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STRENGTHENING ADAPTIVE FARMING IN BANGLADESH, INDIA & NEPAL

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Foreword

Christoph Schweifer
Secretary General, Caritas Austria

Worldwide, livelihoods of millions of small scale farmers are at risk from climate change. Many communities suffer from frequent and extreme floods, storms or drought; farming families are struggling with more unpredictable seasons. To prevent climate change pushing people more into poverty, Caritas organisations in India, Nepal and Bangladesh have been implementing a five years program to support small scale farmers in about 90 villages of their 3 countries to build resilience against the terrible effects of climate change. This program was co-funded by Caritas Austria and the European Commission and benefited from the scientific support of the Centre for Development Research of the University of Natural Resources and Life Sciences in Vienna.

This booklet tells stories of farmers involved in the program and how they managed to adapt to climate change and to assure food security of their families. It gives examples on how joint efforts of many stakeholders can effectively and sustainably contribute to improve living conditions and resilience of small holder farmers.

“One human family - food for all” is the worldwide campaign of the global Caritas network aimed at ending hunger by 2025. The SAF-BIN program is one of the many successful initiatives that can bring us closer to this goal. Hunger is todays' most pressing challenge and climate change is one of the greatest global constraints to combating it. The year 2015 is a crucial year – the international community will decide new Sustainable Development Goals, aiming also at taking urgent action to combat climate change and its impact. The climate talks in Paris should finally lead to an ambitious and binding climate change agreement. Every single one of us can contribute its part by living simply and climate-friendly.

I want to thank all those who contributed that the stories told in this booklet became reality - my colleges from Caritas India, Nepal and Bangladesh, the European Commission for co-funding the program, the scientific consultants of BOKU and especially the farmers who are so much struggling to grow food for their families and who put all their energy into adapting to consequences of climate change.

Message Sunil SACU

Sunil Simon
SAF-BIN South Asia Programme Manager, Caritas India

Of the estimated 570 million farms in the world over 500 million are family owned. They are responsible for at least over half of the global agricultural production. In Asia, the percentage of family owned farms is even higher at 85%. Especially South Asia is the land of smallholder farmers. 70% of farmers in this region farm on less than 1ha. These farmers manage their land to sustain remarkably high levels of productivity under multifaceted social, economic, political and climate related challenges.

Smallholder farmers are “knowledge factories” that use their indigenous know-how and innovative ideas to develop new technologies to address the ever increasing nutritional insecurity and challenges caused by climate change. This vibrant community has tremendous potential in sustaining the increasing demand of food security of the country.

Strengthening Adaptive Farming in Bangladesh, India and Nepal (SAF-BIN) programme has demonstrated a successful model of collaborative effort among the academic, research, extension systems and the farming communities. The project approach to smallholder farmer-led on-farm adaptive research has successfully supported farmers in the project regions in building resilience to climate change while ensuring food security.

Collective action and multi-stakeholder exchange has enhanced a comprehensive understanding to the challenges of climate change. It has also facilitated the identification of locally suitable solutions through a blend of traditional and modern practices. Constant engagement of the farmers in crucial decision making processes of developing adaptive models has increased their analytical abilities, making the initiative sustainable.

As South Asia Program Manager of SAF-BIN I am honoured to share this publication with you. This collection of case studies has been compiled to give an overview about the diverse range of changes brought by SAF-BIN project. Farmers share their experiences and learnings. I hope you will enjoy browsing through these stories and they will inspire you in your professional and private life.

CONTENT

Preface

Romana Roschinsky
(SAF-BIN researcher, University of Natural Resources and Life Sciences Vienna)

In the past four years of implementing the Strengthening Adaptive Farming in Bangladesh, India and Nepal (SAF-BIN) project the project team has continuously learned from their field experiences and matured concerning the new approaches that are being followed in this project. Cooperating with farmers in a farmer-led adaptive on-farm research approach has brought many challenges and learnings. Many stories of change from the field have been documented in the process.

With this collection of case studies the SAF-BIN project team wants to share a wide range of these stories from its three project locations. What unites these individual cases is their relevance for the SAF-BIN aim to build resilience to climate change through strengthening adaptive small scale farming systems in rain-fed areas in Bangladesh, India and Nepal. Each of these cases shows how the multitude of activities, conducted within the project framework, contributes to the achievement of the overall SAF-BIN objective: promoting food and nutritional security through adaptive farming in a context of climate change.

Each case is presented from the viewpoint of an individual smallholder farmer participating in SAF-BIN activities. Through the engagement of these individuals in smallholder farmer collectives (SHFC), group dynamics play an important role. Learnings of individuals are taken to the regular SHFC meetings allowing a quick dissemination of newly gained knowledge, skills and insights within, and beyond, the SHFC. This multiplier effect is an important part of the SAF-BIN strategy as it creates ownership within the farming communities.

To make these personal experiences more relevant for outsiders interested to learn about SAF-BIN activities, the individual stories are intertwined with relevant background and technical information concerning the respective SAF-BIN activity.

The selected cases are just as diverse as the agro-ecological contexts and farming systems that are represented within SAF-Bin project. The stories take the reader on a journey covering such areas as rice cultivation under pressure, organic agricultural practises, improved seed storage, traditional food basked items, kitchen gardening, honey bees, fish farming and poultry rearing.

The SAF-BIN team hopes this compilation will give you a good overview about its activities and that the experiences will be helpful for smallholder farmers and sector stakeholders all over the South Asian region.

An introduction to Strengthening Adaptive Farming in Bangladesh, India & Nepal (SAF-BIN) project[1]

Sunil Simon (SAF-BIN South Asia Programme Manager, Caritas India)
Romana Roschinsky (SAF-BIN researcher, University of Natural Resources and Life Sciences Vienna)

The Strengthening Adaptive Farming in Bangladesh, India and Nepal (SAF-BIN) project is research and development project funded through the European Union Global Programme on Agricultural Research for Development with a duration of 5 years (2010-2015). SAF-BIN wants to build resilience to climate change through strengthening adaptive small scale farming systems in rain-fed areas in Bangladesh, India and Nepal.

SAF-BIN project team

A diverse range of partners are involved in SAF-BIN that guarantee a multi-sectoral approach to meet the challenges climate change has posed on smallholder farmers food production, distribution and consumption systems in the three project countries.

As project applicant the civil society organisation Caritas Austria is cooperating with Caritas Bangladesh, Caritas India and Caritas Nepal as implementing organisations in the project countries. The BOKU University of Natural Resources and Life Sciences Vienna is research partner. This partner consortium is expanded by a range of associated partners from the project countries. Civil society organisations are additionally represented by Action for Food Production (AFPRO) from India and Local Initiatives for Biodiversity, Research and Development (LI-BIRD) in Nepal. The agricultural research sector is further represented by the Sam Higginbotom Institute of Agriculture, Technology and Sciences (SHIATS) and the Bangladesh Rice Research Institute (BRRI).

[1]This introduction is based text developed by the SAF-BIN team during the project proposal phase

Overall objective

To promote local food and nutritional security through adaptive small scale farming in four rain-fed agro-ecological zones[2] in South Asia in the context of climate change.

Specific project objectives

To screen and document **innovations** in traditional **food production, distribution** and consumption systems of smallholder farmers with respect to climate change adaptation, mitigation and nutritional security

To collectivize and **strengthen smallholder farmer institutions** and achieve an organized and sustainable approach

To develop **multi-stakeholder monitoring mechanisms** to enhance the efficiency of these models for food production, distribution and consumption systems of smallholder farmers

To **test** the potential of **models** for **food production, distribution and consumption systems** of smallholder farmers designed by **blending traditional** practices and **modern** innovations in order to increase smallholders' capabilities to adapt to and mitigate climate change effects as well as ensure nutritional security

To **influence** national **research and policy agendas** for the promotion of collectivized food production, distribution and consumption systems of smallholder farmers to adapt to and mitigate climate change effects as well as ensure nutritional security

[2]Bangladesh: sub-humid flood plain and semi-arid upland agro-ecological System (AES) classified as FAO agro-ecological zone (AEZ) 3; India: sub-humid tropical hilly AES (FAO AEZ 5) and sub-humid tropical plateau AES (FAO AEZ 5); Nepal: humid sub-tropical montane AES (FAO AEZ 8).

SAF-BIN direct beneficiaries

SAF-BIN project works in 90 villages with 270 smallholder farmers collectives comprising of 15000 farmers in total.

SAF-BIN final beneficiaries

SAF-BIN project had the ambitious aim to produce knowledge, processes and outputs that are relevant for 10 million smallholder farmers in agro-ecological systems in South Asia. Furthermore the project wants to achieve a sustainable impact on National Agricultural Research Systems (NARS), extension networks, policy makers and agricultural practitioners in the region.

Estimated results of SAF-BIN

1. An increased understanding and use of documented innovations in rain-fed food production, distribution and consumption systems of smallholder farmers as pro-poor research and policy options towards adaptive food security and climate change mitigation
2. Improved productivity, diversification, and adaptation in smallholder farms and enhanced food and nutritional security of smallholder farmers in vulnerable and remote rain-fed agro-ecological systmes in the context of climate change of the target countries
3. An enhanced appreciation of cross-cutting issues affecting climate change and food security (cultural identity, gender, collective action, sustainability, health and natural resource base) by the National Agriculture Research Systems
4. Establishment of innovative multi-stakeholder partnerships and dialogue among smallholder farmers collectives, civil society organisations, agricultural research organisations, extension agencies and policy makers leading to more inclusive and responsive policies.

SAF-BIN approach

SAF-BIN project is primarily a civil society attempt to fill the gap between research, extension and smallholder farmers. The NARS in South Asia lack the research infrastructure to produce relevant outputs for smallholder farmers. Additionally the adoption of NARS research outputs is often hampered by a lack infrastructure and efficiency of the extension systems. This situation is further worsened through the poor fit of extension approaches to the needs and demands of smallholder farmers in the region. This lack of inclusion of smallholder farmers leads to a limited ownership and adoption of agricultural technologies by smallholder farmers.

For these reasons SAF-BIN project implements a farmer-led approach in

which smallholders are directly involved in action research via an on-farm trials concept. The SAF-BIN teams in Bangladesh, India and Nepal work with smallholder farmers collectives (SHFC) at village level. In close collaboration with these groups problems relating to climate change are identified, possible solutions discussed and field trial objectives developed. SAF-BIN empowers farmers by supporting them to hold regular SHFC meetings, establishing contacts with agricultural researchers and NGO representatives and during on-farm trials that train the analytical skills of smallholder farmers. The implemented on-farm trials are adaptive allowing farmers to change the research focus of the SHFC in each farming season. This flexibility is not possible in more formal research settings but crucial to enable an immediate reaction to the often fast changing demands of smallholders.

To facilitate a broader dialogue between stakeholders SAF-BIN project facilitates the formation of District Level Smallholder Forums. The rules and regulations for these multi-stakeholder platforms are developed by the smallholders themselves. The District Level Forum is a platform for the exchange of experiences and allows smallholder farmers direct contact to district administration, extension representatives and other sector stakeholders.

In each project district a Resource Center is established as central information point matters concerning smallholder farmers. Access to information is seen as key element to build smallholder farmers capacities to adapt to climate change effects.

SAF-BIN project sites

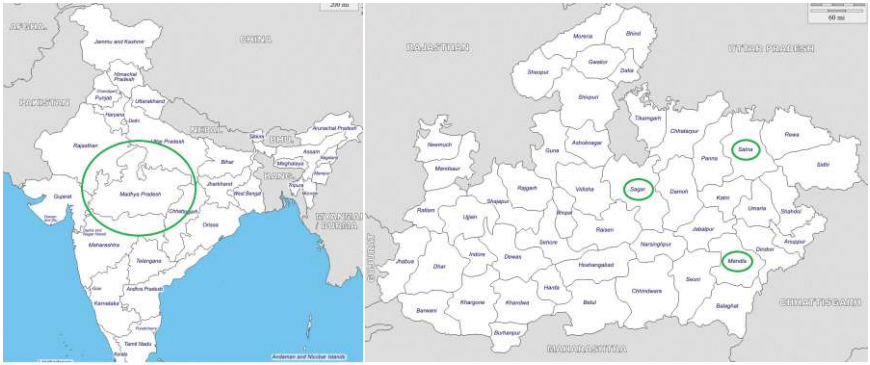
Agro-ecological systems selected for this project are especially vulnerable to climate change effects. The site selection within four agro-ecological zones sites represents a continuum of farming systems comprising a considerable proportion of the agricultural landscape of South Asia.

SAF-BIN project districts in Bangladesh
(source: www.mapsopensource.com
http://tinyurl.com/mjfkt94

A total number of 90 villages (10 per district[3]) are targeted by SAF-BIN project. In each village two to three smallholder farmer collectives are established that comprise of 10-20 smallholder farmers each. Research sites are situated in 3 districts in Bangladesh (Natore, Naogoan and Rajshahi

[3]except in Nepal where the 10 villages are distributed in 4 districts

3 districts in India (Mandla, Satna and Sagar in Madhya Pradesh state)



SAF-BIN project districts in Madhya Pradesh, India
(source: dmaps.com India: http://tinyurl.com/lhydd7e; Madhya Pradesh: http://tinyurl.com/q2epcta)

and 4 districts in Nepal (Kaski, Nawalparasi, Bardiya and Surkhet).

SAF-BIN project districts in Nepal
(source: http://traveltrendnepal: http://tinyurl.com/lmbmw46)

Participatory selection of adaptive rice varieties in Bangladesh

Sukleash G.Costa, SAF-BIN National Project Coordinator, Caritas Bangladesh

Abstract

Climate change induced changes of monsoon patterns and prolonged droughts affect rice farmers in Bangladesh. In a participatory approach, facilitated by SAFBIN project, smallholders in Naogaon district, Bangladesh explored drought tolerant, quickly maturing rice varieties.

Keywords: Bangladesh, climate change adaptation, drought tolerant rice, farmer-led action research, food security, monsoon, resilience, smallholder farmers, short duration rice.

Anamul Haque (40) lives as farmer in the village of Gopinagar, Naogaon district, Bangladesh. He left school when he was in class nine, married and is father of three children. Mr. Hague has only 0.4 ha of rain-fed, cultivable land and was struggling with the cultivation of long duration rice, such as Sharwna due to prolonged drought caused by irregular and insufficient rainfall.

This situation makes crops more susceptible to diseases and pests which results in lower yields and delayed establishment of consecutive crops. Anamul Haque did not know how to optimize yields even in drought conditions and about alternative options to adapt to the changing climatic situation. Anamul Haque is not alone – climate change affects many smallholder farmers in the region.

In 2012 Anamul Haque joined a smallholder farmer collective (SHFC) of the EU funded project "Strengthening Adaptive Farming in Bangladesh, India and Nepal" (SAFBIN) implemented by Caritas Bangladesh. Through his participation in the farmer-led action research activities he got the opportunity develop his skills in rice production, integrated pest management and on-farm adaptive research (OFAR). In this approach farmers plan, establish, conduct, and analyse trials on their own farms.

To overcome the drought problem the Gopinagar SHFC selected a rice varietal trial as their research topic. Five rice varieties were selected that showed relatively short duration qualities and drought tolerance (BINA7, BRRIdhan49, BRRIdhan56, BRRIdhan57 and Swarna). Anamul Haque contributed by making 0.02ha of his land available as trial plot. He invested inputs supplied by the SAFBIN project and implemented improved cultivation practices assisted by project staff and the other SHFC members. Key management options for his trial were timely seed bed preparation, land preparation, weeding, fertilisation and control of pests and diseases.

Anamul Hague in his SAFBIN trial plot in Gopinagar, Naogaon, Bangladesh
(© Caritas Bangladesh 2014)

> "IN MY PLOT BINA-7 AND BRRIRICE56 PERFORMED THE BEST CONSIDERING YIELD, AND DROUGHT ESCAPING PARAMETERS"
>
> Anamul Haque, SAFBIN project participant of Gopinagar, Naogaon district, Bangladesh

This was confirmed by an in depth analysis that revealed that BINA-7 and BRRIdhan56 performed best concerning short duration and drought tolerance. Medium duration rice varieties BRRIdhan49 and Swarna could compensate better by tillering that contributes to higher yields and were on the same level as BINA-7. "Many yield parameters, like 180 grains/panicle, were amazingly big" (Zhillur Raman, SAFBIN Bangladesh Research Officer).Obtaining higher yield from short duration varieties was supported by supplemental irrigation provided by farmers. However, this creates the opportunity of sowing winter crops on time.

Now Anamul Haque feels happy because through the participatory OFAR process he and his SHFC partners selected drought tolerant rice varieties for their specific location. Through the activities within SAFBIN project farmers are assisted in overcoming the scarcity of drought tolerant seeds, improving their food security and minimizing their production costs.

SAFBIN trial plot in Gopinagar, Naogaon, Bangladesh
(© Caritas Bangladesh 2014)

Drought tolerant rice varieties help farmers to adapt to changing monsoon in Nepal

Chintan Manandhar, SAF-BIN National Project Coordinator, Caritas Nepal

Abstract

Farmers in Nepal, experience irregular monsoon that challenges rice cultivation. Guided by SAFBIN project farmers conduct action research to test drought tolerant rice varieties and improved cultivation practises. Results are promising as yields, food security and cash income increase.

Keywords: climate change adaptation, drought tolerant rice, farmer-led action research, food security, monsoon, Nepal, resilience, smallholder farmers

Suja Rokaya in front of his vegetable tunnel build through SAF- BIN support in Alayachour village, Surkhet, Nepal (© Caritas Nepal/C. Manandhar 2013)

Suja Rokaya is 40 years old and owns a farm in Alayachour village, Surkhet district, Mid-Western Nepal. On his 9 kattha (0.3ha) he produces rice, vegetables and potatoes. 10 family members depend on the harvest. As his land is unable to produce enough food Mr. Rokaya leases another 0.5ha by an Adhiya arrangement. In this way, he was manages food security and income of his family.

Suja Rokaya reports how low rice productivity, due to inadequate rains, unfertile soils and low technical knowledge, is a challenge for his farm. As many other farmers, cultivating under rain-fed conditions, he noticed the fluctuation in the arrival of monsoon from one year to another which makes it difficult to decide when to establish rice nursery. Farmers are highly dependent on monsoon as their main rainfall season. Even if monsoon arrives in time, some seasons do not bring enough rains for proper growth of rice plants and good paddy production. Suja Rokaya shared that of the past nine years only three received timely and adequate rainfalls. These conditions, under which small farmers in this area have to manage, increasingly make farming a challenge.

Upon joining "Chadani Small Holder Farmers Agriculture Research Group", facilitated through SAFBIN project and implemented by Caritas Nepal, Suja Rokaya learned that the changing climate in Surkhet is part of a wider

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Upon joining "Chadani Small Holder Farmers Agriculture Research Group", facilitated through SAFBIN project and implemented by Caritas Nepal, Suja Rokaya learned that the changing climate in Surkhet is part of a wider phenomenon called global warming. SAFBIN project supported the research group to plan, conduct, monitor and analyse farmer-led action research trials and test mitigation strategies for climate change. Irregular rainfall, as main challenge of the area, was addressed by undertaking trials on newly released drought tolerant short duration rice varieties developed by the Nepal Agriculture Research Council (NARC), a partner in the SAFBIN project. The "farmer group led action research" tested Sukha Dhan 2 (a 'fat rice') and Sukha Dhan 3 (a 'thin rice') against the locally used variety Radha 4. Additionally improved cultivation and fertilisation practises were introduced by SAFBIN project (e.g. limitations of plants/hill, crop geometry, compost and farm manure, reduction of urea, adequate chemical fertilizer application).

Promising results of the initial trial period (2012) of this farmer led action research lead to an upscaling of trial area in 2013-14. The newly introduced Sukha Dhan 2 and 3 varieties provided greater grain and straw yields compared to Radha 4. Seed supply is ensured by the farmers themselves who keep new variety seeds for cultivation in the coming year.

Suja Rokaya demonstrating the Sukha Dhan 2 variety growing on his field

(© Caritas Nepal/C. Manandhar 2013)

By using the potential of the new rice varieties and improved farming practises Suja Rokaya is now able to realize a yield increase of 37%. He has improved his food security from his own land from 5 to 11 months per year. In addition, he also is now increasing rice yield from his leased land by 50% which provides him with additional income from rice sale. Suja Rokaya is grateful to Caritas Nepal's SAFBIN project team and the European Union for assisting them to adapt to climate change in rice farming. Caritas Nepal is glad to see that farmers are adapting to climate change by selecting suitable drought tolerant varieties and by pursuing good practices in rice cultivation.

Improvement of rice production in Mandla

Valentine Denis Pankaj, SAF-BIN National Project Coordinator, Caritas India

Abstract

Rice is life for millions of people particularly in developing countries and the main cereal for India. Demand is growing. But rice is a water intensive crop. One way to adapt rice cultivation is the System of Rice Intensification (SRI). This method was tested in farmer-led on farm action research in Mandla district, Madhya Pradesh, India.

Keywords: climate change adaptation, farmer-led action research, India, organic pest control, resilience, SRI, smallholder farmers

Gulab Saiyam and fellow farmers transplanting rice according to SRI method, Mandla district, Madhya Pradesh, India

(© Caritas India/ Sunil Pandey, 2013)

More than 70 percent of India's ground and surface water are used for agriculture, and out of this, 70 percent are allocated to rice cultivation. For each kg of rice 3000-5000l water are required for irrigation. Another challenge is that in India are plateauing. Hence farmers need to build their capacity to produce more rice with less water which will contribute to both water and food security, especially in a context of climate change.

One way to adapt rice cultivation is the System of Rice Intensification (SRI) method developed by Henri de Laulanié in Madagascar in 1983. SRI cultivation requires less water, spaces plant to plant and row to row in a certain distance and needs weeding to be done every 15 days. The SAF-BIN cooperated with smallholder farmer collectives (SHFC) in the rain-fed Mandla district, Madhya Pradesh, India in testing this method using farmer-led on farm action research trials.

Gulab Singh Saiyam is one of the smallholder farmers taking part in these trials. He lives in Katigahan village and owns just above 1ha of land. Traditionally farmers from his village practice paddy cultivation either through direct sown rice dry DSR[6]

[6]Direct seeding can be categorized into (1) Wet-DSR (sprouted rice seeds are broadcast or sown in lines on wet/puddled soil), (2) Dry-DSR (dry rice seeds are drilled or broadcast on unpuddled soil after dry tillage, zero tillage or on a raised bed) and (3) water seeding (in which sprouted rice seeds are broadcast in standing water)

or transplantation both water intensive methods. In these traditional methods farmers use 90kg seed per hectare and a high amount of chemical pesticides.

In SRI only 10kg of seeds are needed per hectare and top-dressing with chemical fertilizers is not necessary. Through the SAF-BIN project farmers were educated that locally made botanical pesticides can be used to reduce production costs. Additionally seed treatment can be done with local resources (a mixture of salt and water) that keep seed-borne diseases at may further contributing to production cost reduction.

> **"I HAVE ADOPTED SRI AND WILL CONTINUE THROUGHOUT MY LIFE. I WILL PUT MY EFFORTS TO CONVINCE AS MANY OTHER FARMERS AS POSSIBLE TO ADOPT THIS SIMPLE TECHNOLOGY"**
>
> Gulab Saiyam, SAF-BIN participant, Mandla district, Madhya Pradesh, India.

Gulab Saiyam and fellow farmers transplanting rice according to SRI method, Mandla district, Madhya Pradesh, India. (© Caritas India/ Sunil Pandey, 2013)

Gulab Saiyam experimented during the Kharif season 2012 on 20m^2 of his paddy field from which he harvested 1.1kg of paddy. Encouraged by the trial results he applied the SRI method in Kharif 2013 to just above 1ha of his land. He applied recommended practices like seed selection, seed treatment, 25cm distance between plant to plant and row to row, weeding by conoweeder and locally made pest repellents pitcher manure and fish tonic to his entire field.Also 12 other farmers in his village adopted this practice.

There was a difference in productivity as traditional cultivation yielded 1.5-2 t/ha while SRI yielded 3.5-4t/ha. The cost of cultivation was less than half from the previous years' cultivation. On a hectare basis, SRI reduced cultivation cost by 3500 INR. These particulars encouraged other farmers to venture into scaling up this technique to their fields. Gulab Saiyam said he will remain grateful to the SAF-BIN and Caritas India research project which has given an important contribution to his method of cultivation.

SHFC member of Bija Tola village during application of pest repellent botanicals in Mandla district, Madhya Pradesh, India (© Caritas India/ Sunil Pandey, 2013)

[7] Rice plants are grown in a nursery bed and transplanted into the paddy field at the age of 15-20 days. The transplanting is not follow a strict design

[8] kharif ist the monsoon season

[9] 2.5 acres

[10] pitcher contains cow urine, cow dung, neem leaves and jaggery

[11] fish tonic contains raw fish and jaggery

From one harvest to three: improved food security in Bangladesh

Sukleash G.Costa, SAF-BIN National Project Coordinator, Caritas Bangladesh

Abstract

In regions prone to drought, climate change has a worsening effect. Farmers in the Barind Tracts area of Bangladesh cultivate one crop per year that often fails to produce sufficiently. In farmer led field trials improved seeds and cultivation methods increased output from one to three harvests improving local food security.

Keywords: Bangladesh, climate change adaptation, crop diversity, farmer-led action research, food security, improved cultivation practises, resilience, smallholder farmers, short duration rice.

Gopal Chandra Pramanic in his SAF-BIN rice trial plot in Sreekhondi, Natore district, Bangladesh

(© Caritas Bangladesh 2014)

Mr. Gopal Chandra Pramanic (48) is a poor farmer living in Sreekhondi village, Natore district, Bangladesh. He left school when he was in class three and is sustaining a family of four from 1.7ha of single cropped land under rain-fed conditions. In this region situated within the Barind Tracts is known for its barrenness. Even during the rainy season rainfall is very low and irregular. As a result, a vast area remains fallow more than six months a year. Farmers like Gopal Pramanic cultivate the land during the rainy season only. From this single crop he often failed to produce sufficiently to meet his family needs.

Looking for alternative opportunities Gopal Pramanic joined the, Strengthening Adaptive Farming in Bangladesh, India and Nepal (SAF-BIN) project implemented by Caritas Bangladesh in July 2013. Together with other community members he established a smallholder farmer collective to get involved in adaptive research on short duration rice, wheat and mungbean.

Gopal Pramanic and his group received inputs in the form new varieties of rice[12], wheat and mungbean seeds as well as technical guidance from the SAF-BIN

[12] BRRIrice57 rice variety developed by Bangladesh Rice Research Institute. It is a short duration rice maturing in 110 days compared to 150-160 days for other rice varieties

project. The selected varieties were agreed on by skilled farmers, government extension officers and scientists. Improved cultivation methods were applied. After harvesting rice in October he was able to cultivated wheat followed by mungbean in March. The rice, wheat and mungbean varieties were newly introduced in this area.

This mix of improved seeds and cultivation practices led to amazing results:

Gopal Pramanic satisfied in his mugbean plot and harvesting rice
(© Caritas Bangladesh 2014)

Gopal harvested 180kg rice, 160kg wheat and 60kg of mungbean from his 0.17 hectare of land. A massive increase compared to the average previous production level of 140kg of rice only. But not only the production increase but the cultivation of a variety of crops in the same year has great potential. Diversification of crops reduces the risk of crop failure. A greater variety of foodstuffs has nutritional benefits. Gopal Pramanic plans to further disseminate the technologies to his neighbouring farmers.

Gopal Pramanic and fellow farmers observing wheat harvest in Sreekhondi, Natore district, Bangladesh
(© Caritas Bangladesh 2014)

The magic of Matka and Ark

Valentine Denis Pankaj, SAF-BIN National Project Coordinator, Caritas India

Abstract

In the face of climate change sustainable farming practises contribute to resilience of smallholders. Organic pest control using locally available resources, as sustainable farming practise, has been tested in a farmer-led action research trial in Sahgarh District of Madhya Pradesh, India.

Keywords: chilli leaf curl virus, climate change adaptation, farmer-led action research, food security, resilience, India, organic pest control, smallholder farmers

Ramesh Bhalla demonstrating the impact of organic pest control in his SAF-BIN trial plot in Bagrohi, Sahgarh district, Madhya Pradesh, India

(© Caritas India/Adaita K. Mishra, 2014

In the face of climate change and the mitigation of adverse effects sustainable farming practises shift to the centre of attention. With increasing concern regarding environmental protection and human health, the use of biological/organic pest control is an alternative, environment friendly means for the management of crop diseases. The emerging paradigm of sustainability in agriculture strives to amalgamate modern technology with traditional farming wisdom which has also been a core focus of the SAF-BIN project activities.

In Bagrohi village, Sahgarh district, Madhya Pradesh, India farmer Ramesh Bhalla (48) owns a small piece of land (0.16ha) to cultivate crops and vegetables. This small piece of land supports the food security for his family, which includes his wife and three kids. He is an active member of the local smallholder farmer collective established within the SAF-BIN project and has always shown his interest in learning and practical application of technologies in his fields despite the additional time and labour demand.

In kharif[16] 2014 Ramesh Bhalla cultivated chillies using a local variety which preferred for its taste, durability and fetches good market prices (60-80 INR/kg in

[16]kharif is the monsoon season

2014). Things were going pretty well, until one day he noticed that his chilli plantation was infected with Chilli Leaf Curl Virus (bemisia tabaci) locally called as Kukra or Patimoda, a severe viral infection that spreads rapidly. The infection was so severe that Ramesh Bhalla had to remove some plants from the field resulting in an economic loss for him. Despite these problems Ramesh Bhalla had a strong believe in organic cultivation. SAF-BIN project had provided training on the formulation and application of organic, botanical pest repellents that could be made from locally available resources of which local farmers had not been aware before. He decided to apply organic pest repellents Lamit Ark[17] and Matka Khad[18] to his chilli plot. He applied a solution of Lamit Ark and water (ration 1:10) twice a week and a solution of Matka Khad and water (ratio of 1:10) once in ten days. This accumulated to 4 applications of Lamit Ark and 2 applications of Matka Khad within a period of 3 weeks.

> **"In organic farming input cost is less and output is more if we use the organic solutions on right time"**
>
> Ramesh Bhalla, SAF-BIN participant,Bagrohi, Sahgarhdistrict, Madhya Pradesh, India

The locally available ingredients of Lamit Ark ready for production
(© Caritas India/Valentine Denis Pankaj, 2014)

The results of this treatment provided a learning opportunity to the local farmers. The chilli plants recovered and survived the virus attack. Instead of losing his a significant proportion of his chilly crop Ramesh Bhalla was able to harvest 10-12kg of chillies every week which sums up to a total harvest of 50kg from his 0.16ha plot. By achieving a good price on the market he was earning more than INR 2000-2500 a month enabling him to support his family.

Ramesh Bhalla expressed his happiness towards SAF-BIN program which inspired smallholder farmers to adapt organic pest control technologies as sustainable agriculture practices through a farmer led approach.

Ramesh Balla showing healthy chilli plants after the application of Lamit Ark and Matka Khad
(© Caritas India/Valentine Denis Pankaj, 2014)

[17]Lamit Ark contains chillies, ginger and garlic and acts as pest repellent

[18]Matka Khad contains cowdung, cow urine and jaggery and acts as nutrient supplement

Improved seed storage for small farmers in Bangladesh

Sukleash G.Costa, SAF-BIN National Project Coordinator, Caritas Bangladesh

Abstract

Quality seeds are an important agricultural input. Farmers in Bangladesh rely on their own seed storage. Climatic parameters, pests and diseases pose challenges on storage facilities. Farmer-led action research tested storage options to assess the optimal solution for the local setting.

Keywords: access to seeds, Bangladesh, climate change adaptation, farmer-led action research, food security, quality seeds, resilience, smallholder farmers, storage technology.

Sanowar Hossain, presents his seed bank (© Caritas Bangladesh 2014)

Sanowar Hossain (35) is a poor small farmer of Batasmolla village, Rajshahi district, Bangladesh. He left school when he was in class seven, married and became father of one Sanowar Hossain and his wife farm 0.6 ha of triple cropped land to sustain his family of four. The area they are located in is famous for production of rice, wheat, jute, pulses, onion, garlic, oil seeds and vegetables. Seeds are the major agricultural input needed and best option to improve outputs. For the access to quality seeds farmers are highly dependent private seed dealers who supply 33% of quality seeds while the Bangladesh Agricultural Development Corporation is only able to meet 17% of total quality seeds requirement. But the largest proportion of 50% is preserved by farmers themselves.

Until recently Sanowar Hossain has been confronted with the climatic challenges and insufficient storage technologies to preserve his seed at optimal quality.

That is why in January 2012, Strengthening Adaptive Farming in Bangladesh, India and Nepal (SAF-BIN) project implemented by Caritas Bangladesh conducted training on seed production and preservation in his village. The community shared their problems of seed preservation and agreed to set up an on-farm adaptive research (OFAR) trial to identify the most suitable options for seed storage that will ensure successful germination and keep the seeds free from diseases and pests. Sanowar Hossain conducted parts of the trial at his farm.

The tested storage options were selected with the technical guidance of the SAF-BIN project staff: earthen pot, gunny bag with polyethylene lining and air tight plastic drums. Preserved crops were wheat, lentil, chickpea, grass pea, mustard and linseed.

After ten months Sanowar Hossain observed that earthen pots are not suitable for seed preservation:

> **"AS MY NEIGHBOURS OBSERVED THE QUALITY OF MY SEEDS, THE DEMAND INCREASED"**
>
> Sanowar Hossain, SAF-BIN participant, Rajshahi, Bangladesh

Storage facilities (gunny bag, earthen pot, plastic barrel) for SAF-BIN storage trial in Rajshahi, Bangladesh (© Caritas Bangladesh 2014)

Improved seed storage in Bangladesh This was confirmed by an in depth analysis of Zillur Rahaman, Research Officer of the SAF-BIN project who analysed that the germination rate of seed preserved in gunny bag and plastic drum increased by 22% compared to earthen pot. Seed moisture level decreased by 8% compared to earthen pot. Emphasis should be on storing clean, hand graded and appropriately dry seeds only.

As a result for Sanowar Hossain the quantity in his seed bank has increased from 95 to 520 kg and from 2 to 5 different crops. It was unnecessary for him to purchase seeds during the past three years. After observing this success 9 other farmers in his village have started to store seeds according to these technologies.

Close observation of storage trial results
(© Caritas Bangladesh 2014)

Reviving kodo for nutritional security of Indian smallholder farmers[19]

Valentine Denis Pankaj, SAF-BIN National Project Coordinator, Caritas India

Abstract

Diversification of food baskets and adaptive crops are key actions towards climate mitigating farming strategies for smallholders. In Mandla district, Madhya Pradesh, India smallholder farmers in a tribal area revived the traditional kodo millet that contributed now to food security.

Keywords: climate change adaptation, farmer-led action research, food security, India, nutritional security, paspalum scrobiculatum, resilience, smallholder farmers.

Hari Lal, SAF-BIN participant, Mandla district, with one of his sons and his wife

Kodo millet (paspalum scrobiculatum L.) was introduced to India almost 3000 years ago. On a national level it is only a minor grain crop, but on the Deccan Plateau it plays a much larger role. Some of kodo millet's nutritional qualities bypass the more common cereals like rice and wheat. Kodo millet contains 10% protein and is an excellent source of fibre and other nutrients adding to the diversification of local food baskets. It can be easily cultivated by smallholder farmers as the crop is hardy, requires minimum input costs and survives in wastelands or undulating terrain. The taste is locally accepted and the grain can easily be stored[20]. This "wonder grain" lost its ground to rice and wheat as the post-harvest is labour intensive and time consuming. But the adaptive qualities of kodo millet, to grow under adverse conditions, make it an interesting crop for adaptation of smallholder farming systems to climate change. Supported by SAF-BIN project and through the interaction with experts, farmers in Mandla district, Madhya Pradesh, India have formed a smallholder farmers collective (SHFC) and have realized the importance of kodo millet.

[19] The revival of kodo millet through SAF-BIN project has been featured in the EU delegation to India e-Newsletter, Vol 4, May 2014: http://euindiaenewsletter.com/Vol_4_May_2014/Millet.html

[20] Unlike rice and wheat kodo millet can be stored at a lower 13% moisture content. The grain is also less sensitive to temperatures.

Hira Lal is one of these farmers. He resides in the tribal village of Gram Baigakheda in Mandla district. He owns a farm of just above 1ha on which his family of four depends for their food security. In 2013 Hira Lal joined his local SHFC established under the SAF-BIN project.

In 2013 there was excess rainfall that threatened the harvest of usually grown crops. Upon observing this risk, the local SHFC, in which Hira Lal is involved, decided to try growing a local variety of kodo millet called "badi kodo" supported by SAF-BIN project. Hari Lal borrowed seeds from fellow farmers and sowed 0.6ha with this traditional crop. He applied the local cultivation practises to his upland, sandy plot (ploughing twice for levelling after sowing to allow excess water runoff).

Harvest was plentiful with 100kg from the initially sown 4kg. This grain surplus was replacing rice to be consumed by the family as dali, pej, kheer[21] and stored until food shortage in summer season. Unlike previously, when he had to barter with other farmers for rice, Hari Lal could also supply his family with kodo millet during sickness as it is known as food supporting a quick recovery.

> **"There were times when I use to borrow seeds and grains to feed my family, but now I have surplus grains to feed my family and share with fellow farmers"**
>
> HariLal, SAF-BIN participant, Mandla district, Madhya Pradesh, India.

Hari Lal showing his kodo millet harvest
(© Caritas India / Sunil Pandey, 2014)

The kodo millet trial was continued by the SHFC also in 2014 with the introduction of the kodo variety JK41 by SAF-BIN project. Hari Lal was supplied with 4kg of this variety and once more cultivated 0.6 ha with this crop under different weather conditions (delayed rains) and with slightly adapted cultivation practices (weeding, botanical, ploughing three times). The result was a harvest of 170kg of which he could preserve 8kg in a seed bank ensuring cultivation for the following year.

For Hari Lal a lot has improved. His family is food secure throughout the year as kodo millet contributes to other cereals, pulses and vegetables. Furthermore he is now in a position to share kodo millet seeds with others.

A SHFC member presenting kodo millet harvest in Mandla district
(© Caritas India/ Sunil Pandey, 2014)

[21]local dishes

Kitchen gardens for food and nutritional security of Indian smallholders

Valentine Denis Pankaj, SAF-BIN National Project Coordinator, Caritas India

Abstract

Smallholder farmers often lack sufficient cash income to meet their food and nutritional demands adequately. One way to address this issue is the establishment of kitchen gardens. Smallholder farmers in Satna district, Madhya Pradesh, India established kitchen gardens using a farmer-led on farm research approach.

Keywords: climate change adaptation, farmer-led action research, India, kitchen gardens, micro-level intervention, resilience, smallholder farmers

Kaushal Pal on his farm in Gubrao Kala, Satna district, Madhya Pradesh, India

Smallholder farmers often lack sufficient cash income to meet their food and nutritional demands adequately. One way to address this issue is the establishment of kitchen gardens. By directing some family labour power towards the management of a kitchen garden, even with limited land resources a small area around the house can make a difference in the lives of many. Taking local opportunities, preferences and challenges into account, a kitchen garden acts as source that can address food insecurity and bring in self-reliance, sovereignty and dignity.

In Satna district, Madhya Pradesh, India the SAF-BIN project took initiative to address this issue by cooperating with a local smallholder farmer collective (SHFC). The aim was to address food and nutritional security of these smallholder farmers through micro level interventions like the supply of traditional seeds and training farmers on locally available organic fertilizers (compost, fish tonic[22], matka khad[23]).

Kaushal Prasad Pal (40) is a smallholder farmer in Gubrao Kala village, Satna district, who holds a small plot of 0.4ha which he farms with his family of four. He is

[22] fish tonic contains raw fish and jaggery

[23] Matka Khad contains cowdung, cow urine and jaggery

one of the active members of the local SHFC group and also acts as its' secretary. His land is on undulating terrain and depends on rain for cultivation of the only possible crops: legumes (Arhar[24], Gram[25]). Since his land is not able to adequately feed his family, Kaushal Pal borrowed 0.2 ha as Adhia Batai[26] from family members.

This is the plot he used for his farmer led field trial on kitchen gardens in cooperation with his SHFC and SAF-BIN project in the rabi[27] of 2014. SAF-BIN project supplied a kitchen garden kit (a variety of 10 different seeds) to establish a kitchen garden. Kaushal Pal and his wife share the management tasks of the kitchen garden and the used organic fertilizers fish tonic (15ml : 15l water) and the nutrient supplement matka khad (2.50g dissolved in 15l water) and applied a the solutions every ten days for 3 weeks.

Results from this trial were promising. During the first season of 2014 Kaushal Pal and his family did not only improve their own food basked but could also sell surplus produce at village level. The money from the sale of 0.3t/ha of radish for 4000 INR[28] could be invested in different seeds (garlic, coriander, tomato, potato, cauliflower) which he continued to cultivate in the kitchen garden in 2015.

This demonstrates that a small intervention in form of a small amount of inputs coupled with providing the necessary information and skills to smallholders can have a significant impact on local food and nutritional security.

SHFC members of Gubrao Kala, Satna district, Madhya Pradesh, India observing the developments in a kitchen garden (left) and bountiful harvest (right)

(© Caritas India/ Sunil Pandey, 2013)

[24]Pigeon pea (cajanus cajan)

[25]Mungbeen (vigna radiata)

[26]a local, intra familiar leasing agreement for agricultural land. The price for the lease is given as share of the harvest.

[27]rabi is the winter season

[28]Indian Rupees

Improved cultivation and frost protection for potatoes in Mandla

Valentine Denis Pankaj, SAF-BIN National Project Coordinator, Caritas India

Abstract

An effect of climate change in Mandla district, Madhya Pradesh, India, is an increase of frost. Frost is a major risk for potato cultivation in the area. Farmers raised this problem during an initial assessment conducted by SAF-BIN project in the area. In a farmer-led on farm research approach improvement and protection measures were tested.

Keywords: climate change adaptation, farmer-led action research, frost protection, India, organic pest repellent, resilience, SRI, smallholder farmers

Nawal Saiyam, SAF-BIN participant in one of his fields Mandla district, Madhya Pradesh, India
(© Caritas India/ Sunil Pandey, 2013)

Traditional potato cultivation practises include covering the potato plants with earthen heaps 20-30 days after plantation of the tubers. This method was insufficient to protect the potatoes from frost. The tubers were not treated or irrigated in time leading to a low productivity. Chemical fertilizers and pesticides were applied.

Nawal Singh Saiyam, a farmer from Baigakhera village, Mandla district, and member of the local smallholder farmers collective (SHFC), supported through SAF-BIN project, also used to cultivate potatoes in this manner. To react to the higher frequency of frost damage Nawal Saiyam and the SHFC decided after an exposure visit facilitated by SAF-BIN project to alter their potato cultivation practises. For the planting season 2014 the plan was to treat the tubers with fungicides (water and salt) prior to plantation. Earthen heaps were built immediately after tuber plantation following the ridge and furrow method. The soil was loosened after 30 days to give the tubers enough space for growth and enhance yields. To continuously protect the plants from frost, dead compost for additional insulation was provided. Unlike initially planned irrigation during the frost period was not possible due to water scarcity. SAF-BIN project trained farmers how to formulate and apply organic fertilizers from locally available

materials: fish tonic[29] and matka khad[30]. The aim was to reduce production cost, enhance potato yield and quality while reducing production costs.

Nawal Saiyam planted a trial plot of 0.29ha with the newly proposed cultivation practises and a control plot of 0.3ha with the traditional practises. He was a lead farmers, supported by the SAF-BIN team and provided guidance to the other farmers in the village also involved in the trial. Also farmers from villages not participating in the SAF-BIN activities visited to observe practises and progress.

> **"The farmer-led on farm trial have shown me a way. I can now grow potatoes commercially to additionally enhance my income"**
>
> Nawal Saiyam, SAF-BIN participant, Baigakhera, Mandla district, Madhya Pradesh, India

A fruitful potato harvest for Nawal Saiyam
(© Caritas India/ Sunil Pandey, 2013)

Results of the field trial were good. Total production of Mr. Saiyam trial plot was 35kg (an equivalent of 4.3 t/ha. In the control the harvested yield was 30kg (an equivalent of 2.9 t/ha. Cultivation cost in the trial plot was 3567 INR compared to 4875 INR in the control plot which means a reduction by using the introduced practises by 27%. The cultivation costs could be reduced through the use of compost, organic fertilizers and pesticides and lower labour cost of furrow and ridge method compared to traditional earthen heaps.

Nawal Saiyam will increase the acerage cultivated with these methods and continue to teach other farmers about what he has learned through these farmer-led field trials.

SHFC members of Baigakhera village behind a potato plot planted using ridge and furrow
(© Caritas India/ Sunil Pandey, 2013)

[29]fish tonic contains raw fish and jaggery

[30]Matka Khad contains cowdung, cow urine and jaggery and acts as nutrient supplement

Village pond fish farming for drought prone areas in Bangladesh

Sukleash G.Costa, SAF-BIN National Project Coordinator, Caritas Bangladesh

Abstract

Climate change induced changes of monsoon patterns and prolonged droughts affect fish farming ponds in Bangladesh. In a farmer-led approach, facilitated by SAF-BIN project, smallholders in Naogaon district, Bangladesh, explored fast growing fish for village pond fish farming systems.

Keywords: Bangladesh, climate change adaptation, farmer-led action research, fast growing fish, food security, monsoon, puntius sophore, smallholder farmers.

> "SPOTFIN SWAMP BARB CULTIVATION HAS HELPED TO SOLVE MY PROBLEM TO CULTIVATE FISH IN A DROUGHT PRONE AREA. MY SIX MONTHS PRODUCTION IS SIMILAR TO EARLIER ONE YEAR PRODUCTION"
>
> Habir Uddin, SAF-BIN project participant of Gopinagar, Naogaon district, Bangladesh)

Habir Uddin selling some of his newly introduced fish variety Bangladesh (© Caritas Bangladesh 2014)

The people of Bangladesh are very fond of rice and fish. But due to decreasing and irregular precipitation during monsoon the production of fish is at risk especially in the north-western part of Bangladesh. Habir Uddin (45) lives in Gopinagar village of Naogaon district. Average rainfall of this area is only one third compared to the national average. Habir Uddin is a fisherman. He left school when he was in class five and sustains his family of seven members on merely 0.04 ha of pond adjacent of his home that relies on monsoon water influx. During the past 10 years his fish production was decreasing because his pond dried up earlier than before. Currently the monsoon water supplies his pond with water only from July to November. This makes farming his usual fish type, a carp species which takes 10 months to mature, impossible.

This was the starting point for the participation of Habir Uddin in smallholder farmers collective (SHFC) implemented with the support of the Strengthening Adaptive Farming in Bangladesh, India and Nepal (SAF-BIN) project in 2011. He attended different training courses, meetings and exposure visit on fish farming and crop production technologies for drought prone areas organized by SAF-BIN project. After receiving training, he continued searching for alternative options to raising fish in his pond that matures within a 4-5 months period. During a SHFC meeting in June 2014 Habir Uddin raised his problem. The SHFC members decided to set up an experimental fish trial in Habir Uddin's ponds.

The SAF-BIN project staff and sub-district level governmental Fishery Office supported these trials. SAF-BIN project arranged access to fingerlings of a short duration fish species, Spotfin Swamp Barb (Puntius sophore), from a model hatchery in Naogaon district.

Habir Uddin prepared his pond according to the suggestions of the Fisheries Extension Department and released 1000 Spotfin Swamp Barb fingerlings in his pond on July 23rd, 2014. He applied improved fish farming methods (e.g. supplementary food, netting after 15 days and use of cow dung).

> "NOW I AM CONFIDENT ENOUGH TO ARRANGE AT LEAST 5-6 MONTHS FOOD COST FROM MY POND. I WILL TAKE STEPS FOR SCALING-UP THIS TECHNOLOGY IN OUR LOCALITY"
>
> Habir Uddin, SAF-BIN project participant of Gopinagar, Naogaon district, Bangladesh)

Habir Uddin and community members during harvest of Spotfin Swamp Barb in Bangladesh (© Caritas Bangladesh 2014)

On December 2nd 2014, after just over 4 months, 104 kg of fish could be harvested. The family members consumed 10 kg and could sell the other 94kg to purchase rice and increase their food security. As mentioned in his above statement Habir Uddin is happy with the outcome of this farmer-led experiment and thankful for the support of Caritas Bangladesh and the SAF-BIN project.

Bountiful harvest of Spotfin Swamp Barb (© Caritas Bangladesh 2014)