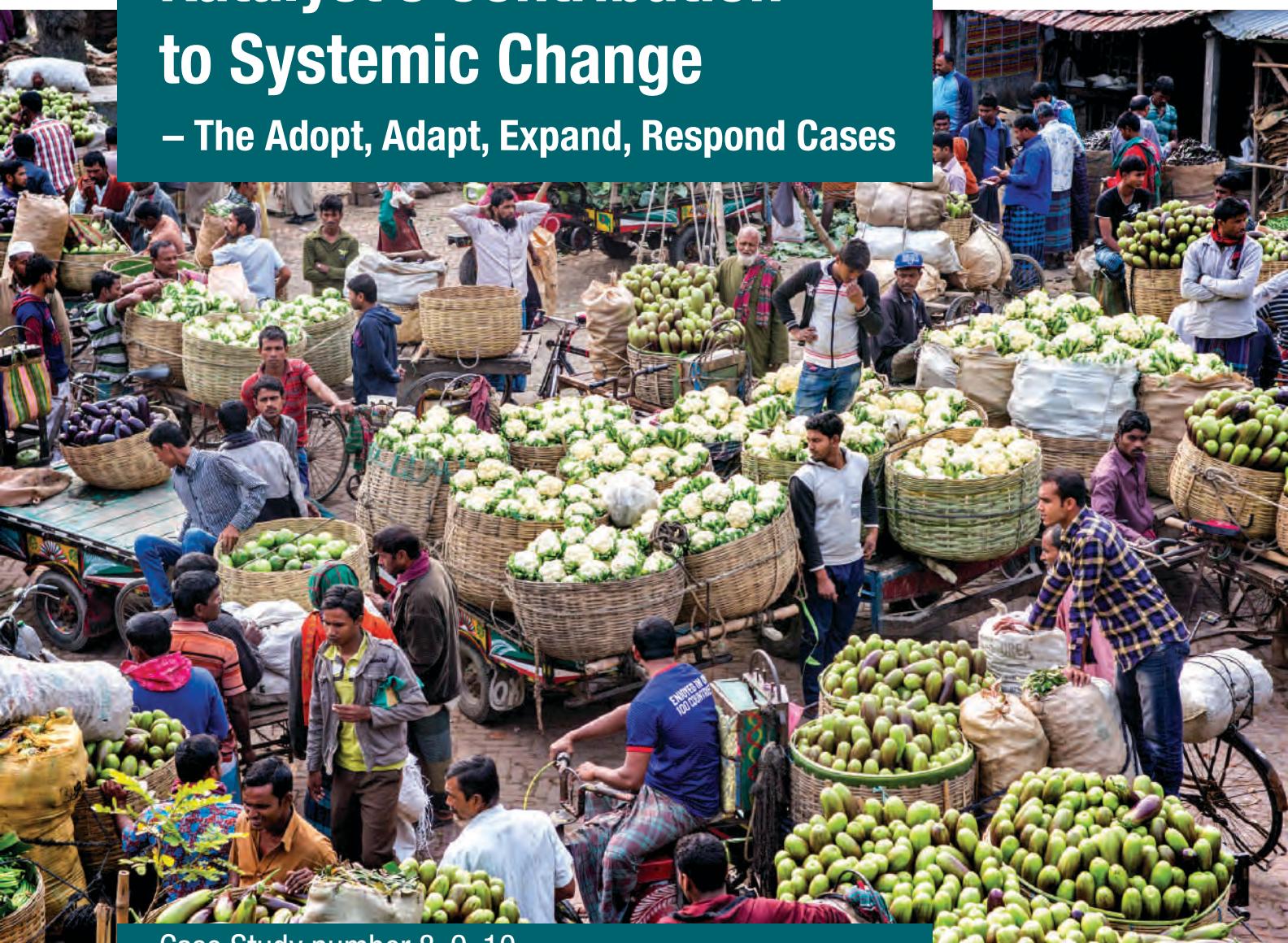




Katalyst's Contribution to Systemic Change

– The Adopt, Adapt, Expand, Respond Cases



Case Study number 8, 9, 10

Dr. Ben Taylor
Dr. Jake Lomax
Karen Smith



Implemented by



Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

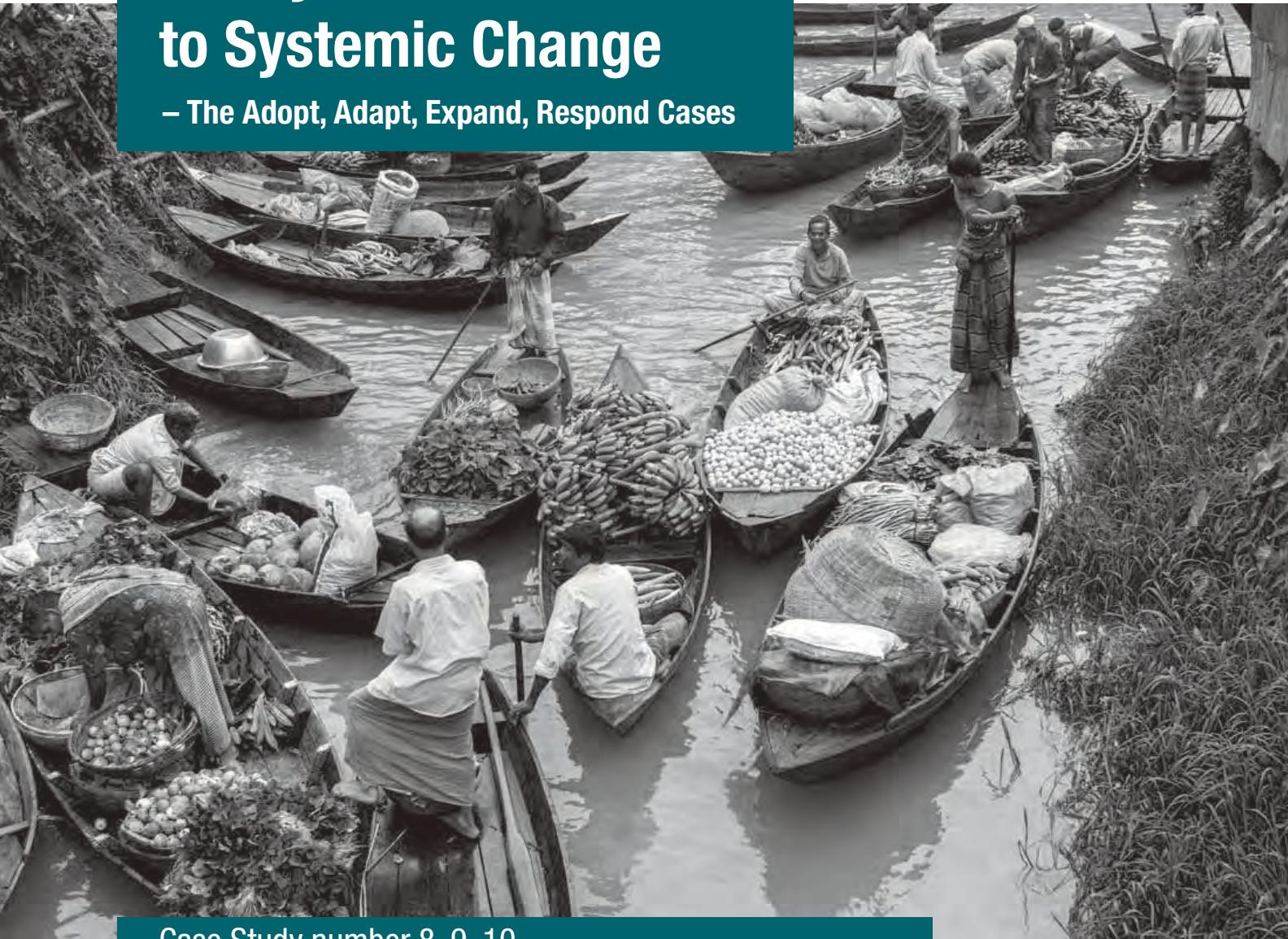
Swiss Agency for Development
and Cooperation SDC

EMBASSY OF DENMARK
DANIDA | INTERNATIONAL
DEVELOPMENT COOPERATION

Funded by

Katalyst's Contribution to Systemic Change

– The Adopt, Adapt, Expand, Respond Cases



Case Study number 8, 9, 10

Dr. Ben Taylor
Dr. Jake Lomax
Karen Smith



Katalyst's Contribution to Systemic Change

– The Adopt, Adapt, Expand, Respond Cases
Case Study number 8, 9, 10

Dr. Ben Taylor

Dr. Jake Lomax

Karen Smith

Published in
June 2016

Photo
Wahid Adnan

Prepared by
Communications unit, Katalyst

Design and Print
Arka

Foreword

Katalyst, one of the leading Market Development project, is pleased to present you 'Katalyst's Contribution to Systemic Change – The Adopt, Adapt, Expand, Respond Cases'. This publication is an outcome of our longstanding, innovative and dedicated partnership, with known British think tank the Springfield Centre. The publication includes detailed case studies on how Katalyst's work across our three core sectors (farmed fish, maize, vegetable) has facilitated systemic change and contributed to inclusive economic development.

Katalyst's approach is based on the premise that enhanced private and public sector business services, coupled with an improved enabling environment, lead to more competitive enterprises, inclusive economic growth and, ultimately, poverty reduction. By facilitating systemic change in Bangladesh's agriculture sector, the project aims to reach 1.43 million farmers and SMEs, and to increase the income impact of these beneficiaries by USD263 million.

Based on the sustainable and clearly visible impact of market development projects such as Katalyst, development practitioners increasingly recognise that scale, and sustainability can all be linked to systemic change. However, while systemic change

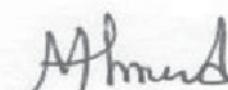
aims at including poor farmers better into the markets, there is still a lot of discussion on how to do that.

The Adopt, Adapt, Expand, Respond (AAER) framework which Katalyst and the Springfield Centre have jointly developed helps to explain Katalyst's approach to systemic change. Furthermore, the case studies will show how systemic change creates win-win situations for market players such as private companies as well as for small and poor farmers across Bangladesh. Being more than an analysis of a technical approach in the development sector, these case studies then demonstrate how systemic change has concrete impacts on peoples' lives and how systemic change is contributing to accelerate inclusive economic growth in Bangladesh.

We intend this publication helps to further establish 'systemic change' as a key development approach to help improve the lives of millions of people in Bangladesh and other developing countries. We are confident that the lessons learned and conclusions drawn from the case studies will contribute to a wider learning in the planning, implementation and measurement of systemic change programmes.



Markus Ehmann
General Manager
Katalyst



Nasir Uddin Ahmed
Head of Capitalisation, Communication and
External Relations Unit, **Katalyst**

Table of Contents

Table of Figures	8
Introduction	11
What systemic change means	11
Adopt	13
Adapt	13
Expand	13
Respond	14
Employing AAER	15
Structure of the cases	15
CASE STUDY	17
CHANGING THE VEGETABLE MARKET SYSTEM	19
Introduction	21
The overall market	21
Inputs market performance	22
Symptoms	23
Lack of access	23
Lack of quality	23
Lack of use	24
Underlying causes	24
Distribution and marketing	24
Systemic change in seed	26
From analysis to intervention	26
Defining the innovation: Changing the way poor farmers access seed	26
ADOPT: Piloting	27
Results – Proof of concept	28
ADAPT: Institutionalisation of change	30
Results	30
EXPAND: Greater benefits to more people	30
Results	32
RESPOND: Making change stick	33
Results	35

Summary of impact	36
References	37
MINI CASE – SYSTEMIC CHANGE IN CROP NUTRITION	41
Defining the innovation	42
MINI CASE – SYSTEMIC CHANGE IN CROP PROTECTION	45
Defining the innovation	46
References	47
Lessons from the vegetable sector	48
1. Partnership principles are vital to intervention success	48
2. Importance of the nature of the market – reducing transactions in the core market	48
3. Interventions to increase resilience	49
CHANGING THE FINGERLING MARKET SYSTEM	51
Introduction	53
The overall market	53
Fingerling market performance	56
Symptoms	56
Lack of access	56
Lack of quality	56
Lack of use	56
Underlying causes	57
Hatchery management	57
Brood stock supply	57
Aquaculture information marketing	58
Systemic change in the fingerling market	59
From analysis to intervention	59
Defining the innovation: Increasing access to, and quality and use of, HVS fingerlings	59
ADOPT: Piloting	59
Results – Proof of Concept	60
ADAPT: Institutionalisation of change	61
Results	61
EXPAND: Greater benefits to more people	62
Results	64
RESPOND: Making change stick	65
Results	66
Summary of impact and specific lessons	67
References	67

CHANGING THE MAIZE MARKET SYSTEM	69
Introduction	71
The overall market	71
Market performance	73
Market information	73
Skills and behavioural norms	73
Input supply	73
Market linkages	74
From analysis to intervention	74
Defining the innovation: Enabling the maize supply side	74
ADOPT: Piloting	74
Results – Proof of concept	75
ADAPT: Institutionalisation of change	77
Results	77
EXPAND: Extending the benefits	78
Expansion of benefit in the North	79
Geographical expansion to the South	79
Results	81
RESPOND: Making change stick	82
Results	83
Summary of impact and specific lessons	83
References	84
LESSONS FOR PRACTICE AND POLICY	85
1. Direct activities can help secure buy-in and make markets if they are part of a realistic systemic vision	85
2. It is important to maintain whole market perspectives – functions not firms or fixes	86
3. Adapt to learning	86
4. Expanding impact has multiple dimensions	87
5. Understanding systemic change	87

Table of Figures

Figure 1	: Market System Diagram	9
Figure 2	: Principal and supporting markets	10
Figure 3	: Functions addressed through AAER	12
Figure 4	: Katalyst's work in the vegetable market system	18
Figure 5	: Issues in the supporting system of inputs	19
Figure 6	: Timeline of interventions in the vegetables sector	31
Figure 7	: Bangladesh Aquaculture Production 1980 vs 2012 (FAO.org, 2016)	46
Figure 8	: Pond fish market system	48
Figure 9	: Timeline of interventions in the pond fish sector	58
Figure 10	: Chicken meat production in Bangladesh in MT	64
Figure 11	: Maize production, imports and yield; Source: FAOSTAT	64
Figure 12	: Maize market system	65
Figure 13	: Impact on one marginal farmer; Source: Katalyst	68
Figure 14	: Timeline of interventions in the maize sector	75



Katalyst's Contribution to Systemic Change

Introduction

Development programming is temporary in nature. External entities intervene in a system and change it with the aim of benefiting poor people. Throughout the history of development there have been temporary impacts on small numbers of people as, when funding stops, so does the impact of the change in the system. Katalyst's approach is different in that it explicitly targets large scale, sustainable – or *systemic* – change. These cases represent a significant milestone in the implementation of market development programmes. Katalyst, with the Springfield Centre, has played a leading role in developing thinking around what systemic change means. This suite of cases examines this concept across three sectors, demonstrating with different levels of complexity how a system can be changed to create sustainable impact at scale. Before engaging in the case material, however, it is important to clarify the *Adopt, Adapt, Expand, Respond* (AAER) framework as a means for identifying and defining systemic change so that this can be employed to understand how it has been facilitated in these sectors through the work of Katalyst.

What systemic change means

The first key concept defining systemic change is the identification of a system. M4P provides a useful framework for understanding a system which is seen as a series of interconnected supply-demand transactions which are supported by functions and governed by formal and informal rules (see Figure 1). **The supporting functions and rules are components of a system which affect the price, level, or quality of supply, demand or exchange in the core transaction.** The target group, which in the case of Katalyst is poor people, will always play the role of either supply or demand – as producers, consumers, rights holders, or

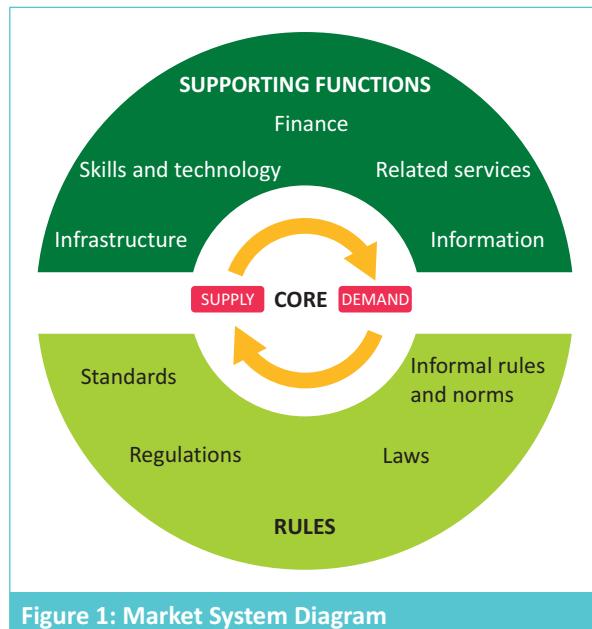


Figure 1: Market System Diagram

employees – in the core transaction of the principal market system, i.e. the system where the programme aims to improve outcomes for the target group.

The performance of the supporting functions and rules dictates the outcomes of the transaction. In order to change the way the system works for the benefit of the poor, one must change how these supporting functions and rules work.

The performance of each of the supporting functions or rules is, in turn, dictated by its own system – the supporting market system – which has its own supporting functions and rules.

The objectives of systemic change are defined relatively consistently as sustainable, large-scale change. However, while these goals are clear, consensus and clarity on what systemic change is, how to recognise it, and when intervention might be required, is notably absent. The Merriam-

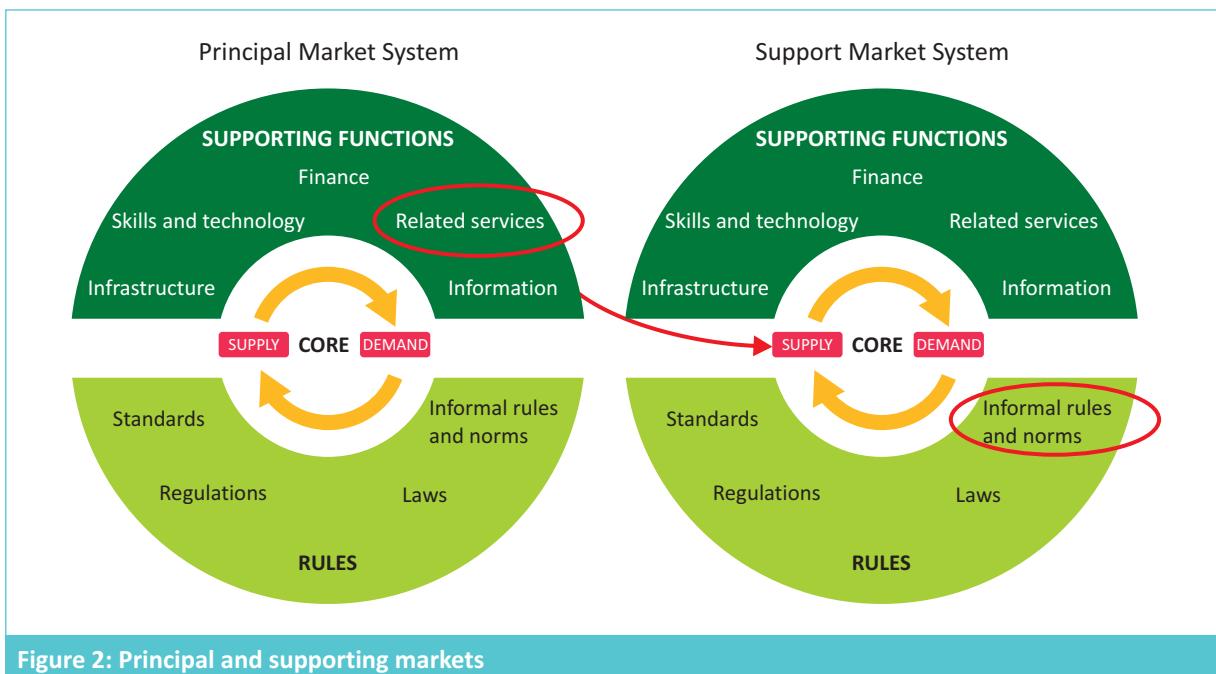


Figure 2: Principal and supporting markets

Webster dictionary defines 'systemic' as of or relating to an entire system and 'change' as to make someone or something different. New Philanthropy Capital's 2015 handbook introduces concepts of sustainability and the different components of a system, defining system[s] change as:

...an intentional process designed to alter the status quo by shifting the function or structure of an identified system with purposeful interventions...Systems change aims to bring about lasting change by altering underlying structures and supporting mechanisms which make the system operate in a particular way. These can include policies, routines, relationships, resources, power structures and values.

The M4P Operational Guide makes this more specific to development, using the objective of the change as part of its definition:

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.

Definitions are inherently limited when they have to be applied in context and the real question that development programmes need to address is what

does systemic change look like and how do I know if it has happened?

Based on the goals of sustainability and scale of impact, the changes in performance of supporting functions and rules identified above must demonstrate:

- Uptake, ownership, and investment by relevant players within the system, in the absence of external involvement; a sustainable change in behaviour.
- Increasing impact over time; more benefits to more people in the target group.
- Changes in other supporting functions and rules to stabilise or augment the impact of the initial change.

Cognisant of the concept of systemic change, the Springfield Centre and Katalyst developed a simple conceptual framework which aims to capture these different dimensions. The framework, known as the *Adopt, Adapt, Expand, Respond* (AAER) framework or the *Systemic Change Framework*, can be used by a programme to monitor whether systemic change has happened, is happening, or requires further programme action in order to take hold. These case studies are presented through the lens of this systemic change framework, the four key components of which are explained here.

Adopt

In the first instance, the role of a programme is to identify what change is needed – which of the supporting functions and rules within a system are underperforming, how they might perform better, and what actions should be taken to bring that change about. The system is not generating this solution of its own accord and so programme intervention to instigate an innovation is necessary.

Adopt is a process whereby an innovation in the operation of one or more supporting functions or rules of the market system is introduced and ownership over it is gradually institutionalised within the relevant players in the system. This will involve different roles for different actors. In this phase, a programme will be testing and refining an innovation in partnership with one or more players whose incentives are similarly aligned should the innovation be successful. It may be the case that multiple models of innovation fail at this stage – constraints may be intractable or the barriers to opportunities being realised too significant to warrant further programme investment.

For example, a programme might want to change the way that farmers receive information – changing the way the function of ‘information’ operates. To do this, they might need to partner with radio stations, journalism training institutions, research institutions, and private advertisers. All of these players, whether they are programme partners or not, need to change their behaviour in some way in order for the new model to work.

By the end of the *Adopt* phase, a programme will no longer be providing support to the initial

partner or partners in the same way. However, as documented below, changes required to further expand or stabilise the impact of the initial innovation will require **actor level institutionalisation** among relevant players. Further programme involvement may be required and so that this transferal of ownership takes place.

Adapt

The *Adapt* component of the systemic change framework refers to sustained behaviour change by relevant actors. The players involved in the innovation – both those that were supported by the programme and those that weren’t – must have accepted the different changes in their behaviour necessary for the model to work and incorporated them into their standard operations, in the absence of programme involvement, with independent investment of time, money, or other resources.

The process of institutionalisation – moving from *Adopt* to *Adapt* – needs to happen at the system level i.e. the functions which comprise the innovation need to continue to operate in this novel way after external intervention has ended. However, in practical terms, functions are comprised of a wide range of actors adopting a wide range of behaviour changes. Whether an initial partner, or an actor involved in the expansion or response component of the change, any shift in behaviour has to be institutionalised in order for it to be sustainable.

Expand

Expand is about pushing the boundaries of the innovation – more benefits for more people.

Change		Mechanisms
More People	More Benefits	
<ul style="list-style-type: none"> • New geographies • New segments of target group • Income groups • Marginalised segments: women, minorities etc. 	<ul style="list-style-type: none"> • Lower costs • Higher incomes from produce • Greater health or quality of life benefits • Better protection of future incomes through disease resistance or genetic diversity 	<ul style="list-style-type: none"> • Existing actors <ul style="list-style-type: none"> ▪ Roll-out • New actors <ul style="list-style-type: none"> ▪ New geographies ▪ Competition <ul style="list-style-type: none"> • Lower prices • Further innovation

The competition mechanism also has a dividend on sustainability, as an innovation becomes less dependent upon individual actors. If others are not imitating or emulating innovations that are seemingly successful and aligned with incentives to do so then it is indicative of a more fundamental problem with how the system operates including the information transmission mechanisms.

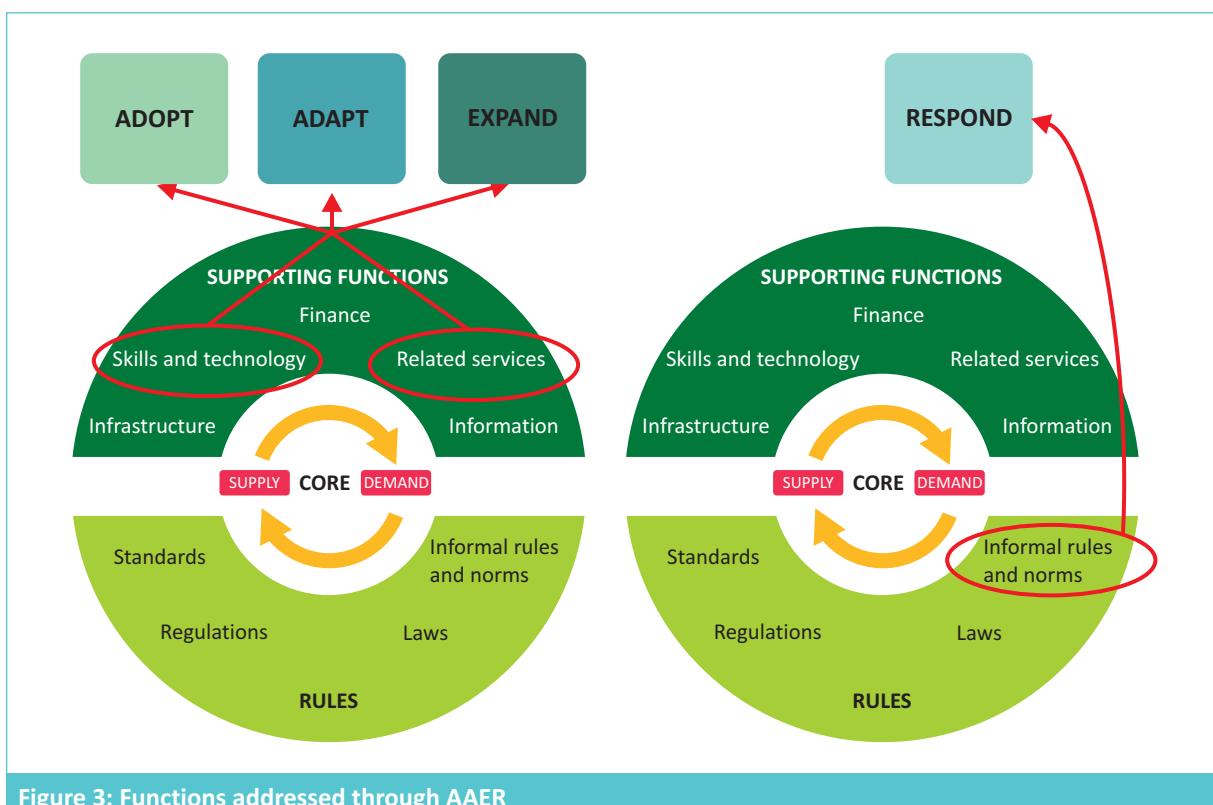
Having monitored the adoption and adaptation of a change in behaviour, a programme might need to re-engage in order to include new players or new areas in an innovation. It may be that the concept is proven and so the risk for a private sector partner is lower, or it may be that the programme initially targeted easier to reach areas and so heavier programme involvement is required in order to push impact into more marginal areas. Different partners also have different needs determined by their capacities, and so the type of programme support might also differ from that in the initial innovation.

Referring again to the earlier example of intervention in the information function, a behaviour change may have been sustainable with the programme partners – for example a radio

station and a research institution – and with all of the other players who needed to change their behaviour, such as journalists, training providers, and advertisers. However, the impact from that single radio station might not be reaching as many people as it could and so it might be necessary to partner with other players – whether they are radio stations and research institutions or perhaps other relevant players – in order to expand the benefits of the model to more people.

Respond

The *Respond* component of the systemic change matrix examines whether other supporting functions and rules are changing in response to the behaviour change that has been assessed through other components. It assesses what changes are happening and the degree to which they are supportive of or obstructive to the desired impact. If impact could be increased by responses within supporting functions and rules that are not happening organically then this represents an opportunity to increase the scale of impact. As such *Respond* is an important aspect of systemic change for both sustainability, through creating resilience of change, and scale, through realising opportunities for increasing impact.





Adopt, Adapt, and Expand represent changes in the operation of one or more initial supporting functions or rules which are part of a programme's vision for how a sector might work better to improve outcomes for the target group. *Respond* represents changes in other supporting functions or rules which reinforce or enhance the changes from the initial innovation.

In the example here, a range of players altered their behaviours and have helped to change the *skills and technology* and *related services* functions. However, if the growth in benefits to and numbers of the target group are to continue to expand from these changes, it may be that informal rules and norms need to change the way they work too.

Employing AAER

In summary, then, there are two roles of the AAER framework. Firstly, it is an articulation of the programme's vision. If a programme aims to bring about systemic change and the AAER framework helps articulate what it looks like, then a programme should be able to articulate how they can realistically expect the system to change in each of these components, before intervening.

However, systems are dynamic and complex and

plans are rarely borne out in reality. As a second and on-going use of the framework, then, the systemic change matrix is used by the programme as a tool for monitoring, reflection and guidance to action.

Structure of the cases

The cases are structured as follows. In this introductory chapter, the two key concepts necessary for defining and articulating systemic change are outlined; the nature of the market system and the dimensions of change necessary to ensure sustainable, large-scale impact. This is then employed to examine Katalyst's work across three sectors. Firstly, focus is put on the vegetables sector. Katalyst's work here has been extensive over 13 years and so the case study will concentrate on the inputs market, with a full case study on vegetables followed by mini-cases on crop nutrition and crop protection. There then follow two further case studies examining change through the AAER framework; one on fish and one on maize. While each case includes sector specific lessons, the final chapter of the cases draws together some higher level conclusions based on common findings across cases. These should be used for wider learning in the planning, implementation and measurement of systemic change programmes.



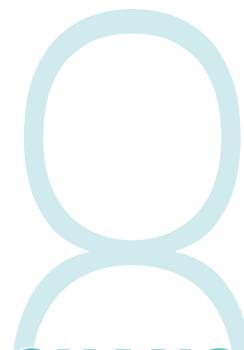
CASE STUDY

8 CHANGING THE VEGETABLE MARKET SYSTEM

9 CHANGING THE FINGERLING MARKET SYSTEM

10 CHANGING THE MAIZE MARKET SYSTEM





CHANGING THE VEGETABLE MARKET SYSTEM





CHANGING THE VEGETABLE MARKET SYSTEM

Introduction

Vegetables are important to poor people. They form a vital part of people's diets as the key source of much of their vitamin intake. As such, vegetable production is a longstanding part of the agricultural production landscape in Bangladesh. As incomes have increased and with changing tastes, there is an increasing opportunity for poor people to participate in the vegetable market in a way that can significantly improve their incomes. However, there are multiple barriers to the participation of the poor in the sector and to the benefits they extract from it.

Since 2003, Katalyst has been working in the vegetable sector in order to improve the position of poor people within it. As with other sectors of the programme, Katalyst's mandate in vegetables began in the north on limited crop varieties, expanded during Phase 2 to a nationwide mandate and more cross-cutting issues with all vegetables, and in Phase 3, has begun to deepen this impact into more marginal areas. After having outlined the market as a whole and how Katalyst sought to address constraints in multiple areas, this case

study focuses on two of those constraints; the marketing and distribution of agricultural inputs. Using the AAER framework which guides these case studies, a lasting impact is shown which is embedded in the system.

The case is structured as follows. The overall market for vegetables is described briefly before focusing in on features and constraints of the inputs market for the vegetables sector. The symptoms and underlying causes of underperformance are identified, and narrowed down to marketing and distribution functions. The major case of seeds is then developed. In seeds, the functions developed through interventions in Adopt, Adapt, Expand, and Respond components of the framework are described together with results at each stage. This is followed by mini-cases on crop nutrition and crop protection which are less mature as sub-sectors, but in which similar constraints in marketing and distribution have been tackled. Specific lessons from the three vegetables cases are then documented together with a timeline of overall interventions.

The overall market

There are both supply side and demand side issues which impact on the profitability of vegetable farming in Bangladesh. On the supply side, Bangladesh exhibits very low productivity in comparison with other countries with similar climatic factors. Both production and productivity have been increasing in recent years and vegetables now account for around 4.5% of gross

value added (GVA) in agriculture (BBS, 2012). Approximately 12% of the rural population is involved in vegetable production (BBS, 2013). Nevertheless, vegetable productivity in neighbouring India is 81% higher than in Bangladesh (Vanitha et al., 2013) and so it is clear that there are still issues constraining the growth of the sector¹. On the demand side, there are issues with post-harvest losses which impact on prices and incomes from sale and the transaction costs involved in the marketing of produce for farmers.

Following an M4P approach, Katalyst began to map the supporting functions and rules that determine the terms of the main transaction involving poor people in the vegetable sector. The focus was put on the role of the poor as producers, rather than as labourers or consumers, and the underperforming elements of the system were determined. There were clear problems with information for farmers on how best to market their products; standards to certify quality of produce; agricultural skills and practices of farmers; post-harvest handling of produce; and with the inputs market in terms of quality, price and availability.

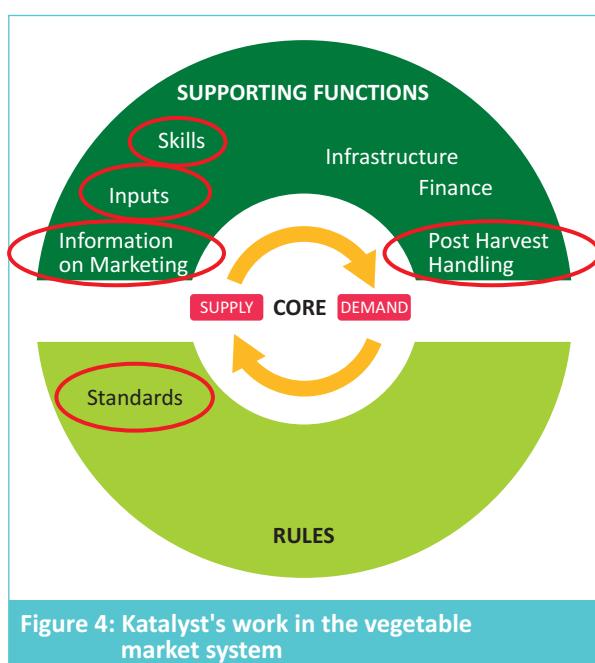


Figure 4: Katalyst's work in the vegetable market system

As outlined in the M4P approach, change is affected by altering the underlying causes of underperformance and, as such, Katalyst's analysis took them into a range of supporting systems. Over its 13 years of work in the vegetable sector, Katalyst has developed interventions designed to address a great number of these constraints. This case study, and the two mini cases which follow, will focus in particular on the inputs market system, a supporting market of the core vegetable market system, as this system has been of vital importance in the recent improvements made in the productivity of vegetable farmers.

Inputs market performance

Provided the pre-requisites of adequate land and water are in place, all agricultural commodities require four main things at the production stage: the raw materials – seed or breed; nutrition to make them grow – fertiliser or feed; protection from damage – crop protection or veterinary services; and finally the knowledge of how to utilise all of these things to ensure productivity. In Bangladesh, there are clear issues caused by the latter of these factors and Katalyst has facilitated a range of interventions to address this constraint, including the successful retailer training which has been represented in a previous case study in the vegetables sector (Gibson, 2006).

Vegetables are a more technically challenging crop than staple crops and their cultivation is more input intensive. The major inputs necessary for vegetable production are seeds, crop protection inputs such as pesticides and integrated pest management (IPM) procedures, and crop nutrition which includes macro, micro, and compost fertilisers. While demand for and usage of inputs in Bangladesh has been gradually increasing over the past three decades, the fundamental problem remains – in the inputs market for vegetables, farmers are not using them enough or at all, and those which they are using are of poor quality. There are three interlinked aspects to this underperformance: lack of access; lack of quality; and lack of use.

¹ The 2006 case study went into depth on the broad features of the market which remain largely unchanged. As such, this case will focus on Katalyst's work in the sector in overcoming the constraints it experiences.

Symptoms

Lack of access

Bangladesh is the most densely populated large country² in the world. In fact, the population density is three times that of India. Despite this, only a small proportion of the population have access to high-quality inputs and many have no access to retail inputs at all.

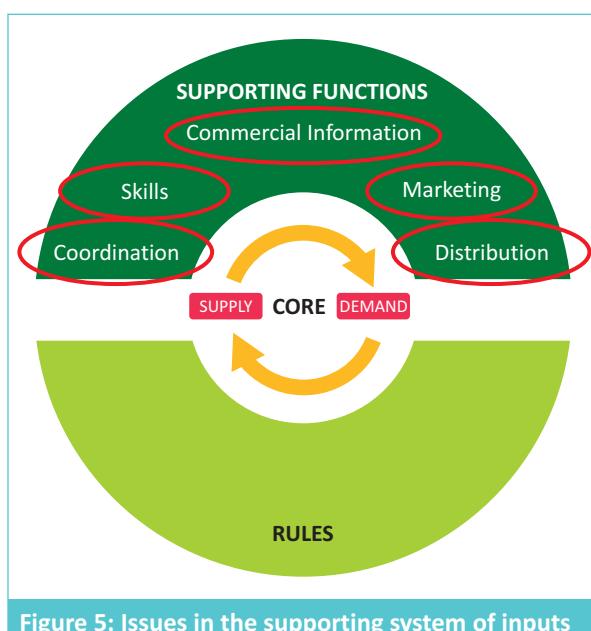


Figure 5: Issues in the supporting system of inputs

There are many places where farmers might acquire inputs from. As with many developing countries, the government of Bangladesh has traditionally played a significant role in the distribution of agricultural inputs. The Bangladesh Agricultural Development Corporation (BADC) is a parastatal entity which is charged with delivery of agricultural inputs to farmers. It has seed, horticulture and fertiliser management wings, as well as a minor irrigation wing. It produces and distributes seed and fertiliser but also has a remit to transfer seed production technologies to the private sector. Production and distribution of vegetable seed has been a relatively recent endeavour for BADC and remains at a very low level of 40,000 tonnes per year. While this is insufficient to have any real impact on the demand for seed, it can have a negative impact on the incentive for private companies to perform the functions of production and marketing. Fertiliser manufacturing and distribution is a more far-

reaching public function with up to 50% subsidies for certain types of fertiliser provided by the government (Bangladesh Bureau of Statistics, 2012).

From seed production companies, the most common distribution relationships are arm's length, with often inputs 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.

Access is also, to some degree, a function of price. Inputs are only accessible if they are affordable. The gap between best quality seeds and farm-saved seeds has not been bridged by locally appropriate and affordable varieties, so poor farmers are prohibited from climbing the ladder of productivity.

Another driver of the low levels of access is the lack of awareness amongst private sector input providers of the potential business opportunity presented by smaller farmers. In a market that is growing despite underutilisation by poor people, the incentives to enter this unknown market are reduced.

There are some inputs which, until recently, it was simply not possible to buy in Bangladesh. Tight controls regulating which inputs can be sold together with the absence of demonstrable demand has meant that, for example, numerous IPM products which could improve productivity have not been made available to farmers.

Lack of quality

The inputs that are available in Bangladesh, particularly in remote areas, are of poor quality. There are over 100 listed seed companies in Bangladesh, only 20 of whom are selling good quality seed. The majority of these companies are new and are still developing their products and their offer. Unpackaged seed accounts for at least around 70% of seed sales.

² Countries with a population of greater than 10 million people.

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.

Lack of use

Beyond access and quality, there are also areas where the inputs market is underperforming despite adequate quality and availability. Particularly in less remote and more commercially-oriented areas, inputs of a genuine high quality are available but they are still not utilised to the degree one would expect, given the potential productivity gains.

One reason for this is a lack of awareness of both the products' existence and their potential benefits.

In terms of the potential productivity gains, an important factor is a lack of trust in the products. The origins of this lack of trust can include: improper usage resulting in lower yields and higher losses; previous experience with poor quality inputs meaning people see a risk in investing in genuine high quality inputs; or poor communication of the potential benefits of using improved inputs. These factors are compounded by established norms of agricultural practices and a lack of willingness to change.

Underlying causes

The input supply market had many supporting functions which were not operating to their full potential. Some of these problems required short-term solutions to generate momentum within the sector. Within seeds, the industry association (BSA) was simply not adequately skilled to perform the coordination function necessary, advocating on behalf of the seed industry and bringing members together to pursue common interests. As such, Katalyst intervened to build the capacity of the BSA. Further, seed suppliers were not taking advantage of the opportunities to introduce higher quality seed and to market this to the potential customers, representing a failure in the transmission of market information from

manufacturers to producers and then on to consumers. Here, Katalyst engaged in joint ventures with seed suppliers to source higher quality imported seed varieties, inputs such as germplasm and breeder seed and technical knowledge in order to build the capacity of the seed producing companies.

IPM represented an opportunity to introduce low-cost crop protection solutions which also had a positive environmental effect and catered to a new market in low-residue produce. However, the skills to provide information and training on these inputs which were new to Bangladesh did not exist within the inputs system.

Two interlinked and crucial functions were identified as the underlying causes of the underperformance of the inputs market system documented above – marketing and distribution – and it is those which will be examined in the remainder of this case on seeds and the two mini cases on crop protection and crop nutrition.

Distribution and marketing

These two supporting functions to the effective operation of the inputs market are intrinsically linked. It is important to bear in mind that use of improved inputs is very low in the rural communities targeted by Katalyst. This includes inputs which would allow for participation in the markets for higher-value varieties. Within the inputs market, it is this low level of use that is at the core of low productivity, while general agricultural practices and other demand and supply side drivers are addressed through other components of the programme.

Lack of access, lack of quality, and lack of use are all largely attributable to deficiencies in marketing and distribution. Poor and inappropriate distribution practices meant that many people who had the willingness and ability to pay for quality inputs were not able to buy them. The inputs weren't stocked at the outlets used by these farmers. Supply was also unreliable and so no brand loyalty could be built. On the marketing side, farmers weren't aware of the potential benefits so there was a perceived lack of quality which

reduced usage. Lack of use was also a result of the affordability of inputs; they weren't being marketed in a way that was appropriate for poor consumers. It was these underlying causes which

Katalyst sought to address in the markets for three separate inputs – seed, crop protection, and crop nutrition – to create systemic change.



Systemic change in seed

Seed has been a key area of interest for Katalyst for over a decade. The problems of lack of access, lack of quality, and lack of use were all clear. However, the reasons for this were complex and required both detailed analysis and experimentation. Would simply taking seeds to farmers who previously had no access increase usage? Were farmers not buying seeds because they had doubts about the quality? Were farmers not buying seeds where they were available, because of price, because of the availability of appropriate markets for their products, or because of lack of information on the potential benefits? In addition to work in other aspects of the vegetables market system, Katalyst began working in the marketing and distribution supporting functions in the seed market in 2008.

From analysis to intervention

Defining the innovation: Changing the way poor farmers access seed

Analysis led Katalyst to determine a number of interconnected factors behind the low levels of

access, quality, and usage of improved seeds. Firstly, on the demand side, farmers did not see the benefits of using improved seed. The primary reason for this was determined to be that for those entrepreneurial farmers in an area who had experimented with improved seed, they did not have the knowledge or skills necessary to extract the maximum benefits from it. A good seed improperly used may not deliver any yield improvements at all. Due to the mechanisms for the transmission of information in communities, which typically involve word of mouth and imitation of lead farmers, consensus quickly develops that improved seeds are not worth investing in.

Secondly, and to compound the perceived low quality of seeds due to misuse, there is an actual reduction in quality due to poor marketing practices. As often detached and remote retailers of seeds are general retailers without specialist skills, storage practices can result in degradation. Further, these unspecialised and unregulated retailers commonly practice adulteration of seed, which limits the productivity impact.

Thirdly, the input companies themselves don't see the market in poor and remote areas. In a rapidly growing market, the incentives to take risks in expanding to new markets are significant.



Information on demand is poor. Further, companies are not aware of how best to reach these remote areas which had high transaction costs, making experimentation with new models expensive.

In summary, the risks on both sides of the seed transaction were perceived to be too great. The costs of investment in changing behaviour to new business models – as growers of high value vegetables or as distributors and marketers of high value seeds to new markets – were perceived to be too high.

Katalyst recognised that the functions of marketing and distribution in the seed market had to work differently if these constraints were to be overcome. A vision of the future was developed whereby seed companies would actively develop rural markets by both raising awareness of their products and ensuring that they were used correctly in order to maximise productivity. This would lead to repeat custom and develop the market further. In order to make this viable from an economic perspective for the seed companies, but also to ensure that it had a pro-poor impact, the market had to be of sufficient size and so Katalyst envisaged an integrated distribution model, combined with new marketing practices, which grew the market by expanding into more rural areas.

This new configuration of better performing functions within the seed system represented an innovation by Katalyst that would improve the performance of the inputs market so that the productivity, prices, sales, and ultimately incomes of poor farmers would increase in a sustainable way. Katalyst set about the challenge of identifying partners with the right capacities and incentives to bring the change about, and developed interventions in order to facilitate this behavioural change.

ADOPT: Piloting

The initial changes envisaged in the seed market had two components. Firstly, in seed marketing, seed companies needed to overcome the negative perceptions of improved seed in poor communities by showing that they actually worked

in increasing productivity. In order to do this, in mid-2008 Katalyst identified five seed companies with whom they would partner to set up demonstration plots in poor communities to show that the seeds worked.

This tactic had multiple purposes. Demonstration plots have been shown to be effective in both increasing awareness amongst farmers and also transferring knowledge on cultivation practices which have then been implemented and resulted in improved productivity. Further, attending a demonstration has been shown to be as effective as running the demonstration plot in the adoption of practices (Duflo et al., 2004; Khan et al., 2009). Demonstration plots also give the programme assurances about the quality of the technology, in this case seed, in this specific context. These factors justify the use of demonstration plots as a tactic but the challenge consistently faced by demonstration plots is scale up. Scale being one of three key objectives in M4P programmes along with effectiveness and sustainability, the continuous replication of demonstration plots is not a way to address systematically the problem of marketing in seeds. As such, Katalyst decided to engage a number of partners in this initial pilot.

There were multiple reasons why Katalyst simultaneously engaged five partners, none of whom were the market leader. Such a strategy is not common in an M4P programme where it is generally assumed that one or two partners, often a lead firm, will demonstrate a new model to the market and other players within the market will begin to emulate and develop the model. In this case, mindful of the potential limitations to scale-up, Katalyst began with five companies who could all operate their own demonstration plots. This provided greater coverage but more importantly, in this nascent market, it would help reveal the competencies of various partners and develop competition amongst the firms. This was a relatively low risk and low cost intervention for Katalyst, and so the potential returns from involving multiple partners at this stage were greater than the costs.

However, as has been shown in other contexts, the impact of improved marketing through demonstration plots will have little sustained impact if the distribution system is inadequate:

[T]he low rate of adoption of the inputs was due to non-availability (Khan et al., 2009; 313)

Aware of the interactions between marketing and distribution functions, Katalyst recognised that seed distribution to remote regions was inadequate. Even if the awareness and knowledge were present, farmers wishing to buy improved seeds would have to walk for several kilometres in order to buy them.

Katalyst's market analysis revealed that informal mobile seed vendors (MSVs) were being used to bridge this gap. These MSVs would buy bulk amounts of seeds from towns and then travel to villages, usually on a bicycle, to sell the seeds. This function was nascent and informal in the market. Problems remained of a lack of quality control and knowledge of these seed vendors. The seeds they bought were often adulterated and poorly stored. Katalyst attempted to overcome these challenges, at the same time as capitalising on the benefits of the marketing intervention in demonstration plots, by formalising these MSVs and linking them directly with seed companies.

There were many potential advantages to this formalisation. One of Katalyst's most successful interventions in vegetables was the retailer training programme (RTP), whereby seed companies invested in the information function of the system. For Katalyst this overcame productivity problems caused by agricultural practices while for seed companies, it institutionalised retailers as a reliable source of knowledge and increased sales of their products accordingly. This model has been replicated across Katalyst sectors and in many other countries, by Katalyst partners, other companies, and other development programmes. Within the remote areas which were the subject of the seed interventions, contact with retailers as providers of information was limited. Hence, Katalyst saw an opportunity to synthesise the RTP and MSV aspects of intervention by utilising MSVs as a provider of information.

For seed companies, this would spread the benefits they had seen through the RTP into previously unreachable markets and consequently increase their sales. It would effectively lower the risk in entering these markets by increasing the probability of productivity gains from the use of their products being realised. For MSVs, they stood a chance of significantly increasing their incomes as a result of increased sales and increased margins on their products. For farmers, the core target of Katalyst's intervention, they would now have access to inputs which were previously unavailable to them which would increase productivity and incomes if the marketing interventions were successful in creating demand.

For this intervention, Katalyst partnered with two seed companies, of which one did not pursue the intervention beyond the very early stages owing to an internal capacity issue. The remaining company was the market leader and was not involved in the marketing intervention. The nature of the distribution problem was such that it was too risky to undertake as an initial venture but was, in theory much easier to emulate once the concept had been proven – particularly for competitors whose seeds had already established a presence in some remote regions. In the initial stages, then, Katalyst needed an established partner who was willing and capable of shouldering this risk. There was an obvious theoretical risk in creating a monopoly by contributing to first mover advantage for the market leader. However, Katalyst's analysis saw this risk to be minimal due to the nature of the intervention which was not technologically intensive, and the ownership of the information on how the model worked, which remained in Katalyst's hands.

Results – Proof of concept

The goal here was to test that the pilot worked. Partners were willing to sign up and continue to engage in the activities throughout the pilot period. Projections on the number of demonstration plots, the number of people attending demonstrations and the number of MSVs trained were all assessed, together with a basic test of the theory of change; if actors change their behaviour in the ways envisaged (and at this

point facilitated by the programme), would this improve the functioning of the seed system and consequently improve productivity and incomes?

On the marketing side, between the five partners, over 400 demonstration plots were established and over 150 field days for the sharing of learning in strategic locations were conducted over a period of two seasons. Almost 12,000 farmers were exposed to demonstration plots with many more involved in field days over this period and programme calculations show around 22,000 to have used the seed to their benefit. For two of the companies for whom data is available, sales increased by 13 – 14% in those areas of the country, although there is no clear attribution to the demonstration plots. This was achieved despite environmental problems of droughts and floods in several areas.

On the distribution front, 55 MSVs participated in a residential training programme which was co-funded by Katalyst and the seed company and was then followed up by regular meetings between the MSVs and the seed company. The MSVs mirrored the role of retailers under the RTP and so 180 lead farmers were supervised by the newly trained MSVs to develop demonstration plots. These were complemented by 1000 smaller demonstration plots within homesteads which were customised for these remote areas and more appropriate to that context. A small programme study of MSVs reported an increase in sales of 20% overall, and an increase in sales of improved seed of 50 – 70%. Farmers using the seeds have reported an increase of 10% in yields.

As defined in the opening section of these case studies, the components of systemic change are non-linear. The subsequent sections, therefore, do not necessarily follow chronologically or in isolation. In attempting to broaden the impact of a change in a sector, new partners will have to transition through adaptations of the original model and in increasing the resilience of a change by observing and facilitating the response of other supporting functions and rules.



ADAPT: Institutionalisation of change

Intervention design is always a collaborative effort between a programme and their partner and attempts to align incentives behind a shared vision. However each partner will always have their own objectives, and realities frequently change as new ideas are introduced, the programme reduces support, and market realities evolve. A sign of a robust change in the functions of a system is when partners continue to invest in and develop a model after the programme has exited.

By definition, in Adapt, Katalyst looked for evidence that change was institutionalised rather than taking actions to institutionalise change within partners. With the Expand and Respond components of systemic change, at the actor level, each new actor to become involved in the innovation will have to firstly adopt and then institutionalise the change. These actor level changes are addressed separately within the relevant section.

Results

On the marketing side, three of the five pilot companies continued to utilise demonstration plots in the areas tested with the programme at the time of last measurement in 2012. Most of these have been adapted from the exact model conducted with Katalyst to suit the company's needs. One company found the process too expensive for the returns generated and ceased to use demonstration plots. This, in part, justifies the use of a multi-partner approach to piloting in a nascent market. The other partner seed companies have invested further in these marketing methods, adding other marketing tools such as promotional materials and signboards to the demonstration plots to increase their effectiveness in attracting farmers. One firm has moved to crop specific promotion and, through new marketing techniques in these rural areas, has effectively created a market for a new variety of cucumber.

In terms of distribution, MSVs have now become an integral part of Katalyst's partner's business model. Fourteen of the MSVs trained with Katalyst were incorporated as dealers of the seed company

Katalyst's major partner in MSVs reports that over 1000 MSVs have now been through their formal training programme and they see it as a vital part of their business strategy for reaching small farmers. They are continuing to expand the model to reach new geographies.

Abul Baki from Shibgong is a mobile seed vendor who has formalised his business through Katalyst's partner. He is now delivering embedded services and has attracted a wider and more loyal customer base of farmers who are increasingly buying higher quality seed and increasing their profits. His business has expanded and he too is experiencing increased profits, tripling the number of farmers buying quality seed.

and a further four as sub-dealers, all targeting seed sales in rural areas. The partner continues to offer training to MSVs and sees them as a part of their distribution network to expand into rural areas. Further, the more successful of the two partners has developed a model specific to MSVs which was not part of the original innovation. MSVs have a different pay and commission structure than other distribution outlets which has been seen to incentivise greater professionalism. Other actors required to sustain their behaviour change include the MSVs themselves. Katalyst data suggests that all MSVs have increased their profitability as a result of the shift in business model, and the proportion of higher quality seeds in total sales has increased.

EXPAND: Greater benefits to more people

AAER is a framework for analysis of existing impact, and for planning around how to increase it or make it more resilient to shocks. Expand can happen in many ways as documented in the opening chapter of these cases, and Katalyst continued to monitor the extent of impact from their interventions beyond the pilot period. The gains from the initial marketing and distribution interventions were strong. MSVs have grown significantly and there are now an estimated 4,500 operating in Bangladesh, supplying an average of 125 farmers each. That provides a total of 700,000 farmers who



now have access to seed who previously did not, and the emulation of formalisation and the delivery of embedded services through MSVs means that more and more of these people have access to improved seeds and skills in how to use them.

From the interventions in product development (see Respond), it can be seen that mini-packs are now the predominant form of vegetable seed retail by seed companies and, without Katalyst intervention, this has become mainstreamed within the market.

Nevertheless, Katalyst recognised that there was still scope for penetrating further into poor communities. There were evidently some farmers for whom the demonstration plots did not deliver sufficient incentive to purchase seeds, did not deliver sufficient knowledge to realise productivity impacts from improved seed, or who were not reached by demonstration plots. Further development of the marketing mechanism was necessary in order to target these farmers.

Two years after the end of the initial marketing intervention, when it was clear that practices had

been institutionalised within some of the initial partners but that there was still potential for further penetration of improved seeds into remote areas which the market was not realising, Katalyst developed an intervention with two of the initial partners from the demonstration plots intervention. These partners clearly exhibited an interest in reaching poor and remote markets but did not possess the knowledge of how to reach them nor sufficient risk appetite for experimentation. Katalyst developed new marketing methods, with the help of technical expertise, which were piloted by the partner. These were as simple as flipcharts and videos but were locally appropriate and new for the sector. However, these flipcharts contained vital information which had not previously been delivered but provided a vital incentive for farmers to invest in new seed technologies – cost benefit analysis of switching to new seed varieties. While this may have been verbally relayed by some extension agents or other information providers, this was displayed in a relatable format so that farmers could easily understand the potential benefits of investing more in improved seeds.

By Phase 3 of Katalyst, in 2014, gains from marketing and distribution interventions, together with the further refinement of the product development function, were significant. Katalyst had learned a great deal about the requirements of poor people and how businesses could cater to their needs to improve the seed system. However, a country with the size and diversity that Bangladesh has, requires different approaches for different regions. Poor farmers in vulnerable and peripheral regions of Bangladesh were still not able to access or use the required quality of seed to boost their incomes.

For seed companies that were still growing significantly, in part because of accessing the poorer markets which Katalyst had targeted previously, entering into these peripheral markets was not a priority despite the potential commercial gains. Katalyst partnered with the same company that had been successful in both the MSV and mini-packs (see Respond) interventions, to synthesise the MSV, mini-packs, and marketing interventions for implementation in the Chars – river islands with marginal land highly susceptible to flooding – region. This area had not, to date, seen any benefit from previous interventions due to its low income levels, geographical isolation and the climatic difficulties it experiences.

Here, Katalyst partnered with the market leader, owing to the significant risk involved in targeting this region, to implement simultaneously all of the marketing, distribution, and product development innovations in the Chars region. Owing to the risk involved, Katalyst had to bear a larger proportion of the total cost, but in investing a quarter of the total cost, the partner clearly saw potential in the market and was willing to commit to experimentation. This activity finished at the end of 2015 and so results are limited and provisional.

Results

Actor level institutionalisation

In marketing, the two partner firms continued to invest in the new techniques after Katalyst support had ended. They each continued to experiment with a mix of tools to establish which were most appropriate for their own use.

Further, beyond the partner firms, there is evidence of uptake of these tools to access new market segments by other firms in the market. One major seed company has developed their own range of flip charts, videos and presentations in line with those trialled by Katalyst, with a view to improving their marketing in rural areas to increase the size of the market.

In distribution, MSVs have spread organically throughout the sector and their formalisation is becoming the norm.

Impact level change – contribution to poverty reduction

As ever with this component of systemic change, there are multiple dimensions which affect the overall impact, and quantification is challenging. There are those affected by the direct interventions in order to facilitate expansion of the impact of the original innovation. There are those impacted indirectly, such as farmers within the networks or the farmers who attend a training or workshop and improve their productivity as a consequence. There are also farmers who benefit because they are reached by the firms that imitate and emulate the intervention of Katalyst who then, in turn, have a cascade effect within their networks.

A competitor to Katalyst's partner in MSVs reports how proliferation of knowledge is occurring through staff turnover and they are now incorporating formal MSV training in order to attempt to reach 40 – 45% of small farmers through MSVs.

One firm now focusing on MSVs describes skilled MSVs as...

"the market penetrator...they are in the door of the end users"

Katalyst's partner in the expansion of minipacks and MSVs to the Chars reports that since the partnership ended in 2015, they have extended the model to new Chars stating that there is a...

"huge opportunity. Vegetable cultivation has been more accepted after we started selling in the Chars"



Katalyst measured two of these levels, with further measurement prohibited by the lag between intervention and emulation. Overall, 1,011 farmers were seen to have received increased income in the year following Katalyst intervention through their exposure to the new marketing methods used in the events facilitated by Katalyst and their partners. An additional 2,865 within their networks were seen to have realised a total income increase of USD1m based on a Katalyst investment of USD25,000. If the uptake by competitors of these firms continues and is successful in increasing penetration of seeds into more marginal areas, the true impact figures are expected to be far greater.

In terms of accessing more people through the geographical expansion to the Chars, a total of over 15,000 mini-packs (see below) had been sold in the first year of the intervention, with many of them sold by MSVs. Interestingly, in addition to an income increase for farmers purchasing seed, there was also a decrease in cost owing to reduced losses and better agricultural practices.

RESPOND: Making change stick

With the performance of the marketing and distribution functions having improved in the areas targeted by the programme, Katalyst realised that uptake was not as high as had been hoped. Market analysis revealed that the price of seeds and capital requirements for farmers were so high as to make repeated purchase unfeasible for many at this time. It did not appear, based on this analysis, that it was an information problem, or an issue caused by the informal rules around purchasing of inputs as many farmers were aware of the potential benefits. It was merely a question of affordability for what were very poor farmers.

Two potential reasons for this were a lack of suitable financial products including pre-financing of inputs and a lack of appropriate products to cater to poor consumers. Credit markets do function in rural areas of Bangladesh. Typically, loans are taken from informal sources and used for consumption smoothing. Formal credit providers, which are sparse in the poorer rural areas, tend to be for larger production investments such as

livestock or land (Duong and Izumida, 2002). Given that the target group are those who have little or no experience in growing higher yielding, more technically demanding varieties, pre-financing was likely to be difficult and connection to potential providers limited. Katalyst saw flaws in the product development and market information functions of the system i.e. potential providers of seeds were not aware of the existence of a potential market and had not developed appropriate products to explore it. These functions had failed to respond to the growth and potential of poor³ rural seed markets and product offering remained largely undifferentiated. Aware of experience elsewhere in miniaturisation allowing access to products for low income consumers, Katalyst sought to introduce a smaller, more affordable packet size of quality seeds to the market which was more appropriate to poor consumers. In integrating this with the gains already made in marketing and distribution methods, Katalyst were able to increase the penetration of these higher yielding seed varieties into new markets.

³ Katalyst define 'poor' as earning less than USD2.5 per day or holding less than 2.49 decimals of land.

Katalyst selected two partners with whom to pilot the intervention, one of whom had been involved in the marketing intervention and one of whom was involved on the distribution side. Both practices had now spread within the sectors and so were now part of the business model of both partners. Seeds were initially made available for 35 varieties of vegetable in packets around one tenth of the previous standard size, costing USD0.13 – 0.25. These seeds were distributed through the mobile seed vendors meaning they were targeted at the poorest and most remote communities who had both limited access to seed and limited ability to pay. Structuring the deal with partners is always important but here, it was necessary to ensure that learning from the intervention belonged to the programme and could be disseminated sector wide as quickly as possible. The Katalyst commitment of USD45,000 was directed at the technical elements of the intervention, leaving the companies to pay for all capital and human resource expenditure. This meant that Katalyst retained the learning from the intervention. In order to expand the impact of the intervention,



Katalyst facilitated a workshop with a wide range of stakeholders including potential competitors who then, recognising the returns available, began to offer mini-packs independently.

By 2014, gains had been realised from the compound impact of marketing and distribution as well as the response in terms of product development. These gains had begun to be expanded through tailoring the models to new regions with different challenges. Katalyst's ongoing analysis revealed an opportunity to expand impact further. Certain small, low capacity farmers were still not maximising productivity gains from using improved seeds. For seed companies, this risked damaging the reputation they had worked to build through better marketing and distribution. There were also potential sales that were being missed through not properly catering to these segments of the market. Even amongst those who continue to buy, they might buy more if they realised bigger gains through proper use.

Not all MSVs were part of formalised training provision schemes and some were of a very low technical capacity. There was also an issue in that different people learn differently. An MSV who tells a farmer how to plant and care for a crop at the time of seed sale might not be as effective for some farmers as having something they could refer back to. Here, then, Katalyst partnered with a new seed company, one that had begun to implement many of the innovations within the market that had been introduced through their competitors, demonstrating their entrepreneurship. The idea here was to address the remaining problems around skills in the input market through the function of marketing, in order to increase sales and usage of seed and ultimately increase incomes. Katalyst and their partner redesigned seed packaging so that it contained detailed but accessible information on use and care in local languages.

Results

Actor level institutionalisation

The intervention in product development has been transformative for the sector. The two partner



Bibi Julekha Khatun, a homestead vegetable farmer from Char Bhuta, reports how minipacks have helped her engage in commercial production, selling excess produce at market where she had previously only produced for subsistence. She has continued to buy minipacks after the Katalyst support to the seed company ended as they are increasingly available in the local area.

Mini-packs have allowed poor people who would not have engaged in commercial farming to participate and supplement their income using marginal land.

"I never thought that I would get 3,000 taka from cultivating the aisle" – Nibaron Sarker, a landless day labourer from Pirkacha.

Montaz Ali Fokir, a poor landless day labourer bought a seed mini-pack from an MSV who had received training from a competitor of Katalyst's partner. Sharecropping marginal land from his employers, he made USD45 profit within two months by growing pumpkins.

companies have now made mini-packs part of their core business model. Indeed, 71% of the seeds sold by these companies are now in the form of mini-packs. Between them, the companies now produce 127 varieties of seed and have produced almost 2 million packets in total. They have further developed the packaging so that it is customised for the mini-packs which should increase the appeal. All this has occurred while sales of regular pack sizes have been maintained.

Evidence on institutionalisation within non-partner seed companies is not yet quantifiable, but is nevertheless clear. Mini-packs are now the



predominant form of seed retail in rural areas of Bangladesh, available from a wide range of seed companies. Some of this was demand driven. Seed dealers approached seed companies asking for mini-packs having seen their competitors benefit from their sale. There were, therefore, additional dimensions to the expansion of impact.

In terms of the agricultural skills within the inputs market, the intervention to improve marketing is still in progress and so results are limited and provisional.

Impact level change – contribution to poverty reduction

None of the interventions undertaken by Catalyst can be isolated from the context of the systemic constraint they addressed. The interventions in marketing and distribution put in place the foundations for outreach to be increased

significantly, but the introduction of a new product, which addressed problems of product development and market information, built on this foundation to change the sector, and resulted in huge increases in access to seed for poor farmers. Within three agricultural seasons of introduction, almost half a million households had purchased mini-packs, resulting in an additional USD14m of vegetables produced. This resulted in both increases in sales and decreases in purchases of vegetables for consumption which amounted to an average of USD15 per farmer per season. Further, the changes in industries offering related agricultural inputs which now also offer mini-packs means the impact level changes on poor farmers are magnified significantly.

Summary of impact

Catalyst have indisputably changed the seed system and therefore increased the productivity

and incomes of hundreds of thousands of poor farmers. They have done so in a sustainable manner where the system is robust and the changes they have facilitated will continue to adapt to external factors.

Figure 6: Timeline of interventions in the vegetables sector		Year								
COMPONENT	INTERVENTION	08 09 10 11 12 13 14 15 16								
		08	09	10	11	12	13	14	15	16
ADOPT	Seed marketing - demo plots									
	Seed distribution – MSVs									
EXPAND	Seed marketing - innovative marketing tools									
	Seed marketing and distribution - MSVs and Mini-packs in Chars									
RESPOND	Product development – Mini-packs									
	Skills - information dissemination through packaging									

References

- BANGLADESH BUREAU OF STATISTICS, 2012, Statistical Yearbook of Bangladesh 2012, 32nd Edition, Statistics and Informatics Division, Ministry of Planning, Government of the People's Republic of Bangladesh, Dhaka.
- DUFLO, E., KREMER, M. & ROBINSON, J. 2004. Understanding technology adoption: Fertilizer in Western Kenya, preliminary results from field experiments. Unpublished manuscript, Massachusetts Institute of Technology.
- DUONG, P. B. & IZUMIDA, Y. 2002. Rural development finance in Vietnam: A microeconometric analysis of household surveys. World Development, 30, 319-335.
- GIBSON, A., 2006, Bringing Knowledge to Vegetable Farmers: Improving embedded information in the distribution system, The Katalyst Cases (1), Dhaka.
- KHAN, A., PERVAIZ, U., KHAN, N., AHMAD, S. & NIGAR, S. 2009. Effectiveness of demonstration on plots as extension method adopted by AKRSP for agricultural technology dissemination in district Chitral. Sarhad J. Agric, 25, 313-319.
- VANITHA, S.M., 2013, Vegetable Statistics, Technical Bulletin No. 51, Indian Institute of Vegetables Research, Uttar Pradesh.



MINI CASES



MINI CASE

SYSTEMIC CHANGE IN CROP NUTRITION

Crop nutrition is the second element of the trinity of crucial factors in growing vegetables. The crop nutrition system experiences very similar problems to that of crop protection, in that most farmers have some knowledge, but the limitations to that knowledge mean it can actually harm rather than increase productivity. The impact of problems in this aspect of the inputs market for vegetable production are severe. In terms of the underlying causes, Catalyst's analysis saw them as threefold.

The first two interlinked problems, in line with the problems seen in seed and in crop protection, were that the functions of marketing and distribution were not working effectively. Good agricultural practice for the growing of vegetables stipulates specific ways in which to use different elements of crop nutrition. Three categories are identified as macro (major chemical fertilisers such as NPK – Nitrogen, Phosphorus, and Potassium), micronutrients (zinc, boron, etc. sold in different mixes), and compost. As with pesticides, farmers default to simple solutions and so used as much macro fertiliser as they could afford. If problems with crops arose they simply used more,

particularly of macro nutrients, in tandem with the additional pesticides they were using. There were products, particularly micronutrients and higher quality compost, available in the market at a national level but, for the reasons outlined in detail for the seed sector, they were not getting out to the areas that would benefit from their use and, if they did, inefficient marketing meant that they were not valued accurately and demand was low.

In addition to marketing and distribution problems, a related but separate constraint was in the technology itself, or the research and development function of inputs companies. Compost is the most traditional and still widely used form of crop nutrition in the majority of developing countries. However, low quality compost by itself does not provide adequate nutrition for most vegetables. The decomposition of manure or food waste affects soil fertility and there is very little knowledge among farmers of the determinants of this nutritional value. Poor farmers do purchase compost commercially. However, the cost is generally high and the quality low by the standards in comparable countries.

Even more commercial farmers, some of whom employ many workers, do not have access to high quality compost. Commercial compost producers also engage in low technology methods of production which are slow and therefore increase costs significantly.

At all three levels of the crop nutrition spectrum, the functions of marketing and distribution were underperforming which was resulting in reduced productivity for farmers. At the macro-level, failure to deliver proper advice as part of a marketing strategy was damaging a brand through overuse and crop failure. At the micro-level, dealers – often the same companies as those that market macro fertilisers – were not delivering information on balanced fertiliser usage and so uptake was low. As a consequence, these products were not reaching areas where potential markets existed. In the compost market, even once the issue of the research and development function itself had been overcome, the marketing and distribution functions for both commercial and smallholder farmers were not developed. Katalyst saw an opportunity to transform the crop nutrition market.

Defining the innovation

Katalyst envisaged a crop nutrition market where farmers were aware of, and had a greater choice of, products across the crop nutrition spectrum. Marketing of products would incorporate greater product support to increase competence of farmers in their application, while the market would grow through increased confidence of producers increasing demand in low-income markets.

The first area for experimentation to change the operation of the marketing and distribution functions was in altering the behaviour of different types of companies so that they would begin to embrace some new marketing techniques. These would educate customers as to the proper use of their products. This was a sensible place to start as it required a relatively low level of investment from fertiliser companies and could, in fact, save money for farmers. This was not about new products or new investment but largely about a behaviour

change using current tools at the disposal of all stakeholders.

There is a complexity here in that companies might sell one or multiple micro-nutrients, macro fertilisers, or compost or they may be integrated with a combination of these products, as well as performing a number of other roles such as seed suppliers in the target communities in some cases. The Katalyst view was that all parties could benefit from advocating balanced use, but that personal incentives and a lack of coordination might lead some to give counterproductive advice. For example, it is difficult to see the incentive for a producer of a single micronutrient to tell potential customers to use less of that and more of another product. As such Katalyst experimented with a range of different types of partners. Two of the partners were producers and marketers of micronutrients, one was a mixed fertiliser company selling products from micro to certain macro, and the other partner was a compost producer and marketer.

Katalyst played the same role as in other marketing interventions; assisting companies to see the benefit of accessing new markets and helping them to reach new customers through the development of innovative marketing techniques. In this case, one of the main methods was a docudrama, which was shown to draw the interest of the community but also to result in greater adoption of practice than direct advice. Other techniques included dealer training, farmer meetings and demonstration plots. Signs of impact from this intervention were positive at both the market performance and beneficiary level. There was significant growth in sales of all types of fertiliser but particularly in micronutrients. Networks and the number of permanent employees within the firm have also spread significantly, and they continue to scale up the model, showing actor level institutionalisation. At the farmer level, a limited scope study by Katalyst showed notable increases in purchases, yields and profits of farmers in the target areas.

However, while successful, it was clear that the envisaged gains in fertiliser usage would not be

realised by changing behaviours alone based on existing products, due to the underdeveloped nature of the market. Just as with IPM, the market for higher quality compost—or the technologies to create it—did not exist in Bangladesh prior to Katalyst. After one year of the marketing intervention, Katalyst saw the potential benefits of the introduction of technologies to improve the quality and decrease the cost of compost as being of great value to some of the other work that was being done in vegetables, and indeed in other crops. As such it was seen as a necessary introduction to the compost component of the fertiliser market system before the more systemic constraints of marketing and distribution could begin to be addressed. In this related system for the supply and demand of the technology—Trichoderma, which is a biological agent which accelerates and improves the compost quality—there were two constraints in which Katalyst sought to play a more direct role. Firstly, there was the question of whether the technology worked in the context of Bangladesh. Here, Katalyst partnered with an inputs company who saw an incentive in that, if Trichoderma were eventually to become a valuable product, they would have first

mover advantage and a more developed understanding of the product than their competitors. Katalyst and their partner tested the product and found it to be successful, raising awareness of the product's potential. It was at this point that Katalyst decided to move to the next level in both Trichoderma, and in the broader marketing and distribution interventions.

In Trichoderma, Katalyst now had a key ally in advocating for the potential benefits of the product from the private sector. The task now was to address the formal and informal rules around regulation and government buy-in. Katalyst partnered with the government's Rural Development Academy (RDA), both to refine further the product's applications for the local market and to secure buy-in from key stakeholders. The public nature of the partner was also important to ensure ownership of knowledge from testing remained in the public domain. The intervention was successful in generating both knowledge and buy-in. However, it had been hoped that a solution would be generated as to how to scale up the production of Trichoderma to a commercial level. It was clear that RDA could not



be this partner and it would be necessary for commercial actors to invest if the products were to become available on any scale in Bangladesh. Importantly, though, the benefits of Katalyst's work here were already beginning to spread with one inputs company having begun testing on Trichoderma in its own laboratory.

In marketing, based on the success of the pilot, it was felt that the market would benefit from increased competition and a more diverse range of stakeholders becoming involved in providing these products. This had the potential to utilise the existing distribution networks of firms already selling multiple agricultural inputs and as such, expand the drive to a more balanced use of fertiliser into more rural areas. As such, Katalyst partnered with a further five firms to accomplish these goals. Exact intervention methodologies were modified slightly based on early learning from the pilot. This intervention modality has proven low-cost and effective at the farmer level.

In both Trichoderma and in marketing and distribution of micronutrients, Katalyst's focus since 2014 has been on increasing the number of farmers impacted by the interventions developed and refined earlier in the programme. Through Katalyst's work in marketing and distribution, the system has clearly changed in the way that farmers are accessing information on the availability of different fertiliser products and those products are now available to them. However, the lag between when this would impact on the majority of the

population and the current rate of growth is something that Katalyst feels it can shorten and thus deliver benefits to people more quickly whilst maintaining sustainability. The partners in the new phase are larger companies who might have the capacity to reach scale more quickly.

In Trichoderma, both commercial farmers and commercial producers of fertiliser have begun to utilise the product to produce higher quality, lower cost compost. However, as Katalyst begins to look towards impacting more specifically on poorer farmers rather than attempting to demonstrate the technology, the focus has shifted away from providing better and cheaper compost for farmers to buy in the market, to allowing homestead farmers to produce their own compost through the purchase of Trichoderma. Here, Katalyst have partnered with one of the firms who have demonstrated their interest and capability in catering to new markets and directly to poor farmers through partnerships with Katalyst in both the seed and crop protection sub-sectors.

The expansions in outreach that have occurred, both through Katalyst facilitation and independently, have been expedited by an independent response by the regulatory function of the system. The Department of Agricultural Extension (DAE) has begun to formalise the use of Trichoderma by granting licences for its manufacture.



MINI CASE

SYSTEMIC CHANGE IN CROP PROTECTION

Crop protection products and services act as inputs to the production of vegetables that many farmers are aware of but few have a detailed understanding of. It is the most technical element of crop production with entire crops lost to both under and overuse. In general, chemical pesticides have proven to be transformative in protection against pests, weeds, and diseases. The potential loss from these factors is estimated at 80% with actual losses at around one third of total production globally. Effective crop protection – pesticides, herbicides, and fungicides together with manual measures – can reduce losses by up to two thirds (Oerke, 2006).

Evidence from many developing countries has shown that once pesticides are introduced to an area, their use spreads rapidly and they quickly become the sole source of action for treatment and protection of all pests and diseases (Ntow et al., 2006; Ngowi et al., 2007).

The negative impacts on farmers' livelihoods created by this are many and are often underestimated. Firstly, there is the damage to the crop. Crops which are over-treated with chemical pesticides can easily be damaged or destroyed. Secondly, humans too can be severely affected by

exposure to pesticides. The first element of this is in direct exposure as a farmer to harmful chemicals. A great number of production days are lost and medical costs are incurred due to illnesses caused by exposure to pesticides. Another impact on human health and the third impact on farmers' livelihoods is through consumption. Pesticide residues in developing countries often reach dangerous levels and in recognition of this, produce which is seen as potentially over-treated will sell for a lower price in the market. Finally, the cost of pesticides is high and the more you use, the more it costs. Overuse of pesticides can, therefore, substantially increase the overall cost of production (Abhilash and Singh, 2009).

Crop protection in Bangladesh experiences the same problems of lack of access to appropriate technologies, lack of use, and lack of quality seen in other agricultural inputs. Catalyst recognised these issues and began to address them on several fronts. Unlike with seeds, there was a clear and basic problem with the knowledge and skills of farmers. While perceptions in seeds prevented farmers from using certain products, the origin of the problem here was not in the product but in the practice. In fact, in many cases the objective was to

get farmers to use less chemical pesticide and not more. The programme therefore approached that issue as part of a wide ranging approach to tackle agricultural skills through information. Indeed, Katalyst recognised this as an issue as early as 2006, when a retailer training programme was developed which aimed to utilise retailers as a conduit for information on appropriate products and dosages. This was not as successful as had been hoped as there remained a fundamental incentives problem, as advising reduced usage was not in the best interests of the retailer, particularly in the short term.

Another strategy adopted by Katalyst was at a national level. There was a problem with the skills of actors in the sector which were needed as a prerequisite to improving the sector's performance. Here, Katalyst saw the need to address this in a direct manner as a one-off activity which would secure the potential for other interventions to succeed. As such, Katalyst supported the Bangladesh Crop Protection Association (BCPA) to develop a training curriculum for its members so that they could participate in an informed discussion about the sector and begin to play the appropriate coordination and advocacy role.

While other interventions relevant to the vegetable sector sought to address a knowledge gap regarding good agricultural practice, Katalyst recognised that there was an opportunity to create a market where providers of products had the incentive to deliver this embedded service directly in the crop protection area. While it may have been effective to reduce the usage of chemical crop protection products, it was difficult to perceive of an actor with the incentive to do so. From the regulatory side, the government actors who might have an interest from a public health perspective were weak, and from the programme's pro-poor perspective, reducing chemical pesticide use without proper guidance towards an alternative would potentially open up poor farmers to further crop damage. As such it was decided that this had to be a product focused push strategy; there had to be a commercial actor with the incentive to promote the reduction in chemical pesticide use in order for the

change to be sustainable. As such, Katalyst decided to focus on the introduction of Integrated Pest Management (IPM) technologies which have the potential to replace chemical pesticides.

Defining the innovation

Katalyst identified three related and underperforming supporting functions or rules to the IPM system in Bangladesh. The first was a structural one; the regulatory framework was not in place to allow IPM products to be offered commercially. Other than this, the problems displayed in seed were similarly evident here. Within this IPM products market, marketing and distribution functions were not operating effectively. People in poor and rural areas did not have access to IPM products because potential distributors did not see the market, but the market did not exist as there was no effective marketing to demonstrate the potential cost-effectiveness of the products.

On the first issue, Katalyst set about bringing all of the key stakeholders in the sector together in order to begin dialogue on what was a relatively new sector. This was an activity that was required to secure buy-in for future work and was necessary if the sector as a whole was to have any chance of developing. The IPM forum, as it was known, featured discussions on research on appropriate IPM products, legislation, potential conflict between the objectives of companies in the sector, and finally the perspectives of farmers. The product was a policy recommendation in 2010, the release of which coincided with an amendment to the "The Pesticide Rule 1985" allowing for the commercial marketing of IPM products.

After a brief period of evaluation where it appeared the market was not responding to this driver of change, Katalyst actively sought to intervene in the underperforming marketing and distribution functions. The innovation here was to change farmers' crop protection practices through making alternative technologies both available and attractive to them.

The purpose of Katalyst here, unlike in seeds, was market creation as there was very little private

provision of IPM products. As such, Katalyst sought a partner who had the appetite to enter the space and create the market. The dangers of monopoly creation, while real, were outweighed by the fact that the market leader was the only potential partner with the capacity in terms of skills, capital and entrepreneurship to create this market. The skills that the partner did not possess, and the reason they had not entered the market in any significant way to date, were knowledge of the exact products appropriate to rural audiences and how to market them.

Katalyst built on the learning from the seed sector to develop appropriate marketing materials to be used by their partner, who committed financial and personnel resources. Almost 20 cluster demonstration plots were set up in different parts of the country on a limited basis, focusing on a limited range of pheromone-related products. An innovative and very positive tactic used in this intervention was the inclusion of extension agents or sub-Assistant Agricultural Officers (SAAOs). These government employees have significant outreach and credibility among farmers. The private firm demonstrating the benefits of IPM to the SAAOs, both those techniques using commercial products and those which do not, allowed for significant awareness raising which was aligned to the incentives of the SAAOs – to increase productivity at a low cost to farmers. At that time, no commercial licence was available for IPM products and so the potential for further promotion was limited.

While initially positive, the results at the firm level have proven challenging, with low profit margins.

However, the firm did see potential in the market and so the intervention was valuable in raising the awareness in the private sector of the market potential. This was partially as the intervention also served a technical purpose; the partner was able to see that proper use of IPM actually delivered increases in yield, in addition to all the health, soil quality, and sales benefits which might be realised in the long run by farmers.

By this point, Katalyst had confidence that the business model made sense and this partner had both the incentives and capacities to overcome marketing and distribution constraints. However, this innovation, as a trial, was focused on more accessible areas and more commercially-oriented poor farmers. So nascent was the market that, although Katalyst felt that the market leader they had assisted would encourage others to the market and ensure increased access and use of IPM products in the overall market, the registration, marketing and distribution challenges in more peripheral areas were more significant and would take far longer to overcome. As such, Katalyst began to develop the innovation further to ensure that the benefits were expanded to new groups.

This intervention involved using the same combination of innovative marketing techniques but having a nationwide approach. Here, the same partner who was already engaged in IPM was once again part of the intervention. However, to avoid monopoly creation and to encourage innovation, another partner was engaged on different terms. This intervention is in its very early stages and only the activities themselves have been recorded.

References

- ABHILASH, P. & SINGH, N. 2009. Pesticide use and application: An Indian scenario. *Journal of hazardous materials*, 165, 1-12.
- NGOWI, A., MBISE, T., IJANI, A., LONDON, L. & AJAYI, O. 2007. Smallholder vegetable farmers in Northern Tanzania: Pesticides use practices, perceptions, cost and health effects. *Crop Protection*, 26, 1617-1624.
- NTOW, W. J., GIJZEN, H. J., KELDERMAN, P. & DRECHSEL, P. 2006. Farmer perceptions and pesticide use practices in vegetable production in Ghana. *Pest management science*, 62, 356-365.
- OERKE, E.-C. 2006. Crop losses to pests. *The Journal of Agricultural Science*, 144, 31-43.

Lessons from the vegetable sector

There are a number of interesting lessons to emerge from the vegetable cases. Many of these lessons are common across vegetables, fish and maize and so are captured in the final chapter. However, there are two lessons drawn specifically from the case and two mini-cases in vegetables, that emerge particularly strongly and so merit dedicated focus here.

1. Partnership principles are vital to intervention success

Katalyst adopted a range of different tactics in deciding on their partners in order to change different supporting functions at different times, and this proved vital to success. The structure of the market in terms of number and size of firms, the micro political economy of different government and private sector actors, and the risk profile involved in facilitating the desired change were all vital parts of Katalyst's analyse which allowed for a bespoke negotiation of deals. Analysis revealed incentives and capacities, and experimentation was employed where these were not clear.

Market leaders were useful where there was a high technical requirement and higher level of risk in engaging in a pilot, and a portfolio approach was used where there were no clear capacities within the sector, so that these capacities would be revealed through the short pilot period. In partnering with market leaders, Katalyst had a clear view of how this model could be drawn upon by other firms and emulated, usually through an information or technology transfer function.

Part of deciding on appropriate partnership models is knowing which type of actor is best placed to perform a function, which can vary over time. In many cases, it was necessary to engage government to play a role in the early stages of the process, to perform a function which they may not eventually be best placed to perform. This helped secure the buy-in and generate the learning necessary to give the interventions a chance of future success. It is necessary in doing so to look beyond commercial incentives to incentives around power and social incentives in order to make strong propositions to partners.

2. Importance of the nature of the market – reducing transactions in the core market

An interesting and unusual feature of both the crop nutrition and crop protection cases, is that one of the primary objectives was to reduce the transaction in the core of the market system; to persuade people to use less of a product, service, or behaviour rather than more. This has more in common with health and security related sectors rather than agriculture, and is something that is conceptually underexplored. In IPM for example, it is possible to view the system as an input supply system where there are underperforming market information, marketing, distribution and regulatory components. It is also possible to view the system as an IPM system in which, in essence, none of the supporting functions or rules existed, which was the strategy opted for by Katalyst.

The fundamental difference in such markets is the nature of incentives. Where firms stand to increase sales from changing practice, there is a clear incentive for them to do so. Even where the desired changes will result in neutral economic returns, there can be strong incentives around social returns or reputational benefits. However,

when the objective is specifically to reduce use of a product, identifying actors with an incentive to do so is more difficult.

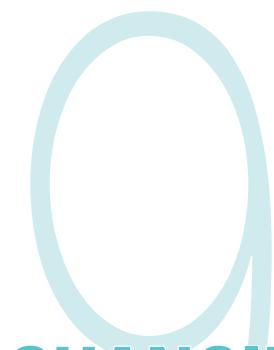
In crop protection and crop nutrition, the situation was slightly different. In crop protection, firms wanted to sell their product and that was harming the crops long-term. Developing and promoting an alternative product in IPM gave companies – either those that sold the chemical pesticides or others – an incentive to market that product instead, which could be complementary to their existing business. In crop nutrition, the problem was different as, by and large, products which are actually complementary are seen as competitive, as they are sold by different companies. There is a typical market failure as it should be in everyone's interest for companies to promote balanced fertiliser usage as, in the medium term, it will be detrimental to all firms if soil fertility is damaged. Katalyst's strategy here was to introduce a new product which would improve the quality of one of the three components of crop nutrition so as to make it more competitive and more likely to lead to balanced usage.

3. Interventions to increase resilience

In crop protection and crop nutrition, there was a challenge in attempting to change behaviours which would not realise a gain but minimise a potential loss in the medium or long-term. Considering not only interventions which are seen to increase productivity but also decrease losses requires different tactics as the potential advantages to a target group are less obvious. People do not, by and large, have an accurate perception of risk nor the information to improve decision making around risk taking behaviours. How can a farmer justify an expenditure on a pesticide without knowing how likely it is that they will be affected by the pest, and the impact on productivity if they are.

In addressing these challenges, Katalyst were able to leverage local trust networks and demonstrations in order to change these longer run behaviours.





CHANGING THE FINGERLING MARKET SYSTEM





CHANGING THE FINGERLING MARKET SYSTEM

Introduction

Katalyst has been working in the freshwater fish sector since inception, recognising the strength of the market both domestically and for export potential, as well as the opportunity to increase incomes of poor people involved in the industry. Initially the programme took a regional approach (Phase 1, 2003 – 2008) and Faridpur was selected as an underdeveloped target area which had potential to increase the productivity of small farmers. The outcomes of this work are described in the 2007 case study Accelerating Growth in the Pond Fish Sector (de Ruyter de Wildt, 2007).

In reviewing Katalyst's sector priorities for Phase 2, which ran from 2009 – 2013, it was clear that aquaculture remained a strong candidate. In line with the new country-wide approach for the programme, the scope of the fish sector was expanded to all regions and built on research that showed that specific high value species could yield the greatest economic benefits for small fish farmers.

This case study examines a number of interventions from Phase 2, detailing their

outcomes and the subsequent strategic decisions shaping further work in Phase 3. Data are also drawn from a number of impact assessments and intervention reports from both phases.

The case is structured as follows. The overall market for farmed fish is described briefly before focusing in on features and constraints of the fingerling supply market. The symptoms and underlying causes of underperformance are identified, narrowing these down to the functions of hatchery management, brood stock supply and the marketing of aquaculture information to farmers. The section 'From analysis to intervention' describes how the programme intervened to achieve systemic change by developing the functions through interventions in Adopt, Adapt, Expand, and Respond components of the framework, with associated results achieved at each stage. Finally some sector specific lessons are drawn out.

The overall market

The fishing industry is an integral part of Bangladeshi culture, as reflected by the saying "Machhe Bhate Bangalee" ("Rice and fish make a Bengali"). As Katalyst conducted their analysis of the sector at the beginning of Phase 2, Bangladesh was the 5th largest producer in the world, although China dominated with nearly 70% of global production (FAO, 2014). In 2009 the fish sector overall accounted for 4.73% of GDP and generated 4.04% of export earnings (Department of Fisheries, 2009), and was one of the fastest

growing sub-sectors of agriculture in the country. Globally, the fishing industry, particularly in Asia, has had strong and steady growth and continues to intensify and expand to meet demand; between 2000 and 2012, for example, worldwide food fish aquaculture production expanded at an average annual rate of 6.2% from 32.4 million to 66.6 million tonnes (FAO, 2014).

The aquaculture sector in Bangladesh offers good income and employment opportunities for poor farmers. The Department of Fisheries (2009) estimated that 12.5 million people were dependent directly or indirectly on fisheries and associated activities for livelihoods. In addition to the economic benefits of fish farming, it is significant that Bangladeshis gain 56% of the protein in their diet from fish (FAO, 2014) and farming families will typically eat the smaller, less marketable fish that they produce.

The fishing industry is sub-classified as either capture or culture (e.g. harvesting from the wild vs farming) and as either marine fishing or inland fishing (aquaculture). The marine sector benefits large numbers of marginal fishermen, but the impact of increased marine capture depletes fish stocks to the detriment of the environment. Inland capture was also suffering from depleted stocks and regulatory restrictions, depressing margins. Of the four sub-sectors, aquaculture was identified to be the most relevant to Catalyst's objectives, since it was growing at a faster rate than traditional capture and was essentially inclusive in nature.

The change in the shape of the Bangladesh aquaculture industry from 1980 can be seen in Figure 1 below, with the total production in 2012 exceeding 1.7M tonnes.

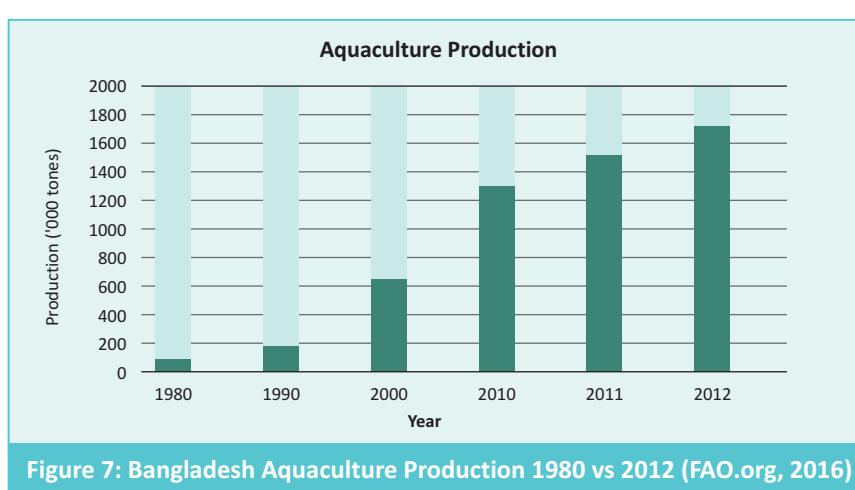
Catalyst's definition of the target small and marginal fish farmers was those holding or accessing 0.5 to 2.49 acres of land. Research showed that a typical small pond fish farmer generated an income of USD285 per year per acre

on average from fish farming (BCAS, 2009). Compared to other agricultural value chains, the proportion of profit retained at producer level is relatively good.

Small pond fish farmers typically do not incur significant fixed costs; they either own ponds of their own or pay to lease them. A farmer prepares a pond and will source fingerlings and provide feed and sometimes aqua chemicals to culture the fish until they reach a marketable size. The cost of feed is the greatest outlay in production, and human resource can also be a relatively high cost.

Small farmers tend to farm 'extensively', whereby the fish feed from natural sources. 'Intensive farming' utilises fish feed to increase productivity, but is not as accessible to small farmers as costs are higher; a 'semi-intensive' approach is a more viable alternative for these farmers to increase yields. Whether taking an extensive or intensive approach, aquaculture can be conducted with either one species (monoculture) or with a variety of breeds (polyculture) to maximise the utilisation of pond resources. Intensive farming is more likely to be monoculture, but there is no fixed approach for any one species.

Farmers will access information on aquaculture practice from a wide range of sources, e.g. from their neighbours, input suppliers and the hatcheries where they buy fingerlings. The government provides fishery extension officers, but these resources are very thinly spread. Traditional extensive farming is much less profitable than more advanced intensive





cultivation, but knowledge on how to use intensive methods is not well disseminated. Farmers can fall victim to problems caused by overstocking, e.g. leading to wholesale losses due to disease, if they lack the necessary agronomic expertise.

Katalyst's Phase 2 engagement in the pond fish market centred predominantly on the input supply chain rather than in forward marketing, as this was where the greatest challenges and opportunities lay. Small farmers are generally able to sell their produce for a fair price, although price crashes can cause losses where one year's strong prices for a particular breed led to oversupply in the following year.

In consultation with industry experts, the programme determined that a critical aspect of the aquaculture market that affected marginal farmers was the choice of species which they farmed. Some work had successfully been conducted in Rangpur and Dinajpur in Phase 1 introducing tilapia as a more profitable fish breed. Two other relatively new species (pangus and koi) have also become increasingly popular cultivated pond fish in Bangladesh. The three breeds are collectively classified as "high value species" (HVS)

due to the greater profitability that can be obtained as a result of their shorter farming cycles, which mean that farmers can produce 2 or even 3 cycles per year, as well as faster growth rates and lower mortality rates than traditional breeds. Farming of HVS has spread across the country since their introduction, and in 2012 the production of these three species accounted for 22 percent of overall fish production (DoF, 2012). The species proved more popular in districts such as Mymensingh, Syhlet, Chittagong, Comilla and Bogra, but they were not yet common choices for smaller farmers. Katalyst chose to focus on the promotion of these three HVS to best improve the livelihoods of aquaculture farmers.

Following an M4P approach, Katalyst mapped the supporting functions and rules that determine the terms of the main transaction involving poor people in the pond fish market, focussing on their role as producers rather than consumers and employees. The programme identified a number of salient demand-side factors which were preventing Bangladesh from capitalising on the growing international demand for fish: the species of fish currently dominating production were not suitable for the export market; Bangladesh was not

price-competitive in the cultured fish market; and poor information flows up and down the value chain made it hard for exporters to source the right supply.

These demand-side issues were not, however, as pressing an issue for small farmers, and the overall demand curve for the pond fish market, as discussed earlier, was broadly one of growth. It was on the supply-side that Katalyst found the more significant weaknesses in performance that restricted the profitable opportunities for small farmers, and so these were the focus of their attention. One such challenge was that of access to affordable capital by small fish farmers; such farmers are high risk clients for the formal financial sector, and borrowing is limited to family or moneylender sources. However, the key area constraining performance lay in the functions of input supply, both in the quality of feed and chemical inputs and in the quality of the basic fingerlings that farmers could acquire. While Katalyst undertook interventions to address the production issues of fish feed and aqua chemicals, the focus of this case is on the more extensive work conducted to improve the function of fingerling supply.

Fingerling market performance

In seeking the key constraints that prevented small farmers from fully benefitting from HVS production, Katalyst found the issues regarding fingerling supply to be the most critical. The fingerling market is illustrated below, and is a supporting market to the principal cultured fish market. In order to improve the opportunity for small farmers to benefit from HVS cultivation, it was predominantly weaknesses and opportunities in the functions and rules in this market that Katalyst needed to address.

There were three primary aspects to the underperformance in fingerling supply as discussed below.

Symptoms

Lack of access

The poor performance of the hatcheries resulted in inadequate supply of fingerlings which meant that those farmers wishing to cultivate HVS found

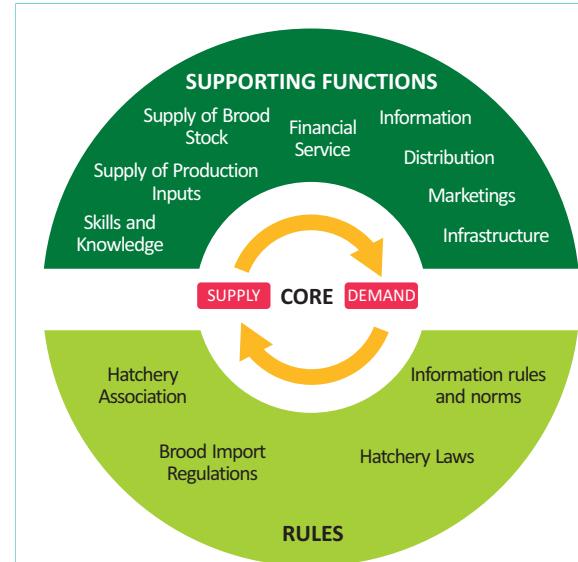


Figure 8: Pond fish market system

it difficult to source the raw materials required. Strong industry growth meant that the supply of HVS fingerlings was lagging behind demand and therefore pushing up prices beyond the reach of smaller farmers.

Lack of quality

The performance of fingerlings was low in terms of both mortality rates of the spawn produced at the hatcheries, the mortality rates of fingerlings and also the overall size and health of the farmed fish. Small farmers could experience expensive failures in their fish farming if they were unfortunate in purchasing such poor quality inputs.

Lack of use

The overarching symptom of the problem, i.e. the failure of small farmers to benefit from the opportunity presented by HVS production, was that they were not choosing to farm these species and instead preferred to continue with cultivating traditional fish breeds, such as local carp, with which they were more familiar. Despite the growing production levels of HVS nationally, the benefits of these species in terms of higher levels of profitability were not being accessed by small farmers.

Small fish farmers perceived that HVS required greater investment in feed and aqua chemical inputs for successful production, and this is true of

an intensive farming approach which commercial farmers adopt. The risk reward ratio was therefore considered to be higher than for traditional species. This risk was exacerbated by the variable quality of fingerlings as described above, but also the erratic quality in feed and aqua chemical inputs, a problem that Katalyst identified and pursued as a linked intervention to improve local input manufacturing.

In summary, small farmers were less likely than their large counterparts to recognise the benefits of HVS farming, and those who engaged were less likely to see a profitable outcome due to poor knowledge of optimal production methods and poor raw materials.

Underlying causes

The HVS fingerling market had a number of supporting functions that were not operating to their full potential and were perpetuating the lack of uptake and cultivation challenges experienced by small farmers. To fully understand the issues faced by hatcheries in producing good quality fingerlings, Katalyst commissioned a study in 2011. There were found to be a number of root causes which constrained performance and these are outlined below.

Hatchery management

Firstly, there was a dearth of technical and management know-how amongst hatchery owners and staff which was leading to numerous production problems (water quality, brood, feed, and disease management). Katalyst's research into the ownership and management of hatcheries showed that most commercial hatchery owners and employees lacked adequate understanding of good breeding practices. Furthermore, 45% of the hatchery owners had received no formal technical training or had just attended a short course and nearly all employees were unskilled labourers. Underlying capacity gaps in hatchery management were magnified by the adherence to poor advice of local "doctors"; nearly all hatcheries had such a doctor acting as a technical adviser, reflecting the strong cultural roots of the fishing industry. The advice being given by such doctors, however, was based on tradition and found to be limiting, if not

detrimental, to production. In addition, public sector sources of support and information were inadequate as exemplified by the lack of any industry guidelines to assist hatcheries.

The negative impacts being seen as a result of these poor practices included brood fish yielding fewer eggs, poor egg fertilisation and as a result, a higher mortality rate for farmed fish as well as stunted growth. These failures were all linked to a lack of effectiveness of the supporting knowledge and skills function on the supply side of the fingerling market, which hampered HVS market potential.

Brood stock supply

Secondly, there was a lack of adequate new brood stock to replenish old material and often stock came from a single source, perpetuating inbreeding problems. The Bangladesh Fisheries Research Institute (BFRI), which is responsible for fisheries research and its coordination, was the only source of pure brood stock in the country available to hatcheries, and only at very small scale. There was also a very small number of vertically integrated firms that imported brood stock, but their dealers only sold to large, commercial farmers.

One of the symptoms of the poor technical performance discussed above was that none of the hatcheries surveyed understood the protocols required to maintain strong brood stock and avoid genetic problems. Advances in fish breeding, such as innovations to improve size, taste, speed of growth, disease resistance, etc., were neither being developed in-country due to a lack of foresight and investment by the public sector, nor exploited from external sources. The weakness in the sourcing function for brood stock was an integral contributor to the quality problem.

This function was further constrained by gaps in public sector support, i.e. in the "rules" governing the market, which needed to be amended and implemented to facilitate the ease of importing brood stock. One of the major contributing factors to the lack of impetus on private sector access to new and improved technology lay with poor

industry coordination, and Katalyst identified this as another function to be addressed in support of the need for better brood stock sourcing.

Aquaculture information marketing

The lack of uptake of HVS cultivation by poor farmers was as a result of their limited understanding of the opportunity it offered. This knowledge shortfall was caused by underperformance in the marketing function, and was the key reason limiting the demand-side of the fingerling market. Small farmers needed to be incentivised and educated to break with traditional approaches to cultivate in a more commercial manner. Poor pond management, untreated disease or incorrect use of inputs could lead to costly problems. Information on optimal use of inputs and cultivation practices was not consistently available from any one source, and so farmers would turn to knowledgeable neighbours or retailers for help, or remain unaware that some of the methods that they were using did more

harm than good. There was an opportunity among a range of private sector players in the pond fish sector, including hatcheries, input suppliers and small traders such as patilwala (fish seed traders), to increase their efforts in marketing HVS to stimulate demand among the less commercial and less accessed small farmer community.

In order to facilitate a systemic change in the fingerling market which would yield the desired uptake and performance improvements in HVS cultivation among poor farmers, the three salient supporting functions that Katalyst sought to transform were therefore: knowledge and skills with regard to fingerling production; brood stock supply, alongside supporting legislation; and informational marketing of HVS to small farmers. Katalyst's farmed fish sector vision was that "small fish farmers will increase their incomes by diversifying into more profitable species and practices".



Systemic change in the fingerling market

The aquaculture sector has been a key area of interest for Katalyst for over a decade. The problems of lack of access, lack of quality, and lack of use in the fingerling supply market were interrelated and required analysis and coordinated attention. Would encouraging small farmers to try farming new species risk expensive failures when their ambition exceeded their understanding of best agronomic practices? Could hatcheries successfully develop better technical management practices to produce healthier, higher quality fingerlings and win the confidence of farmers? Would input companies see the commercial benefits of targeting the small farmer market with information-based sales techniques?

From analysis to intervention

Defining the innovation: Increasing access to, and quality and use of, HVS fingerlings

The analysis of the pond fish sector in Phase 2 gave clarity to the systemic changes needed to increase the benefits to small farmers. Katalyst took a three pronged approach towards facilitating the desired systemic change: to increase the quality of HVS fingerlings by improving the function of brood stock sourcing to hatcheries; to improve the management of the hatcheries through a more effective knowledge and skills function; and to increase small farmer knowledge of effective and profitable HVS cultivation via better marketing of the benefits of HVS farming by private sector actors in the value chain. The challenge was to institute a new configuration of better operating

functions to ensure that change was both sustainable and impacted large numbers of farmers.

ADOPT: Piloting

The hatchery research Katalyst conducted revealed that all but one of the hatcheries surveyed had suffered inbreeding problems for HVS. The hatchery businesses were noticing losses as a result of farmers switching to other species when their fingerling growth was poor. Although some hatchery owners replaced their broods annually, they tended to use the same sources (e.g. government research centres, local sources) and lacked essential management protocols, and so the genetic stock was not being expanded. In order to achieve higher quality seed it was clearly essential to find new sources from outside the country. Although a small number of private companies, operating exclusively through their own dealers, brought in brood stock from abroad, this was at low volumes and was only accessible to larger, more commercial farmers. Katalyst's research showed that hatcheries were also keen to import, but no investment was available from public sources to assist with the process, unlike in other countries with significant fishing industries, where research and importation facilities and public sector culture of brood stock were commonplace.

In order to catalyse the essential inflow of new seed, the decision was taken to undertake a pilot intervention with 14 hatcheries to import of brood stock from optimal quality sources to capitalise on the results of international research and development of HVS genetics. Katalyst facilitated this process by identifying the best providers, arranging buying trips and sharing some of the costs. The hatcheries shared some of the new stock with Bangladesh Fisheries Research Institute (BFRI) so that they could develop the genetic

quality of the species and also make this brood stock available to other hatcheries. This was to not only encourage private sector investment and access to improved brood technology but also to engage and build the capacity of the public sector as an important resource for the industry.

Katalyst had also identified that beyond the quality of the fish seed, the hatcheries had poor technical knowledge and management skills which compounded the issues of nurturing healthy fingerlings. The hatchery study conducted in 2010 in three selected districts (Mymensingh, Comilla and Bogra) highlighted numerous specific areas where a lack of both business skills and technical knowhow was impacting production. Katalyst needed to identify how to change the way in which the knowledge function operated in order to upskill the hatcheries, not only as a one off exercise, but in a manner that meant that independent service provision would be available thereafter to sustain quality in the industry. Bangladesh Fisheries Research Forum (BFRF), a member-based platform for the industry, and BFRI, were both engaged as suitable partners, having both the incentives to support the development and growth of the industry and national reach, as well as experts from the two international institutions in Vietnam and the Philippines, to design and deliver training to 45 hatcheries on essential components of hatchery management including brood management, hatching practice, selection of brood, pond-based breeding, hormone mixing and feeding practice. A hatchery management manual was designed and 1,500 copies disseminated.

Katalyst also analysed the flows of information in the fingerling market between private sector actors in the value chain and the farmers, to understand how to transform the marketing function to increase small farmer uptake of HVS production. The prime candidates seemed to be the feed and aqua chemical companies, who had both the capacity and the incentive to impart knowledge on cultivation techniques and the utilisation of their products. The logic was that companies would see the benefits of “information marketing” by resultant increases in input sales.

An intervention was designed with five input companies, selected according to their capacities, interest and geographical coverage, utilising a range of channels to deliver information to farmers such as training for sales personnel, dealers and lead farmers and demonstration plots. The training incorporated agronomic information that would improve cultivation practices. However, analysis of the uptake revealed that 38% of the farmers were large farmers (farm size of 1 to 2 acres), 32% were medium farmers (farm size of 50 decimal to 1 acre) and only 30% were small farmers. Katalyst concluded that while their endeavour to improve the marketing function had benefited some of the target group, a revised strategy would be required to expand the impact of the function to a greater proportion of poor farmers.

Results – Proof of Concept

The aim of these initial interventions was to test that Katalyst’s logic worked in practice as evidenced by the response from their partners. If these partners changed their behaviour in the ways envisaged, were there signs that the resultant changes in functions would lead to increased productivity for small farmers?

As a result of Katalyst’s support and facilitation a number of hatcheries took part in visits to international research centres to procure high quality brood stock. The list of partner hatcheries selected for the pilot was based on the recommendations in the hatchery research report; 6 visited Vietnam in August 2011 and 8 visited the Philippines in September of the same year in order to purchase tilapia and pangus. M.O. Hatchery was one of the group involved in the import pilot. Their agents were so impressed by the Vietnamese koi they saw on the trip, which has a better flavour than the Thai koi and is a bigger breed, that they arranged to import some of these as well. Two other hatcheries followed suit and the success of this venture led them to promote the species more widely in Bangladesh through BFRI exhibitions and seminars.

The objective of the import strategy was ultimately to see an improvement in fingerling quality. Katalyst reported that the hatcheries who had

One of the hatcheries that took up Katalyst's offer of support to import fresh brood stock was the Fishtech Hatchery, located near Mymensingh. They took part in the initial visits and bought both tilapia and koi, as well as benefitting from the technical training. As a result the hatchery has expanded from a customer base of 200 to a forecasted 5,000 this year.



Mr Jahirul Islam showing the tilapia spawn being taken for hormone treatment, an important aspect of mono-sex tilapia brood development.

imported stock in the initial tranche saw a reduction in mortality rates of the fish fry from 40% to under 5% and that farmers also benefitted from reduced mortality rates of the fish produced from these fingerlings from between 10 – 20% (depending on the species) to under 5%. These benefits were recorded as reaching over 55,000 farmers at an average income saving of approximately USD30 per farmer.

As defined in the opening section of these case studies, the components of systemic change are non-linear. The subsequent sections, therefore, do not necessarily follow chronologically or in isolation. In attempting to broaden the impact of a change in a sector, new partners will have to transition through adaptations of the original model and in increasing the resilience of a change by observing and facilitating the response of other supporting functions and rules.

ADAPT: Institutionalisation of change

Katalyst worked in collaboration with partners in the fingerling market to capitalise on incentives that contributed towards the desired vision of a better functioning system. Sustainable change in the functions can be recognised when these partners independently pursue a new practice once the programme has disengaged.

Results

The introduction of sourcing brood from abroad for hatcheries was part of a behaviour change necessary to see an improved function based on an understanding of the science behind fish breeding.

At the end of Phase 2, Katalyst commissioned another study (Innovision, 2013) into the HVS to better understand the specific informational needs of small farmers and to target interventions more effectively. A wide range of respondents were sought including the farmers themselves, hatcheries, feed producers, intermediaries and government fisheries officers. BFRF proposed to Katalyst that further trainings should be developed, extending to more regions. This signalled that the desired improvement in the knowledge and skills function was being seen; the provision of training was independently being pursued by BFRF and was in demand from hatcheries.

BFRF conducted a training needs assessment with over 300 hatcheries and, following this, designed and promoted a fee-based training programme, targeting businesses from "two tiers", i.e. both formal and informal players, to ensure appropriate levels of content and diversity of outreach. A total of 136 hatchery owners, technicians and managers were trained, representing a significant proportion of the estimated 350 hatcheries which were breeding HVS across the country.

Partly as a result of the training activities, BFRF have reviewed their organisational mandate and plan to become more commercial based on a ten year plan, offering courses at profit-generating rates. This signals that the organisation has fully embraced the innovation of technical training provision to hatcheries. A further indication that the hatchery

training innovation has been fully embedded by BFRF is that they plan to offer training on 8 more species including catfish, crab and eel.

For this innovation to be sustained then hatcheries have to be willing to pay for the training. To date (December 2015) BFRF have charged a USD25 fee, which is a less than commercial rate, but an indication that the course was perceived to offer value and hatcheries are willing to invest in their businesses.

EXPAND: Greater benefits to more people

When change in performance of a function means that the associated benefits are derived by a greater number of people or that these benefits become greater, then the function is in the Expand phase of systemic change. For this expansion to be sustainable it needs to be self-driven by the relevant actors. However, it can also be the case that programme intervention can facilitate expansion which will subsequently contribute to ownership (or adaption) and it is this path that Katalyst was following to catalyse change in the sourcing of brood stock, for example.

It was clear at the end of Phase 2 that the programme had achieved results in terms of enhancing the sourcing function, but the change in practice was not yet fully sustained or scaled and needed further support to reach more people. A workshop for stakeholders (hatcheries, researchers, government agencies and fish farmers) was held in November 2012 to share the lessons learnt in brood import and also the results the farmers achieved in cultivating the fingerlings. The original partner hatcheries were keen to have a second trip to import new brood when it needed replenishing after three years. However, at this stage they did not feel they had the capacity to do it alone and so Katalyst and BFRF once again stepped in to assist the process in 2014 (Phase 3). By providing support at decreasing levels, e.g. from paying 85% of the initial importation trip costs to paying 50% the second time, the project kept the momentum of the change in practice moving but were ensuring ownership was being shifted to the hatcheries.

Following the introduction of higher quality brood stock as part of the improved sourcing function, farmers who grew the newly imported koi reported positively. 142 hatcheries bought fingerlings to develop further Koi brood stock from the three importing hatcheries, thereby expanding the benefits of the improved brood quality to greater numbers of farmers. It is a feature of koi that it is possible to do this, i.e. develop brood stock from fingerlings, whereas for other species, such as tilapia, this is not possible as only male fingerlings are sold.

Despite a lot of interest exhibited by small farmers following the pilot to better market HVS through the feed and aqua chemical companies, Katalyst's research found that they still saw HVS as too expensive for them to farm. Although there was high productivity potential with HVS farming, higher investment is needed in inputs (fingerlings, feed and aqua chemicals), requiring capital investment that was beyond the capacity of small farmers. In order to expand the benefits of improved marketing to the targeted small farmers, the programme needed to find another more appropriate strategy.

Katalyst consulted their technical advisers who proposed two HVS cultivation methodologies which were better suited to the resources of small farmers:

- “green pond technology”, an approach for tilapia farming that requires no commercial feed and relies on effective pond management; and
- “semi-optimal feeding” which incorporates the use of feed for polyculture, with shorter cycle fish added to the system and a reduction in feed (and therefore cost) required compared to intensive farming.

The programme took these ideas to the input companies but the bigger companies were not interested since they were focussed on the larger, more commercial farmer market segment. Instead, Katalyst negotiated to test the promotion of these two methodologies through 11 hatcheries who had been involved with the programme's brood importation pilot. In order to ensure that an



appropriate cohort of small or marginal farmers was selected, the Progress out of Poverty Index (PPI)⁴ was used, whereby a farmer who had access to less than a 50 decimal pond area, and a PPI score of less than 58, was deemed to be part of the target population.

The improvements in the informational marketing function to encourage the new HVS cultivation methodologies were very positive with farmers involved reporting greater profits, and the sale of inputs also increased; successful adoption of implementing the innovative cultivation techniques through training had been achieved. Katalyst estimated that through patilwala and hatchery training, as well as other farmers learning from their peers, over 10,000 farmers have realised an average annual increase in income of USD130 per farmer.

Having established that the two innovative, low cost approaches to HVS farming were viable among small farmers, Katalyst shared the results of the pilot with a number of smaller feed and aqua chemical companies; larger input firms being less interested in the small farmer market segment. A number of these companies were enthusiastic to

Sohel Ahmed is a fish farmer who received training from Fishtech, switching from traditional carp to tilapia and koi four years ago. He now farms koi and tilapia in three of his four ponds, recognising that he benefits from being able to farm two cycles per year and that they are more resistant to disease than the carp. In the last season he made a profit of USD1,800, a significant increase over his original farming income.



Mr Ahmed does not buy from other hatcheries as he believes that he gets better fingerlings from Fishtech.

⁴ The Progress out of Poverty Index® (PPI®) is a poverty measurement tool for organisations and businesses with a mission to serve the poor.

test the novel approach to marketing HVS products to small farmers, including specific labelling aimed at small farmers on their products. In terms of the systemic change Katalyst were trying to bring about, working with input suppliers can be seen as a variant of the initial innovation to facilitate increased benefits of informational marketing via hatcheries.

As a result, a new intervention was introduced in Phase 3 as part of the project's fish sector strategy. Two feed producers were selected, and since one of these, Uttara, was already conducting marketing campaigns in Jessore, Katalyst suggested they focussed on the north as a new region for the information-based marketing trial. The tactics adopted by Katalyst were to "buy down" the risk for partners such as Uttara to encourage them to innovate – in this case to take on the risk of venturing into a new geographic area. On a 50:50 cost share basis, Uttara trained 130 dealers (both their own and independent dealers), provided informational materials and also adapted the labelling on their pack. These dealers typically served 50 – 100 local farmers and were therefore able to impart HVS cultivation knowledge to them directly. Uttara also trained 1600 lead farmers who could share good practice in their localities.

Katalyst also identified two aqua chemical companies, Fishtech and SKF, who were interested in the small farmer market. These companies already had their own marketing tools, but the development of the informational content was supported by Katalyst. At the time of writing, there have been over 300 training sessions delivered by Katalyst partners to small farmers (aqua chemical and feed companies and 57 hatcheries), and a further 100 planned in the year ahead.

Results

Actor level institutionalisation

Since the expansion of the reach of the marketing function to small farmers is being scaled from an initial pilot, it is too early to be able to identify institutionalisation of this innovation among the relevant actors (input companies, hatcheries and small farmers). However, an early signs assessment recorded that the uptake of the

agronomic information accessed by farmers was 96% which is a promising indication. Furthermore, SKF achieved a 90% increase in their aqua chemical sales from USD33,000 in 2013 to USD62,500 in 2014 which they attributed to their involvement in providing training to small farmers and dealers. The company stated that they intended to increase the reach of the trainings to further geographical locations.

However, institutionalisation of the new approach to sourcing has been evident in the independent actions of the hatcheries. The second round of importation visits in 2014 saw many of the hatcheries now seeking brood stock from new sources beyond the first visit and also buying new breeds. For example, hatcheries successfully imported and developed Snakehead in 2015, which is another high value species. This can be seen as an expansion of benefits to farmers in the increase of choice of HVS available to them.

Impact level change – contribution to poverty reduction

There are multiple dimensions which affect the overall impact of change in the Expand component of systemic change, and quantification is challenging. For example, there are farmers affected by the direct interventions (e.g. cost shared brood import) in order to facilitate expansion of the impact of the original innovation. There are those impacted indirectly, such as farmers within the networks or the farmers who attend a training or workshop and improve their productivity as a consequence. There are also farmers who benefit because they are reached by players that have been influenced by Katalyst's interventions, such as the hatcheries introducing Vietnamese koi.

In terms of HVS importation from Thailand, Vietnam and the Philippines, a total of 51 hatcheries were involved: 20 importing koi; 16 importing pangus and 19 importing tilapia. The enrolment of district-level hatchery associations with a newly formed national association, making the regulatory aspect of the import process easier, should result in further expansion of brood stock imports and the associated benefits reaching a

greater number of small farmers. It is too early in the production cycle to measure results for all species since fingerling development from the new brood stock can take years, but Katalyst reported that in 2015, 22,000 farmers were benefitting from koi production and realising an average of USD430 additional income.

In terms of the imparting knowledge to farmers via marketing and embedding agronomic information in products, in 2014 SKF, Fishtech and 32 hatcheries conducted a total of 142 training sessions and reached 204 nurseries, 227 fry traders and 145 input dealers. These private partners also trained around 6,000 farmers. An early signs assessment at the end of 2015 recorded that 11,000 small farmers had increased their incomes by USD250 on average as a result of their improved farming practices.

RESPOND: Making change stick

For the functions addressed by Katalyst to sustainably serve the poor in the market, the changes need to be made resilient to future

externalities. It was apparent after the initial pilot of brood stock imports that a standardised process was needed for hatcheries to follow to embed and regulate the improved function. Katalyst facilitated a meeting between the DoF, hatcheries, BFRF and BFRI to discuss the best way to achieve this. As a result some colloquial guidelines were transformed into a more formal checklist that the Department of Fisheries (DoF) could use to regulate the import process. The DoF also suggested that a hatchery association needed to coordinate licensing and Katalyst facilitated the formation of the Central Hatchery Association to serve as an apex organisation for regional associations to coordinate buying trips and arrange import paperwork. The latter was a significant hurdle to accessing brood stock from abroad, particularly for the smaller, less professional hatcheries.

To further protect and secure brood stock quality, local technologies need to be developed for the Bangladeshi industry, rather than be dependent on external research. BFRF, as part of their mandate to



increase quality in the industry, have been working on a “brood development programme”, making genetic modifications and exploring cryogenic sperm as a breeding option for hatcheries. The DoF is also investing in a brood development programme, which is now entering its third phase. Improvements to the research and development function in-country complement the brood import intervention, and enhance the potential for Bangladesh to pursue competitive advantage in the pond fish industry, providing a robust basis for future sector growth.

Results

Actor level institutionalisation

The ownership of the concept for national coordination and a sign of adaptation of the function was witnessed by the commitment of a number of hatcheries to mobilising the idea of a membership organisation from a concept to reality in a span of three months after meeting with the Director General of DoF. These hatcheries pay a fee of approximately USD120 annually to the association which signals the value they perceive in membership.

In terms of public sector institutionalisation, the DoF now has a standard operational procedure for imports, captured in a reference manual, which consists of a permission letter for hatcheries and testing of the brood stock by BFRI. This process will be embedded in the Hatchery Rules which support

the Hatchery Act and further protection for the integrity of the industry will be provided by the introduction of quarantine regulations which are currently being drafted.

Impact level change – contribution to poverty reduction

None of the interventions undertaken by Catalyst can be isolated from the context of the systemic constraint they addressed. The intervention in information-based marketing creates the foundation for increased demand and ultimately outreach for greater numbers of small farmers, as well as protects these farmers from the risks of trying new species by providing the right kind of technical information. In tandem, the improvement in fingerling input quality through better genetic stock and hatchery management consolidate the productivity benefits that farmers can achieve.

The new import process was successfully used by hatcheries in 2015 to import a novel species, Snakehead, to Bangladesh. The coordination of imports by the Hatchery Association means that now hatcheries can pool their orders, achieving economies of scale, and reducing costs by sending a smaller team for procurement. This improved mechanism for industry coordination also enabled the hatcheries to advocate for their needs, for example in winning a labour hours case against the Ministry of Labour in the high court.

Figure 9: Timeline of interventions in the pond fish sector

COMPONENT	INTERVENTION	Year					
		11	12	13	14	15	16
ADOPT	Brood import (1)						
	Hatchery management training (1)						
	Aquaculture information marketing to farmers via input suppliers						
EXPAND	Brood import (2)						
	Hatchery management training (2)						
	Aquaculture information marketing of techniques for small farmers via hatcheries						
	Aquaculture information marketing of techniques for small farmers via hatcheries and input suppliers						
RESPOND	Hatchery Association and Brood Import Guidelines						

The impact of this on small farmers can only be measured once the fingerlings are available on the market and fish subsequently produced, but in principle the introduction of better industry coordination and regulation by the public sector can be seen to be supporting access to new, better quality, brood stock.

Summary of impact and specific lessons

Katalyst have undeniably changed the shape of the HVS fingerling market, leading to the long term potential for increased productivity and returns for hundreds of thousands of poor farmers. They have done so in a sustainable manner where the system is robust and the changes they have facilitated will continue to adapt to external factors.

A major lesson from the pond fish sector is that a multi-actor approach can be used to instil change in a market function. One of the key challenges faced by Katalyst in ensuring that small farmers benefitted from farming unfamiliar HVS was to ensure that they had access to the necessary

agronomic advice. The DoF cited the risks of poor pond management, particularly with regard to overstocking by farmers who would often attempt to farm five times as many fish than was safe to do, and not understanding how to manage the consequences of disease and potential catastrophic losses, as being their greatest concern for aquaculture. The research Katalyst conducted showed that farmers accessed information from a wide range of sources. The strategy the programme adopted was to leverage all the channels possible (e.g. via patilwalas, hatcheries, input suppliers, dealers, lead farmers) to increase the reach of the information to as many farmers as possible, but also to prevent the chances of miscommunication by multiple iterations of the same messages. Where hatcheries could reach a smaller number of local farmers with direct advice, input suppliers via dealers and demonstration plots could reach a much greater number through various informational means. In terms of sustainability, Katalyst use a "training of trainers" approach to ensure longevity of the intervention.

References

- BANGLADESH CENTRE FOR ADVANCED STUDIES (BCAS), 2009. A comprehensive study on the fisheries sector of Bangladesh. Dhaka.
- DE RUYTER DE WILDT, M. 2007. Accelerating Growth in the Pond Fish Sector. [online] DCED Value Chains. Available at: <http://www.value-chains.org/dyn/bds/docs/659/KatalystPondFish.pdf> [Accessed 18 Mar. 2016].
- DEPARTMENT OF FISHERIES (DoF), 2012. Fisheries Statistical Year Book 2012. Dhaka.
- FAO.ORG. 2016. FAO Fisheries & Aquaculture - Country Profile. [online] Available at: <http://www.fao.org/fishery/facp/BGD/en#CountrySector-Statistics> [Accessed 18 Mar. 2016].
- INNOVISION, 2013. A Comprehensive Study on High Value Fish (Tilapia, Pangas and Koi) in Bangladesh. Dhaka.
- FAO, 2014, The State Of World Fisheries And Aquaculture. Rome: Food and Agriculture Organization of the United Nations, 2014. Print.
- DoF, 2009, Vision 2021. Dhaka: Bangladesh Department of Fisheries, 2009.

10 CHANGING THE MAIZE MARKET SYSTEM





CHANGING THE MAIZE MARKET SYSTEM

Introduction

Maize has become an increasingly important cash crop for poor farmers in Bangladesh. In 2009 – 10, the maize sector contributed USD200 million to gross domestic product (GDP), and USD120 million to farm income. In 2009 – 10, an estimated 480,000 farmers participated in growing maize, 94,000 of them as paid labourers.

Despite rapid progress made up to that point and further progress in subsequent years, the potential of the maize sector, especially outside of the main production areas in the north, remains unfulfilled, and innovation in the north of Bangladesh has not spread organically to other regions. Further, and despite much progress in productivity and land under cultivation, national production of maize still does not meet national demand – demand rooted primarily in the growing poultry sector. Hence, given appropriate forward linkages, maize farmers should still find a strong domestic market for their produce, and the opportunity remains to expand production to substitute imports.

Maize is important to poor farmers primarily because of the opportunity it presents as a cash

crop. Returns from growing maize are generally better than many alternatives, especially when production is in line with best practice. Katalyst's work in the maize sector has helped to drive gains in productivity and profitability. The programme has contributed through many different interventions, spanning 10 years, to the maize market's successful transformation. In this analysis, a primary focus is on their work in contract farming, not only because of the significant impact it had on poor farmers, but because of its role in drawing together other key transformative interventions into a systemic market innovation.

This case study first briefly outlines the maize market system and the constraints preventing the effective performance of that system. The role of Katalyst is then outlined in formulating the innovation that defined the vision of a transformed sector, and the four phases of systemic change by which they realised that vision: by working with partners to adopt new ways of working, through adaption and ownership of the innovation by those partners, through the expansion of the benefits brought by the innovation, and finally by supporting responses in other supporting functions.

The overall market

Despite rapid progress, the maize sector has underperformed in Bangladesh primarily because of constraints on the supply side. The demand side has expanded over the last two decades: the story



Figure 10: Chicken meat production in Bangladesh in MT

negligible imports up to 1998 saw a sudden increase to 270,000 tonnes per annum in 2000. At this point domestic production took up some of the demand, continuing to do so up until 2009, when a sudden drop in production from 1,350,000 to 730,000 tonnes corresponded with a huge increase in imports of 485,000 tonnes. The reduction in production was attributable to market disruption caused by the severe 2008 outbreak of avian influenza. Growth in production resumed the following year, and in 2012 imports were less than 200,000 tonnes and domestic production at 1,300,000 tonnes.



Figure 11: Maize production, imports and yield; Source: FAOSTAT

of the emergence of the maize sector in Bangladesh is intrinsically linked to the emergence of the poultry sector. From 1996 to 2013, chicken production has increased by 100,000 tonnes per annum from the 72,000 produced in 1996. This steady increase has been stimulated by increasing poultry production, which requires maize as a primary ingredient of processed feed.

The graph below shows that initially the increasing demand for chicken feed was met by imports;

The maize production increases have been the result not only of increased land under cultivation but also huge gains in productivity, with yields increasing from around 1 MT/Ha in the 1990s to over 6 MT/Ha in recent years. These are some of the highest yields in south Asia, and have resulted from an increasingly effective maize system in the north where farmers use high quality inputs effectively on productive land. Catalyst commenced operations in the maize sector in 2004; their intervention was based on a diagnostic

process that sought to understand not just the superficial manifestations of market performance, but the underlying causes of this underperformance.

Market performance

The graph above illustrates change over time in the sector, a story of production rapidly expanding to meet rising demand. It is important to emphasise that Katalyst was analysing the performance problems of the maize system prior to this change, and that these problems still persist in various forms in many areas of Bangladesh.

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: the constraints underlying the problem lay deeper. Clearly the immediate causes were related to an absence of information at the farmer level, either about the opportunity or the knowledge of how to exploit it. But why was the market not responding to solve these problems? Katalyst began to diagnose structural issues within the maize system, issues that lay not only in the core of maize production and associated exchanges, but in the supporting functions that enable these processes to happen effectively. There are various ways these functions might be characterised, but broadly speaking they are: market information, behavioural norms, skills input supply, and forward market linkages. Each of these is a market system in its own right, and ineffective operation of each forms a constraint to the effective performance of the principal maize market.

Market information

Put simply, supply can only meet demand if farmers know about the opportunity and benefits of growing a crop, as well as how to produce it effectively. Maize has the potential to provide profits greater than other comparable crops, but this information needs to reach farmers if the supply deficit is to be overcome. They need to know for whom they can produce, and the volumes and quality standards required.

Additionally, information about cropping seasons compatibility with other crops' seasons, and intercropping is required if farmers are to optimise their income from maize.

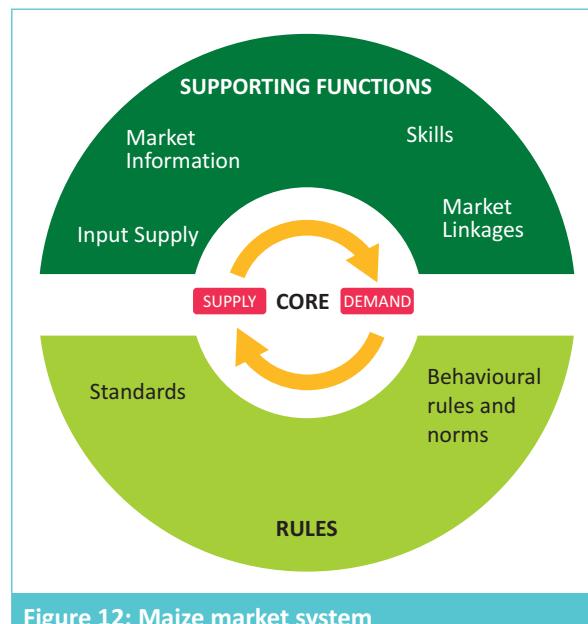


Figure 12: Maize market system

Skills and behavioural norms

Farmers in Bangladesh are generally unaccustomed to growing maize, and it is not a crop that is traditionally consumed by people in most regions of the country. As above, there are low levels of knowledge on how to grow maize, and habitual preferences for growing other crops about which farmers have greater knowledge. Poor farmers tend to be highly risk-averse, and behaviour change often requires substantial evidence of the nature of costs, benefits and risks.

Input supply

For higher productivity, the quality of inputs and their correct application are critically important factors. Seeds, fertiliser and pesticides are the main purchased inputs for maize production, and all can significantly affect productivity. Low quality inputs, incorrect inputs for the soil type, or poorly-timed application of inputs can all reduce quality and output. In addition to the supply of maize inputs, supply of inputs for other crops in the cycle can profoundly affect maize productivity. A system producing effective, convenient, and affordable supply was therefore required.

Market linkages

The constraints above focus primarily on the supply side. Yet, while supply does not meet demand at the national level, there are also problems with finding local markets for emerging areas of maize farming: if farmers see demand nationally, but this is not met by actual local demand for their produce, conversion to maize would be damaging and short-lived. The demand for maize comes from feed mills, which process maize into chicken feed. These mills are not in all cases close to local maize supply, and with many having relied on imported maize inputs the connections with local supply are missing. A market linkage function was needed to aggregate maize supply and ensure volumes and quality were in line with local demand.

From analysis to intervention

Defining the innovation: Enabling the maize supply side

Having identified the supporting functions that were underperforming, and that needed to be addressed to help fix the maize system, Katalyst set about defining its vision for the maize sector. The innovation required was improvement in the performance of the following four supporting functions: information, behaviour, inputs and linkages, with associated impact on behavioural norms. Katalyst sought to help to develop a maize market in which farmers were informed of maize demand and were able to meet this demand effectively through access to high quality inputs and effective market linkages. Realising this vision, as with any improvement in supporting functions, can only be achieved systematically by working with those actors who are currently delivering the relevant services in these support markets, or else have the capacity and incentives to do so.

The extent to which these supporting functions were interconnected not just with the principal maize market, but with each other, is a distinct feature of the challenge of the sector, and shaped the way Katalyst sought to implement their innovation. For instance, the market information regarding the maize being an opportunity would mean little without information about high quality

inputs and a system to provide them, but there was little incentive for market actors to provide quality inputs until demand was in place. Similar problems could be identified in the provision of forward linkages.

In 2006, after a few years of experience of maize promotion activities, and commencement of retailer training programmes (RTP) in partnership with Syngenta, Katalyst identified contract farming as a possible route to synchronise the various aspects of market innovation at the farmer level, and link up their other work in supporting markets. The next sections outline how actor-level changes were facilitated by Katalyst working in partnership with market players in order to overcome these. It is important to emphasise that this case focuses on a specific subset of Katalyst's many interventions in supporting functions of the maize system, including crop protection and crop nutrition covered in other cases in this series.

ADOPT: Piloting

The first stages of Katalyst's innovation were maize promotion activities, and development of RTP with Syngenta. These were focused around the information, behaviour and input constraints, but did little to address forward market linkages, nor was input supply tackled in such a way that would address financial constraints to access of expensive inputs. As such, while these were important interventions in increasing knowledge of maize into northern farming communities, they were only a partial fix in terms of the overall innovation required. This case picks up the story with the commencement of contract farming, an initiative that Katalyst thought had the potential to deliver all of the requisite supporting functions sustainably and at scale, in some parts of Bangladesh.

The intervention began in 2006, with Doyel Agro, a private sector company based in north Bangladesh. Doyel contracted directly with farmers – initially with those of any size, but latterly only with farmers of more than three acres of land in order to reduce their transaction costs when managing its 1,600 contractees. The model seemed to work relatively well initially, but Katalyst

considered that further piloting of contract farming innovations was necessary in order to find a model that truly represented a systemic change and could scale up: that is one in which the contractors themselves could emerge in a sustainable and ongoing manner.

Experience with Doyel led to an attempt to strengthen the contact farming component of the overall innovation. In doing so Katalyst were particularly focused on attempting to develop a system that could reach the farmers on the char lands who suffer disproportionately from many, if not all, of the identified constraints. 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.

In systemic change interventions that involve such intermediaries, they are too many, and too dispersed, to be the partners for the introduction of the change if substantive scale is desired. But this same characteristic makes them invaluable agents in the delivery of change to large numbers of dispersed beneficiaries, often through embedded services. The partners are usually one of a much smaller number of firms or other actors (referred to as scale agents) who can make important changes with the potential to influence a much larger number of people than would be possible through one 'lower-level' intermediary. Such a structure, then, permits greater scale at two different dimensions – it is easier for Katalyst to engage with these 'higher-level' partners, and it is easier for the change intermediaries to reach more farmers.

Unlike with retailers, these maize contractors were not already in place. Creating the actors to perform the missing market linkage function was a key

ambition, but, importantly, the contractors were in a position to deliver the majority of the functions identified as missing in the diagnostic process. As such, getting it right was vital to Katalyst's efforts to transform the maize sector.

The contractors were initially selected from a pool of retailers and farmers and others who had been trained as part of an earlier intervention. As such they were individuals known to Katalyst and their intervention partners, and recognised for their potential and capacity to perform the role required. This was just one example of the complementarity between Katalyst's various interventions in maize. The contractors alone could not make a market, because putting the burden for transforming all the functions on them was unrealistic; it would take a long time for them to realise the benefits of their role, and so they would lack the incentive to continue. In the early stages of a contractor setting up in business, they would act as a key part of Katalyst's wider programme of awareness-raising through maize promotion. They would provide knowledge locally for new farmers, knowledge already available through the retailer training and maize promotion, but delivered alongside inputs and a defined sales opportunity.

Results – Proof of concept

During the pilot, five contractors were selected in Rangpur, and three in Bogra. The contractors arranged trainings for their staff and farmer group leaders during 2009, with 280 attendees. Then, mostly in 2010, trainings for farmers were held with 895 attending. The contractors and seed companies together arranged 73 demonstration plots, and 27 field days with over 3,300 attendees.

During the pilot, the eight contractors had almost 1,700 farmers between them, producing over 7,000 MT of maize. At the end of the pilot, each of the contractors was planning to increase land under cultivation the following year, with the intervention having equipped them with the planning skills to manage the business and removed the great uncertainty regarding the business model. The pilot also seemed to have stimulated effective change at the farmer level.

For the purpose of the maize innovation, the benefits are increased incomes from either (1) more informed production decisions, e.g. in crop choice (2) improved production quality or quantity or (3) improved terms of exchange through, for instance, growing maize at more appropriate times. To illustrate the comprehensive set of changes and overall benefits at the farmer level, the table below illustrates the case of one marginal farmer who took up contract farming and almost tripled profits.

As defined in the opening section of these case studies, the components of systemic change are non-linear. The subsequent sections, therefore, do



Mosammat Bilquis was formerly a day labourer on maize fields. Following the introduction of contract farming she gained access to credit for inputs, and produces around 5,000kg per year, providing revenues of USD800–1,000.

Katalyst report that their impact assessments tend to suggest benefits to farmers of growing maize using effective methods is in the range of USD100–200 per year.

Figure 13: Impact on one marginal farmer; Source: Katalyst

Parameters	2008 – 09 (before contract farming)	2009 – 10 (after contract farming)
Land cultivated (bigha ⁶)	2	3
Sowing time	Not optimal	Optimal
Quality Seed used	No	Yes
Cost of Seed (kg)	USD2.00	USD2.30
Timing of irrigation	Not optimal	Optimal
Cost of Borax (fertilizer)	Nil	USD1.02/Bigha
Cost of Zinc (fertilizer)	Nil	USD1.15/Bigha
Optimal management of crop-field	No	Better
Cost of production per bigha	USD38.30	USD60.00
Increase in cost of production per bigha, over last year's (%)	N/A	57%
Yield or production per bigha	600 kg	1,000 kg
Increase in yield per bigha over last year's (%)	N/A	66%
Certainty about the sale of crop	No	Yes
Pricing of produced crop	lower price because of low quality	higher price because of better quality
Price per kg of maize	USD0.12	USD0.15
Revenue per bigha	USD72.75	USD153.18
Profit per bigha	USD34.50	USD93.18
Increase in profit per bigha over last year's (%)	N/A	170%
Continuation of contract farming	N/A	Yes
Expansion of maize cultivation	N/A	Yes
Sharing of knowledge gained through contract farming with other farmers	N/A	Yes

⁶ One bigha is equivalent to 1335m²

not necessarily follow chronologically or in isolation. In attempting to broaden the impact of a change in a sector, new partners will have to transition through adaptations of the original model and in increasing the resilience of a change by observing and facilitating the response of other supporting functions and rules.

ADAPT: Institutionalisation of change

Katalyst involvement in the changes specified above was central to their initiation but, in the absence of partner ownership of the change, there was no evidence that this would be sustainable. Evidence of this adaption of change by the partner comes from their ongoing investment after the support of Katalyst has ended.

With super-contracting, CP Seeds had multiple incentives to make the system work. In common with other seed selling contractors they wanted to sell more of their premium seeds, but additionally their feed mills needed a regular supply of maize for the growing demand for poultry feed. If this could be fulfilled through national supply it would save the costs of import. Due in part to this dual incentive, and due to the strong commitment of the national director of the seed company both to the contract farming initiative and the Katalyst relationship, CP Seeds took ownership of the innovation, and continued investing after Katalyst support ended. Apart from the ongoing strong CP-contractor commercial relationships, there were several signs of real buy-in at the partner level that suggested Katalyst had found the right partner to take the innovation beyond pilot. Just two examples of this are, first, that CP paid a premium to their contractors slightly above the market price. This is despite the benefits to the contractors of having a guaranteed buyer in place, and is in contrast to, for example, Doyel Agro's practice of paying slightly below the market price to their farmers. A second example is that CP put in place an incentive scheme for their best performing contractors, including taking selected individuals on trips abroad, most recently to Thailand, to help build the relationship as well as for educational purposes.

Adaptation of the innovation occurred not only at the level of the partner, but also of the

intermediaries. This is not only welcome, but necessary – if the model is not wholly owned by all change agents then sustainability at the partner level is difficult to attain. Contractors invested in at least three ways: in farmer relationships, in farm infrastructure and in sub-contractor relationships. These investments were never subsidised by the programme or directly by the partner seed companies - they arose from the initiative of the contractors themselves.

Investment in building relationships with farmers is a necessary part of the contracting role. Some contractors farm maize themselves, but the model is based on building much larger supply base with large numbers of farmers. This requires persuading farmers of the merits of maize and instructing them in best cultivation practice and requisite quality standards, as well as setting up structuring of contracts.

Further, investment in drying facilities and other such small-scale infrastructure demonstrated commitment to the model. In order to expand their supply base, some of the CP contractors then also began to subcontract to farmers who also wanted to serve as intermediaries, an adaptation on the part of the farmers that had also been seen in 100 of Doyel's 1,600 contractees. This means that there are, in some cases, two intermediary change agents between partner and beneficiary, but demonstrates further investment on the part of the initial contractor in developing new forms of transactional relationship beyond that initially envisaged.

Results

Following the initial training of eight contractors, seven remain active as maize contractors for CP. This has been very beneficial to CP Seeds business as well as the contractors and farmers. Just one contractor (albeit one of those that has been extremely successful) bought 10 metric tonnes of seed from CP last year. The successful and lasting uptake of the innovation stems in part from loyalty to CP amongst contractors who make use of the credit provision embedded in the contracting arrangement, which extends down to farmers and restricts side-selling. Farmers also tend to maintain



their relationships with the contractor unless they decide to switch from maize to other crops.

EXPAND: Extending the benefits

Benefits of an innovation can be expanded in two ways: more benefit to existing beneficiaries; or creating more beneficiaries. In the case of the maize innovation Katalyst promoted in Bangladesh, existing maize farmers could benefit through improved supporting functions providing them with inputs, information, skills or forward linkages that would enable to produce more, better quality maize that could more easily and profitably be sold. As well as improving the opportunity, the systemic innovation would improve awareness of the opportunity for farmers not already growing maize, and the benefits that this crop would accrue relative to other cash crops (or relative to other previous activities). As more land came under cultivation, the labour intensive nature of maize meant that there were more rural wage labour opportunities, especially for women. The provision of an additional profitable cash crop choice also improved options for crop rotation amongst, for example, tobacco farmers.

In the section above we saw how, following Katalyst intervention, CP had embedded and invested in ‘super’ contract farming, an effective mechanism for delivering the benefits of the systemic innovation sustainably. This section describes how the additional benefits of the innovation expanded both within the northern regions of increasingly established maize cultivation and, more recently, into southern regions where commercial production was far less established.

Systemic change programmes often expect that expansion of benefits will occur ‘organically’ as a result of the incentives of the partners, since these should be aligned to increasing the number of beneficiaries, and information regarding those incentives encourages competitors to crowd in. Yet in many cases this does not happen, especially where, as in this case, marked regional markets for maize meant either the capacity or the incentives of the initial implementing partners are lacking in new areas. The two sections below outline both the organic expansion and Katalyst’s efforts to promote expansion, first in the North and then the South.

Expansion of benefit in the North

In the case of the super-contracting model specifically there were several possible routes to create more beneficiaries: more seed companies; more contractors; more farmers per contractor; or more subcontractors per farmer. Katalyst's support to help CP expand the model continued for three years, during which the latter three of these grew substantially. This growth continued beyond the end of Katalyst's support and the extent of this expansion is reported in the results section below. However, no organic growth in the contracting model materialised; according to Katalyst staff, no other seed firms took on the role of super-contractor in the northern regions despite the high sales volumes CP were achieving through their contractor network.

Katalyst's staff suggest that the only other player with interests both upstream and downstream in maize value chain has been an affiliate of the NGO BRAC. Such a player does not have the same clear incentives as a private sector seed and feed company. Where commercial interests are only at the input level, there remains significant difficulty in coordinating forward linkages, whether or not the seed company has a network of contract farmers. This is illustrated through the case of Katalyst partner KBP, who recently bought land in Rangpur with the intention of building their own feed mill. What led KBP to consider such a move was the frustration of local feed mills colluding to delay purchasing maize, so as to drive prices down before they do eventually purchase. This type of collusion reduced the demand for maize inputs sold by KBP, as well as the benefits of maize production for poor farmers.

Expansion of benefit is not only about replication of a successful model. Katalyst were not content with having helped transform the maize system in the North, they sought to use this system to extend benefits still further. In Rangpur, maize productivity is now very high following the market innovation Katalyst helped to introduce. Katalyst identified that further benefits could be brought to farmers in the region by using the effective supporting functions to introduce summer maize. Most maize is grown in rabi (winter) season, but

chickens demand to be fed throughout the year so some seasonal shortages for the feed mills need to be filled through import. This presents an opportunity for farmers to grow in kharif (summer) season and benefit from better prices in a period of low supply. These farmers may have already cultivated rabi maize, but are more likely to be rabi potato farmers and new to maize cultivation. In either case, kharif cultivation is a distinct challenge, and requires specific inputs. The necessary quality inputs were not readily available. This problem was identified by Katalyst who leveraged the now increasingly effective maize market system in the region. More specifically the improved input supply function was utilised to bring the benefits of maize cultivation to farmers that grew other crops during rabi season but who were open to trying maize in summer. The systemic changes had already been made, what remained was to demonstrate the benefits to partner seed companies so that they would exploit this improved system with appropriate new varieties of quality seed and associated information. With the greater diversity in forms and options of production comes a more resilient maize production system; the rabi maize intervention not only capitalised on the better-functioning system, but also strengthened it.

Geographical expansion to the South

The lack of substantive replication of the contract farming model pioneered by CP and Katalyst is one obstacle to expansion of the benefit. A second is the interrelated failure for the improved system performance in the North to extend into other areas of the country where maize growing is much less established. These areas of the South – The Chittagong Hill Tracts (CHT), Barisal and Faridpur, and Mymensingh – shared similar systemic weaknesses that were previously witnessed in the North, albeit each with their own distinct characteristics. Katalyst conducted detailed market systems assessments of each region to establish their suitability for maize cultivation and to understand the pattern of systemic constraints within each before selecting where and how to attempt to leverage expansion of the innovation through a tailored set of interventions. In each area, the set of intervention tools on which this

case focuses are retailer training, input promotion and contract farming, all of which built on experience accumulated in the North.

So why had contract farming not expanded organically to bring improved supporting functions to the South? This was due to at least two interrelated factors: the locations of the feed mills; and the weaknesses of maize production in these areas. This means there is more to do in persuading possible maize farmers and contractors, while the rewards for investment on the part of the seed companies are much lower. In short, it is expensive, risky and difficult to build a market or initiate contract farming in such areas, so the expertise and financial backing that Katalyst could offer was key to leverage commercial forces in bringing the potential for maize to improve incomes for the poor to these new areas.

The most substantive attempt to introduce contract farming in the south has been in CHT, which had the benefit of eight feed mills located nearby for processing imported maize at the regional port. Additionally there was a culture of maize farming; maize has long been grown in CHT through the traditional jhum cultivation for human subsistence consumption. However, despite these strengths, the local supply systems have not responded to substitute for imports. The traditional supply is for domestic consumption, and productivity is low because of the lack of good quality inputs and the absence of effective irrigation, not helped by a sometimes tense political situation.

In this regard Katalyst tried to expand contract farming using partners both within and outside of combined seed and feed interests. In CHT, the intervention was trialled initially with EON and Monsanto, who, in line with these super-contracting lessons from Rangpur, found difficulties in coordinating the forward linkages required of the innovation. Monsanto did not have their own feed mill, and EON's Euro feed mill failed to buy back in sufficient quantities. Coordination was therefore required with local mills, but this failed to provide the assured market that farmers

generally need to have confidence in growing a new crop, and Monsanto withdrew from the CHT pilot. The pilot had also gone ahead with CP, meanwhile, who replicated their northern success and built up to six contractors in the area. This example has encouraged Monsanto recently to re-enter CHT contract farming, and reports suggest they had built relationships with 10 contractors in partnership with EON.

Katalyst also began geographic expansion in Barisal and Faridpur where there was no tradition of maize cultivation, and so work creating the market was starting from scratch. They tied in maize promotion work as in the north of the country, investing in promotional activities such as RTP and farmer meetings in order to increase usage of high quality maize seed and proper cultivation techniques. These activities increased the number of maize farmers in these areas through enhancement in profitability and yield, setting the ground for improving the demand side connections. Working with Petrochem, they supported the establishment of relationships with 5 contractors to build forward market linkages and support the expansion of access to inputs. While the work has been challenging for Katalyst and their partner in these early stages, this has now grown to 8 contractors. Expansion in Mymensingh was again distinct. A similar approach to the maize promotion followed in Barisal and Faridpur was in this case not accompanied by contract farming. This was because Mymensingh, being less isolated geographically, had better forward market connections, and supporting financial access to expensive inputs was also seen to be less important here.

It is important to note that these maize promotion activities had two main facets. Interviews with KBP and Petrochem indicated that the benefit of partnering with Katalyst came in the support to organise links through marketing channels in new areas, as well as the financial subsidy to do the work. This means that they now worked with more farmers than they would have done, and were less selective about the areas in which to promote maize. As to whether they would continue these activities without support from Katalyst, seed

companies stated that they would do so but on a smaller scale.

This raises a question as to whether buying scale through subsidising existing activities of commercial companies can be justified as part of a systemic approach. The answer depends on why the subsidy is being introduced, and the likely prospect for sustainable growth. In the case of Katalyst's maize work, the scale subsidy is part of a wider vision of the geographic expansion of a systemic innovation where a certain minimum level of local production is required to introduce other players that will support forward linkages. For instance buyers are unlikely to visit an area until the quality and scale economies of doing so are justified. It also enables Katalyst to input their experience in how such work can be done in the best way to maximise benefit to the poor. A second issue important in evaluating the use of these direct techniques is the prospect of continued delivery at the same scale without subsidy. Here the interdependence of maize promotion with other work to build the market is key: if it is successful and the market grows, it will be financially viable for input companies to continue to scale up their promotion work without Katalyst's support.

Results

Northern regions

The main success in the expansion of benefits of maize innovation has been through the mechanism of increasing incomes from maize through better information dissemination and stronger market linkages through the contract farming system. At the contractor level, from eight contractors during the pilot, Katalyst supported CP to expand to 35 contractors. Organic growth thereafter funded entirely by CP's own investment has increased the contractor numbers to 65, according to CP's report to Katalyst in 2015.

More contractors have brought in more farmers, and each additional actor further embeds the improved supporting functions across the region. Subcontracting farmers often drive expansion into the relatively inaccessible but productive chars regions. The contract farming intervention was



Zakir Hossain is one of the original eight contractors. Known to Katalyst and CP through retailer training, he started contracting with 50 farmers and now works with more than 200 farmers. He reports that 25 of those farmers subcontract to other farmers. To provide inputs to this network, he buys 17MT of seeds per year, provided on credit by CP.

subject to an impact evaluation published in 2013 (de Ruyter de Wildt et al, 2013). The numbers of farmers found to have been impacted directly at that stage was 5,789, and the number impacted indirectly was 23,428, which illustrate how the benefits of the improved system expand beyond those directly involved in contract farming, simply because there are now sustainable mechanisms for information distribution. The increased income for the 5,789 contract farmers in 2011 was found to be \$187 per year. For indirect farmers the calculated income increase is \$78 per year. The most recent figures from ongoing partner monitoring suggests the number of direct beneficiaries has grown to 10,000 farmers in 2015, with a likely associated increase in indirect benefits.

The early signs of impact for summer maize, a much more recent intervention not associated with contract farming, are similarly impressive. Preliminary assessments undertaken by Katalyst suggests almost 42,000 farmers had adopted kharif maize as a result of their activities, with a reported net average annual income increase to each farmer of USD80. The speed of uptake of this new product reflects the better performing information and



input supply functions supporting transactions in the maize system, and would certainly not last without the improved forward linkages.

Southern regions

Early indicators suggest that Katalyst support for expansion of maize cultivation activities in the South has made significant inroads. Based on outreach numbers through retailers and a small sample survey, the early signs of impact reports indicate around 8,000 farmers receiving increased income of around USD115 in each of Mymensingh and Barisal and Faridpur.

RESPOND: Making change stick

The systemic changes reflected in the super-contract farming model had been embedded within CP and many of their contractor change agents. Benefits of the innovation had spread to more and more farmers. Once an innovation has taken hold in this way, there are often responses in other supporting functions that can help to secure the lasting change, and that reflect the significance of the innovation because it creates new opportunities for other actors. Signs of the innovation being embedded at the partner level are related to their investment of resources in the change. Signs of embedding at the system level are similar, but the actors involved are those performing supporting functions or rules that are outside the initial innovation. As such, and as with the initial innovation and its expansion, these new actors involved in the response may require some

initial support from the programme in order to recognise, and be willing to explore, the opportunity.

Katalyst noted the ‘embedded’ inputs on credit within the contract farming model were not being extended through to enough farmers, so the supporting function of finance required adaptation to meet the needs of poor farmers and enable further expansion of the innovation to those without sufficient resources to purchase inputs. The improved functioning of the maize system had created opportunity for financial actors to generate profitable products to target maize farmers, but they were yet to exploit these opportunities due to internal policy restrictions and perceived risks. Chars farmers were particularly underserved: financial service providers did not see the char farmers as suitable to loan money to, due to their char lands not being considered viable collateral, and the high administration costs of providing financial services to remote communities.

Katalyst worked with Agrani Bank and National Credit and Commerce (NCC) Bank to design a new financial product, a dedicated credit line focused on potential contract farmers for whom the contractor would provide a guarantee. The partners were selected on the basis of their incentives and capacities to serve the target market: they had strong rural presence, staff capable of accessing the chars, and provision to

loan directly to farmers, as well as being motivated to develop the product.

Results

When it came to implementing the pilot, several adaptations were made. Contractors were reluctant to take on all the risk for non-repayment, and so organised a group collateral system to reduce their risk. The system has been successful, with a repayment rate of more than 70% for the branches surveyed, especially when compared to other products in the subsidised agricultural loan category that all banks are required to make. Indeed, following the pilot, ABL allocated USD130,000 for five of its branches to scale up the product. But there are two caveats: first, the regulation-driven incentives present at the bank headquarters are not felt so strongly at the branch level, meaning the incentives to roll out the product are not always present with those tasked with doing so; and second, private banks will not be emulating the model until it has the chance to be effective at commercial rates.

As a result, expansion has been slow at the farmer level. Delays in delivery of the product relative to crop cycles have made it frustrating for farmers, and banks have been slow to operate in new areas. Despite the clear potential of the model, its

delivery through the pilot has relied heavily on Katalyst support and new actors capable of supporting the connections between farmers, contractors and the banks may be necessary.

The important aspect of this financial Respond intervention is that it reflects Katalyst's continued monitoring and evaluation of not only interventions but also the wider system. They saw the opportunity to increase benefits through the finance supporting function. While small-scale agro-finance was a notoriously difficult area in which to intervene, the innovation did result in more than 200 loans distributed, and the project has been handed over to the partners to pursue further.

Summary of impact and specific lessons

This case has outlined the diagnostic process and subsequent interventions undertaken by Katalyst through the AAER framework, and there is no doubt that how tens of thousands of farmers have derived substantive benefits from these interventions. Further, it is clear that much of this benefit has been realised from the sustainable improved functioning of the system in the North, while there are clear reasons for optimism the same systemic innovation will become sustainably embedded in the South. The timeline below

Figure 14: Timeline of interventions in the maize sector

illustrates how this AAER process used to articulate this change process is not sequential. For instance, the finance intervention in Respond was based on increased understanding of the market rooted in experience from the Adopt interventions.

Two specific lessons may be drawn from this case for the application of systemic change. First, there is sometimes a perception that systemic change is reliant on the expansion of the number of partner-level firms emulating the change. In the case of contact farming, there was only one firm with the correct incentives and capacities to provide an effective contract farming. Yet this knowledge, that became clear during the pilot, did not deter Catalyst from pursuing the intervention because scale may be achieved by intermediary scale agents without emulation at the partner level. The case also illustrates how an effective system may

promote the emergence of additional levels of scale agents, though not necessarily intended by the program. These additional agents – in this case the farmers who sub-contracted – may help expand the benefits of the system down to poorer or more diverse beneficiaries.

Second, the issues in expanding maize cultivation clearly illustrates important boundaries that may exist within a wider system. Interventions are often set up at the national level, but, while there are usually important national-level supporting functions and rules, those most relevant to the required innovation may be very distinct between different regional and more localised production and exchange systems. Detailed analysis of the local characteristics of these systems is vital in understanding how the overall innovation may be expanded geographically.

References

- FAOSTAT, 2015. Food and Agriculture Organization of the United Nations Database. Accessed 20/12/2015. Available at <http://faostat3.fao.org/browse/Q/QC/E>
- DE RUYTER DE WILDT, M., SEN, N., KRUSEMAN, G., 2013. Impact evaluation of value chain interventions: A mixed methods design for evaluating ultimate income effects of market system interventions. LEI Report, Wageningen UR, The Hague.

LESSONS FOR PRACTICE AND POLICY

Katalyst knew of the components necessary in order to create systemic change. In practical terms, in vegetable, maize and fish this was born out in several ways.

1. Direct activities can help secure buy-in and make markets if they are part of a realistic systemic vision

In many of the areas in which Katalyst has worked, there was an exercise in market creation. In high-value fish species, Trichoderma, IPM products, and in summer maize, markets did not exist in the sense that there was neither the supply nor the demand. The logic for intervention here was based on solid analysis of how the growth of these markets had real potential to deliver significant benefits to the programme's target group. However, the process of market creation is slow which increases the incentive for a programme to take more direct action, rather than rely on facilitation.

For example, in the pond fish market, a programme might have examined the market information function to see why domestic hatcheries weren't sourcing improved species from abroad. Instead, Katalyst decided to directly support hatcheries and create the required international connections to improve the brood stock. There is an inevitable risk in doing so; a trade-off between speed of impact and distortion of the market system. Katalyst's success in taking some more direct measures across sectors was based on a few key factors.

In some cases, Katalyst took direct action which was seen as a one-off which was necessary in order to stimulate the market. In other cases, Katalyst were directly performing what might be seen as a recurrent function, but they did so with a realistic view as to which player might perform that role in the longer term. With the brood stock import, Katalyst supported individual hatcheries and, although this led to increased profits and built technical capacity, the programme was needed to support them further to repeat this a second time, albeit with reduced input from Katalyst. While hatcheries were increasingly demonstrating buy-in, the benefits to the rest of the system from the high-value species meant that this continued direct action was justified.

Katalyst's work in crop protection and crop nutrition demonstrates that, if a technology has the potential to be transformative, based on solid analysis of how realistic its uptake might be – according to criteria of availability, affordability and ease of use – then there is no reason a market development programme cannot be directly involved in its introduction during the early stages. Too often it is the technology that is seen as the solution, but without adequately addressing marketing and distribution functions of the system, it is unlikely to have a transformative impact.

Time is also a crucial factor in the decision as to how a programme engages. To take maize as another example, the promotion of the seed was seen as necessary to create a critical mass of both demand and supply to create a whole range of other market institutions.

In crop protection and crop nutrition, the pace of market creation and the impact that has on activities was notable, as a greater number of

supporting functions and rules have to respond to the introduction of a technology. It is five years since the process of consensus building and establishing early linkages in the fertiliser sector began and the scale up targeting poor farmers has only begun relatively recently. There are likely to be further issues which arise as the market grows in size, with other supporting functions and rules jeopardising the stability of changes and the realisation of further opportunities.

Common across all these more direct activities was a realistic view of who might perform a function and who would pay for it next time it was required, which has been proven to be a viable strategy in some of the more mature interventions.

2. It is important to maintain whole market perspectives – functions not firms or fixes

Katalyst's analysis has been its most important asset over the last decade, not only having a vision of the change that needs to happen but in having something to offer to partners. This view of the system means that programme intervention is led by neither the particular desires of prominent firms, nor by the allure of technological fixes.

In vegetables, Katalyst understood how the market system and the supporting market system of inputs worked. It was from there that they recognised that the reasons for a lack of access, lack of quality, and lack of use which were producing poor yields for farmers, were deeper seated and lay in the performance of marketing and distribution functions. Katalyst's success in improving this performance demonstrates that the 'how' is important. Miniaturisation such as the seed minipacks, is a simple technology focused intervention and many programmes have attempted to introduce the concept in a number of different contexts. Some have been successful but others have not. In many cases, making something affordable will not increase positive outcomes as the true problem might be in a product's application or its availability. Indeed, often farmers can afford larger packets of seed and other inputs, but it is a question of production decisions and opportunity cost and the degree to which they

think they will benefit from the investment. For Katalyst, addressing problems in marketing and distribution set the framework within which this simple technology could be successful, having identified that affordability was, at that point, a key constraint to uptake.

Similarly, Katalyst's strategy of partnering with multiple firms, on multiple terms and for different reasons demonstrates that they are not led by what a given partner wants and the optimum outcome for the company, but the optimum outcome for a more pro-poor system.

3. Adapt to learning

While Katalyst's understanding of the overall market system gave them a clear direction for how and when to intervene in different aspects of the market, it is not possible to predict exactly how the market, its functions and its rules will or will not react to change. Katalyst's monitoring system, together with the informal data collection methods engaged in by the team to allow continued evaluation of the sector, meant that the strategy could be adapted continuously. This monitoring did not supersede the analysis of the innovation that was necessary to address the underperformance of the market, but it did allow for adaptation which meant that the impact could be broadened, deepened and stabilised so that the change was significant, large scale, and sustainable.

In the fish market, for example, the success of the initial model for reaching and benefitting farmers with agronomic information through input marketing in terms of profitability and institutionalisation by firms was shown by the monitoring system not to be impacting sufficient numbers of poorer, target farmers. As such the intervention modality was modified. In maize too, the initial contract farming model was shown to have limited potential for scale up, and so the super-contracting model was developed.

These examples show that AAER is an important tool for planning, as well as for providing a vision of what systemic change looks like, and a framework for assessment of whether or not it is happening.

4. Expanding impact has multiple dimensions

As outlined in the introductory chapter of these cases, expanding the impact of interventions has multiple dimensions and, as demonstrated by the cases, each provides a separate opportunity to increase impact.

In terms of increasing the number of people that benefit from an intervention, the maize sector demonstrated that Bangladesh consists of several different systems and so there was scope for increasing impact by working with the same supporting functions and rules in different parts of the country, with contextually specific modifications to the model. In vegetables, the scale up of mini-packs and MSVs occurred through emulation by competitor companies. This meant both more people had access to the benefit of the interventions but also, it increased competition, increasing diversity and reducing prices for consumers.

5. Understanding systemic change

Finally, the case studies have demonstrated the utility of AAER in understanding systemic change. Programmes are organised in different ways and even within Katalyst, the definition of an intervention is not always equivalent between sectors or across phases. Nevertheless, AAER shows how a range of different supporting functions and rules are changing, the sustainability of that change and whether it is impacting on sufficient numbers of the target group. AAER should not be used, then, for the assessment of whether a product, a service, or a pre-determined behaviour is changing and being replicated. It's about understanding what change needs to happen for your target group and changing the functions and rules in different ways so that it can have a greater impact on more of them. These functions and rules may change independently but observing these changes and the impact they have on the system is a key role of a market development programme.





Katalyst Project Office

House 20, Road 6, Baridhara, Dhaka 1212 Bangladesh

Tel: +(88) 02 8833172-4 Fax: +(88) 02 8835452

www.katalyst.com.bd

www.swisscontact.org

www.facebook.com/katalyst.swisscontact