had a huge industrial demand within the country particularly for poultry feed. Due to the limited maize production in the country, institutional buyers for maize heavily relied upon maize imports from neighbouring countries. Katalyst then was mandated by the development partners and the Government of Bangladesh to promote

non-rice crop which will diversify the cropping pattern of the small farmers and allow them to have greater cash income.

As a mandated project under the Ministry of Commerce, Katalyst follows the overall strategic direction of the Government of Bangladesh (GoB). GoB has discouraged⁹ the rice cultivation in the Northern regions (which includes Kurigram and Gaibandha where the IDS study is focused) due to depletion of water tables. *Boro* (winter rice) requires 30 to 35 times of water pumping, whereas maize requires pumping only 3-4 time. The 6th Five-Year plan of GoB states, “to gradually shift the main ‘High Yield Variety’, irrigation-fed *Boro* rice production to the Southern areas and to utilize the irrigated north-eastern uplands to grow more high value cash crops like wheat, maize, corn etc. and horticulture products”.

In line with the donor and GoB mandate in phases 2 and 3 (March 2008 to March 2018), Katalyst maintained a **portfolio of agricultural sectors** throughout the country to promote multiple sectors and multiple partners. The project encouraged private companies to offer farmers with competing options/choices (in terms of inputs, crop varieties and markets) in their agriculture practices to enhance their income on a sustainable basis. Thus, the project did not only promote multiple crops in the same location but also facilitated promotion of multiple interventions/business models within a same crop/sector to promote more **sustainable and diverse** agricultural practices. Small farmers in Bangladesh who previously had limited choices of inputs and crops can have wider choices. As such, the project **never encouraged mono-cropping** based cultivation among farmers for maize or any other specific crop.

Poverty is highly concentrated in the *chars* of Bangladesh, where income opportunities are limited. Higher ground in the *char* areas is not suitable for rice and vegetable cultivation, due to a sandy soil and lack of irrigation facilities. Also, due to lack of market infrastructure, perishable commodities such as vegetables do not find easy markets for farmers in the *chars*. Katalyst conducted an extensive sector assessment to identify a suitable portfolio of crops for the farmers living on the *chars*. Within that portfolio, Maize featured as one of the possible crops able to bring cash income for small farmers in the *chars*. Katalyst also promoted Jute cultivation in the same areas considering its ecological benefit and cash income potential. Here, Katalyst adopted a beneficiary-centric approach to selecting sectors and interventions. Katalyst analysed the demand in markets, assessed the technical feasibility of crops (given, among others, the land quality, topographical conditions) and also assessed the readiness and capability of the farmers to adopt the crop(s). Triangulated findings of such multi-criteria assessment allowed Katalyst to design interventions that ensured private companies target small farmers and small farmers can effectively benefit from these crops.

⁹ http://www.plancomm.gov.bd/wp-content/uploads/2013/09/SFYP_Part-2.pdf

Katalyst worked closely with organisations such as the Center for (CYMMT) and Bangladesh Agriculture Research Institute (BARI) who are promoting sustainable maize production in the country. According to these organisations, even though maize is a nutrient heavy crop, a balanced use of fertiliser, proper cultivation methods, appropriate residue management and cropping systems will provide long term sustainable income from maize without deteriorating the soil quality. All Katalyst supported interventions throughout its engagement in the sector include these practices as standard offerings. Therefore, the study should have assessed the small farmers awareness on these balanced cultivation methods and whether they have applied this or not. Without exploring the broader practices of cultivation, any effort to assess the sustainability of agricultural production is partial.

The study findings elaborate four interrelated issues in relation to Katalyst's maize sector interventions in Bangladesh: labour, income and profit; risks for small holder farmers; food security and nutrition; and ecology, environment and gender. In the following sections, we present the project's views on each of the issues raised.

2.2. Labour income and profit: risks for smallholder farmers

Our overall view: We appreciate the research team's effort to distinguish the income and profit and its attempt to understand the risks for smallholder farmers. However, the study team's conclusion that farmers' income has increased but costs have also increased, resulting in reduced profit, does not correlate with the project's own experiences and findings over the life of the project. Katalyst acknowledges the study team's findings regarding the risks associated with maize cultivation; however, these are generic to agriculture in Bangladesh (which is at an early stage of commercialisation) rather than being specific to maize cultivation.

Explanation

Income and profits: Katalyst measures the net income of small farmers, which is the return adjusted for cost. During phases 2 and 3, the project has closely interviewed over 1,700 farmers across Bangladesh as part of rigorous and systematic the impact assessment of its interventions. These assessments have clearly indicated that the average profit of farmers from maize cultivation per unit of land has not decreased over the years. Although costs have increased on a year-on-year basis, profit per unit of land from maize cultivation has also increased in the past years (based on analysis of average profit per unit of land throughout the project's Phase 2 and Phase 3 interventions). This also explains why maize cultivation has increased in Bangladesh over the years.

The study states that the incomes of smallholder farmers are relatively lower than those of larger farmers. This is true for all crops, including paddy and vegetables. Economy of scale (or conversely relative disadvantage) works for all crops, and not only maize. The fact that small farmers make less than a proportional profit compared to the larger farmers cannot be a plausible justification for supporting the commercialisation of smallholder farmers. The study compared the return on maize with vegetable, and inferred that vegetable is a more profitable alternative. However, this fails to recognise that for this very reason, Katalyst has also promoted vegetable cultivation targeting smallholder farmers. The study thus needs to be aware that Katalyst was aware of and identified the multiple cash income earning

choices available to farmers, and took a considered and systematic approach to promote a range of possible options. For a more detailed picture of the Katalyst portfolio, please refer to the fact sheet.

b) Risks: The study states that Katalyst assesses *“only their (farmer’s) additional income in the system of analysis; food security and risks are not assessed”*. This is a very generic comment, and fails to assess the process used by the project to design its interventions. It did not assess the intervention design, quality assurance mechanisms and customisation processes of interventions the project teams follow as a matter of well-established practice. This means that this statement of the study is not evidence based. As a matter of fact, Katalyst designs and implements interventions with the purpose of addressing the underlying constraints of smallholder farmers which hinder them from participating in markets, including livelihood aspects. The project follows a rigorous sector analysis, monitoring and impact assessment system, which feeds information to the project on an ongoing basis, in order not only to design suitable interventions but also to make relevant and responsive changes as the project cycle progresses.

While the IDS study concentrates on maize, there is no comparable study on other crops, such as wheat (a crop partially replaced now by maize) or certain rice varieties, which would allow a more balanced picture of risks. In vulnerable regions in particular, the risk is high for many crops, and is certainly not limited to maize.

The study states that risks for small farmers are higher than for larger farmers as they are pushed into mono cropping (suggesting that they have smaller landholdings). However, as stated above, Katalyst has not promoted mono cropping among Bangladesh’s farmers. On the contrary, the project has promoted diverse cropping patterns that are designed to ensure **food security** and offer **maximum cash return** for the farmers, given their access to owned and operating land, and the nature of, among others, land ownerships (such as low land, medium-high or high-land), investment capacity, and market opportunities.

The study identifies that risks of, among others, wind, pest, disease and hailstorm are particular high in maize cultivation. However, these risks also exist for other crops. For example, the IDS study mentions rice being the second most risky crop after maize. As a matter of fact, Katalyst interventions have consistently been geared towards minimising such risks. For example, Katalyst’s partners promote a dwarf variety of maize in areas where wind occurrence is significant. Another example, Katalyst has promoted integrated pest management (IPM) practices to tackle pest and disease. At the same time, the project acknowledges that more is needed to reduce the risks of the farmers, particularly smallholders.

The study refers to Katalyst not doing enough to discourage the use of adulterated seed, a practice which places farmers at risk of losing their income once they have become dependent on a cash crop income. First and foremost however, Katalyst always chooses partners based on their market reputation and quality of products. In fact, many interventions have been targeted to reduce the risk of adulteration at the farmers’ end. For example, Katalyst has worked with its partners to reduce the potential adulteration through branding and better packaging. In 2014, Katalyst received prestigious OECD/DAC

“innovation to scale award” for its intervention related to promotion of quality seed mini-pack in Bangladesh. It has also worked on an innovative Unique Tagging Number system to discourage adulteration.

It is important to note here that maize is grown in Bangladesh in two seasons: winter and summer; the share of total annual production of maize is 85% in the winter growing season and 15% in the summer season. However, most of the risk factors mentioned in the study (wind and pest attack, for example) are related to summer maize. As the study does not refer to this, it runs the risk of overgeneralising the riskiness of maize being greater than other crops in all seasons, which is not the case.

It is to be appreciated that the study highlights the importance of crop insurance to mitigate risks for farmers. However, Katalyst as a project was not ever mandated to work in this specific area. Moreover, crop insurance in Bangladesh is currently at an exploratory phase, and specialised investments and projects are needed to develop it. Katalyst’s effort to provide the right information, a suitable variety of seed, and better market access have noticeably minimised the risks. Nonetheless, we acknowledge that to minimise the residual risk, crop insurance should be promoted in Bangladesh, for maize and for other crops.

2.3 Food security and nutrition

Our overall view: Katalyst is aware that maize cultivation (maize being primarily an industrial crop and not consumed directly as a food crop in Bangladesh) indirectly affects nutrition. However, the study team’s conclusion that maize cultivation has adversely affected the food security situation in Bangladesh is not true. Also, Katalyst’s overall portfolio level interventions (for example in the Vegetable and Fish sectors) are not adequately taken into consideration by the study while drawing this conclusion.

Explanation: The study mentions that Katalyst uses the cash income argument to justify maize’s contribution to food security. Maize is used as a feed ingredient both at the homestead level as well for industrial-scale poultry farming, and poultry is increasingly becoming a significant source of protein in the diet of people in both rural and urban areas of Bangladesh. The study should have focused on understanding this interconnectedness of different sectors to determine the impact of maize on food security, mainly from the perspective of dietary diversity.

The study explicitly equates farmer’s statements on rice with food security. This is a risky position to take in the context of Bangladesh, where overreliance on rice and lack of dietary diversity have been identified as one of the major causes of malnourishment. Cultivating maize does not mean that farmers cannot cultivate rice. The major weakness of the study is that it takes a static and single crop-focused perspective, while Katalyst as a project has worked to promote cropping patterns, not a particular crop. In other words, it recognised the importance of food security for smallholder farmers as well as importance of increasing availability of diverse food crops. In light of this, the project worked with private and public agencies to promote a maize-based cropping pattern (for example rice-maize-rice) which not only ensured food security but also provided its beneficiaries with additional income. Moreover, the choice of crops cultivated by the farmers is also influenced by the quality of

the land. For example, if a farmer has an area of high land and some low lands, cultivating rice in winter on the high land will be way too costly due to the high cost of irrigation. On a piece of land like this, farmers are better off cultivating vegetables or maize, depending on the market realities. The study has not tested these factors while collecting stories from beneficiaries. As a result, the claims made here present a very partial version of reality. It also does not take into account the fact that in any specific geographic location, Katalyst not only promoted maize but also other sectors, such as fish and vegetables. These contribute more directly to food security and dietary diversity.

From its long-standing experience, Katalyst knows that farmers follow a portfolio approach and do not cultivate the same crop on all their land. This is also clearly evident from the eight stories presented in the annex of the IDS report. Efforts to understand the multiplier effect of increased income among farmers merely by studying the impact of one crop has serious limitations. It reflects an oversimplified approach, as farmers vary their crop choices based on a variety of issues (weather events, price, access to market, performance of the previous crop) and their overall well-being is determined by the success and failure of the productivity and income from year-round crop cultivation. Judging the impact of project activities based only on one sector, and drawing conclusions on the appropriateness of the selection of the sector or contribution of the project to food security, can thus only be partial. The report could have added greater value had the study team analysed their stories and tools in the context of Katalyst's portfolio approach. Any conclusions and statements related to the project's contribution to food security could only be arrived at if the study team had also enquired about the vegetable and fish-related interventions Katalyst promoted.

It is worth reiterating that the objective of Katalyst was not to promote any crop or technology in a stand alone manner, but rather to make sure that the market system and the actors in the market took extra steps to offer affordable choices of quality inputs and information to smallholders in Bangladesh. Katalyst's activities were geared towards ensuring that these smallholder farmers in Bangladesh are aware of different opportunities and options, and can make informed decisions on crops, inputs and markets, based on quality information and market realities. Instead of testing whether the small farmers in Bangladesh have indeed benefited from the portfolio of Katalyst's interventions, the study focuses on farmers' statements which narrowly reflect the micro level perspective to draw broader conclusions. This is in danger of missing out the macro level and long-term perspective, as well as the overall country context. Thus, in our view the report has used the wrong yardstick to measure the wider impact of Katalyst activities on market systems.

2.4 Ecology and environmental issues

Our overall view: While we agree that there are challenges in maintaining sustainable agriculture practices in Bangladesh, we observe that the study does not accurately reflect the project's interventions in this regard. However, Katalyst efforts are by no means sufficient and much more work needs to be done in this area.

Explanation: Katalyst is aware of the need to promote sustainable agriculture. In areas where the project worked in the maize sector, Katalyst as part of its strategy has

implemented multiple interventions promoting the use of organic fertiliser, a balanced and rational use of pesticide within several sectors including maize (please see Katalyst fact sheet: Key Interventions). The study overtly focuses on the use of hybrid seed and does not refer to any of the other initiatives promoted by Katalyst. From Katalyst's Monitoring and Result Measurement (MRM) analysis, we understand that small maize farmers accessed and used these balanced agricultural practices. The project's smallholder farmers also benefited from interventions in the fertiliser sector and from Information and Communication Technology (ICT)-related interventions. However, the study does not reveal the complex interplay of multiple interventions of Katalyst in regard to farmer knowledge or their wider impact on ecology. As the study was not designed to assess and capture these issues, the statements related to ecological stress runs the risk of being speculative and perception driven, and of having a questionable evidence base.

With regard to environment and agro-ecological imbalances, this aspect needs further research and comparison with other crops. Without such comparison, it is difficult to understand where maize stands. As there is no comparative study which singles out the impact of maize cultivation, it can only be seen as an assumption at this stage. The study could have differentiated between the assumptions, perceptions and facts. Katalyst implemented interventions such as balanced fertiliser, compost promotion and IPM, which are intended to reduce the negative environmental impact not only for maize but also for other crops such as vegetables. For example, an assessment of maize farmers in Bangladesh's northern regions in 2016 revealed that those who were also trained in the balanced usage of fertiliser through Katalyst facilitation gained a profit of BDT 25,000 per 1.07 acre, and also reported higher quality grain due to better management of soil health. This particular sample study interviewed 106 farmers altogether, where 64 were treatment farmers and 42 were control farmers.

Had the study attempted to understand the impact of these interventions, it would have been more helpful for future projects to determine their strategies on how best to support sustainable agriculture for smallholder farmers.

2.5 Social inclusion/women's participation

Our overall view: Katalyst appreciates the study team's finding that social inclusion, particularly involvement of women in the maize sector, has been a challenge. This matches with Katalyst's experience, which is that women's participation in maize is still low compared to other sectors of Katalyst engagement, such as vegetable.

Explanation: Although still at low level, Katalyst's observation over the years has been that women's contribution to maize production has increased significantly more recently. The EDGE study cited in the IDS report revealed that with the growth of the overall maize sector, opportunities for women playing different roles in the maize value chain have gradually increased. For example, as per the study, in 2014 women make up to approximately 62% of waged labour (including land preparation, sowing, harvesting, shelling, drying and grading) compared to 33% in 2008. Moreover, maize is linked to the poultry and fish sectors, and its growth is contributes to their increased growth. These are sectors which offer a higher level of engagement of women.

In conclusion, while the study contains some insightful observations, its overall usefulness has been compromised by the omissions detailed above. At times, it has not succeeded in getting beyond the first level of analysis, and in the process misses out important facts. The project hopes that this response has been able to indicate gaps in the study's arguments and provide adequate explanation from project's side on the issues raised in the study.

Appendix 4

**Joint Feedback from SDC Bangladesh and SDC Quality Assurance and Poverty
Reduction Section**

to the report

**'A systemic understanding of the choices farmers make to engage or not
with market system interventions: an exploration of Katalyst's work in the
maize sector in Bangladesh'**

Being by virtue of its methodology based on the subjective perspective of a number of maize farmers impacted by Katalyst interventions in the maize sector, the Beneficiary Assessment was not designed as an evaluation or impact assessment but merely as an attempt to capture the full picture of the Katalyst target group's reality and what matters to them. The aim was to identify areas for potential improvement and unintended effects of Katalyst interventions. Given that Katalyst does not work directly with farmers, and the systemic approach taken by Katalyst to develop markets relevant for the poor, the BA faced significant methodological challenges. The central challenge was establishing a link between the issues and priorities cited by the small sample of participant assessors and the interventions of Katalyst. It should be kept in mind that the project interventions cover a variety of sectors and crops, and that in every sector several interventions address different constraints within the market systems. Impacts on beneficiaries are indirect, the impact of individual interventions on beneficiaries often of very limited scope, sometimes affecting only a tiny fraction of people's overall economic activity, and an even smaller portion of their lives. Furthermore, these interventions are always based on the principle of agency: beneficiaries are self-selected. Katalyst does not enroll people in a programme. Farmers chose freely whether or not to cultivate a particular crop, where to obtain information, whether or not to purchase a particular input or to sell to a particular buyer. The project increases the range of options available to farmers.

While the Beneficiary Assessment explicitly acknowledges these challenges, unfortunately it does not fully succeed in overcoming them. This is partly due to the decision to focus on maize as a "sector", rather than on individual interventions, and is compounded by a lack of consideration of the overall project and intervention portfolio. The assessment falls into two fallacies. First, it portrays challenges common to all agricultural subsectors in Bangladesh as specific challenges inherent to maize cultivation. Examples for this include the observed fact that small farmers have less capacity to invest and to take risks than larger farmers, or that women are restricted by their lack of control over the income being made by the crop, reduced mobility and limited access to markets. The second fallacy is that it implies that Katalyst promoted the cultivation of maize at the expense of other crops such as vegetable or Jute, disregarding the cropping patterns promoted, and the fact that the project worked extensively on both vegetables and jute, sometimes in the very same locations. In fact, maize had been cultivated in the regions studied before Katalyst intervened, and will continue to be cultivated after the interventions have ended. Comparing stories of maize growers who benefited from Katalyst interventions to non-beneficiary maize-growers would have yielded valuable insights on the impact of the whole range of maize-related interventions on beneficiaries' lives beyond the simple maize / non-maize dichotomy. These fallacies taint many of the findings under the headings "Labour, income and profit", "Food Security and nutrition", "ecological impacts" and "Gender". While it is true that additional income is the major measure against which Katalyst measures and reports on its effectiveness, it is surprising that on every other dimension the assessment found only detrimental effects and not a single positive effect, intended or unintended.

Many of the findings seem to be strongly influenced by the general academic and ideological debate on market-based approaches. While they are certainly a good basis for discussing the merits and downsides of market systems development, the sweeping normative conclusions on market systems interventions in general in the last two sections of

the report (“reflections for the donor and market systems community” and “recommendations”) are hardly based on the field research alone.

Nevertheless, the report contains interesting elements that SDC Bangladesh will take into account going forward. The report confirms the relevance of the new Swiss country strategy 2018-21 focus on risk reduction and risk transfer solutions for the most vulnerable population as a precondition for being able to take advantage of market opportunities. The Beneficiary Assessment clearly confirms that women need more support to take advantage of market opportunities, which cannot be achieved with a market systems development approach alone. We also have to be careful to integrate fields of observation in our monitoring systems that capture unintended results (positive and negative) in our projects.

The report also allows considering the outcomes of a programme from the different vulnerable groups and from different wellbeing perspectives. As we can see for the Katalyst end-beneficiaries, even if the programme had a positive effect on a majority of small farmers, it doesn’t mean that it has a positive effect on all small farmers. The most vulnerable (the poorest) and the most discriminated (in particular the women), are often not benefiting from the interventions to the same extent as other segments of the population. The assessment shows that the most vulnerable may have a different priorities and risk-taking capacities, a fact that is acknowledged by Katalyst. Different segments of the target group may privilege different outcomes (e.g. food security) than the one foreseen in the project design. This is why SDC Bangladesh is investing in sharpening its understanding of poverty and marginalization and to better differentiate and take into account the specific aspirations, capacities and constraints of poor and marginalized people.

Though not based on the stories collected alone, the conclusions in the report are very timely as they propose an agenda of transition from a “linear” MDG thinking towards a more integrated and multidimensional SDGs thinking. The SDGs are clearly interrelated and interdependent, and it has become essential to consider all dimensions simultaneously. To be truly inclusive, our interventions need to encompass different perspectives from different vulnerable groups and to include specific measures to make sure no one is left behind.