Synthesis of Dryland Systems Innovation Platforms (IPs) Research across Flagships

Innovation platforms as vehicle to strengthen stakeholders' capacity to innovate for improved livelihoods in drylands in Asia and Sub Saharan Africa

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International Crops Research Institute for the Semi-Arid Tropics
2016

Food security and better livelihoods
for rural dryland communities

ACRONYMS

AFEC	AF Ecology Center
AFRI	Arid Forest Research Institute
ALUS	Alternate Land Use System
ARS	Agricultural Research Station
ATMA	Agricultural Technology Management Agency
BłAIF	Bhartiya Agro-Industries Foundation
CGIAR	Consultative Group on International Agricultural Research
CPR	Common Property Resources
CRIDA	Central Research Institute for Dryland Agriculture
FYM	Farm Yard Manure
GRAVIS	Gramin Vikas Vigyan Samiti
ICAR	Indian Council of Agricultural Research
ICRISAT	International Crops Research Institute for the Semi-Arid Tropics
ICT	Information and Communications Technology
IFS	Integrated Farming System
INM	Integrated Nutrient Management
IPM	Integrated Pest Management
IWMP	Integrated Watershed Management Program
KVK	Krishi Vigyan Kendra
MGNREGS	Mahatma Gandhi National Rural Employment Guarantee Scheme
MPTS	Multi-Purpose Tree Species
MSP	Minimum Support Price
NABARD	National Bank for Agriculture and Rural Development
NFP	National Forest Policy
NGO	Non-Governmental Organization
PPP	Public Private Partnership
PRA	Participatory Rural Appraisal
PRI	Panchayati Raj Institution
SAU	State Agricultural University
SC	Scheduled Caste
SHG	Self-Help Group
SRR	Seed Replacement Rate
VDC	Village Development Committee
SRSC	State Remote Sensing Center)
UASD	University of Agricultural Sciences- Dharwad
ANGRAU	Acharya NG Ranga Agricultural University
CORUS	Community Organising for Rural Upliftment Society, Kurnool
RSDS	Rupayan Social Development Society, Kurnool
SBMMAS	Shri Banashankari Mahila Mattu Makkala Abhivruddhi Samsthe, Bijapur
SURE	Society to Uplift Rural Economy, Barmer

Innovation platforms as vehicle to strengthen stakeholders' capacity to innovate for improved livelihoods in drylands in Asia and SSA

"In our interconnected world, drylands are important to us all for climatic, economic, and geopolitical reasons."
Gnacadja and Kjorven[1]

Introduction

Agriculture is the engine for poverty reduction and economic development in the developing nations. The sector employs over 50% of the population in South Asia (SA) and Sub Saharan Africa (SSA) and contributes significantly to their Gross Domestic Product (GDP) (McCullough, Pingali, and Stamoulis 2008). Majority of agricultural lands in these regions are drylands and vulnerable to droughts of various intensities. These threats are far more pronounced in the semiarid and arid regions. Globally drylands occupy some 6.09 billion ha, with a population of 2.1 billion people, nearly half of which are the poorest and most vulnerable and marginalized in the world (UN 2013). Despite the importance of dryland agriculture for the livelihood security of millions of rural people, the level of innovations and technological change in the sector continues to be slow and patchy. Access to and adoption of technologies and innovations remain very low resulting in low productivity, resource degradation and persistent poverty. Many developing countries are now working towards improving rural livelihoods of smallholder farmers. However, achieving this goal will require transforming the traditional top- down, technology-driven extension model to a more decentralized, farmer-led, and market-driven extension system.

Innovation has become a focus of dryland agriculture development and innovation systems are the centre piece of many development projects. These Innovation systems (IS) approaches emphasize the collective dimension of innovation pointing to the need to effect necessary linkages and interaction among multiple actors. IS thinking also pays attention to the co-evolution of innovation processes, arguing that successful innovation results from alignment of technical, social, institutional and organizational dimensions (Hall, 2005; Hall, 2007). These insights are increasingly informing interventions that focus on supporting multi-stakeholder arrangements such as innovation platforms (IPs) as mechanisms for enhancing agriculture innovations.

The CGIAR Research Program on Dryland Systems (CRP-DS) has adopted innovation systems approach to serve as a holistic, multidisciplinary and comprehensive framework for better coordination of innovation process emphasizing on wider stakeholder participation, linkages and institutional context of innovation and processes. The CRP-DS is a global agricultural research partnership to realize the potential of dryland communities. The program brings together eight CGIAR centers, and numerous international, regional, and national partners to engage in integrated agricultural systems research. Institutions for structuring and strengthening local initiatives, stakeholder convergence and inclusive value chains are important features of CRP-DS work. Facilitating and institutionalizing IPs has been a major component of CRP-DS integrated systems approach for enhancing resilience and sustainable intensification of smallholder farming systems for improving rural livelihoods.

For many years researchers have inclined to focus on particular aspects of dryland agriculture, such as crops or irrigation, rather than on the agro-ecosystem as a whole which ignored the synergies and conflicts that exist between the system components. The CRP-DS primarily targets the needs of smallholder farmers, agro pastoralists, pastoralists, and livestock producers. The program used IPs as

[1] Gnacadja, L. and Kjorven, O. 2011. Foreword. Page 7 in Middleton, N., Stringer, L., Goudie, A., Thomas, D. 2011. The Forgotten Billion. MDG Achievement in the Drylands. United Nations Development Programme, New York, USA and United Nations Convention to Combat Desertification, Bonn, Germany.

a means to enhance the technology innovation process by bringing together different stakeholders to achieve common goals and thereby contribute to the improved food security, equitable and sustainable natural resources management, and better livelihoods in the world's dry areas. Between 2013 and 2016, CRP-DS has established and operated more than 40 IPs in the 15 action sites that the program operated during this period. Through these inclusive, interdisciplinary and multi-stakeholder IPs as well as holistic systems analysis and participatory approaches, context specific dryland development options and pathways were being developed. Thus, the aim of IPs has been to create an enduring basis for identifying the key system drivers and developing end user preferred interventions that can bring about scalable livelihood improvements in drylands at local, national, and global levels.

IP approach though found very effective, has not yet been institutionalized in the local agricultural development process. While much emphasis in analysing agricultural innovation systems has focused on how these multi-stakeholder platforms are organized and mechanisms through which actors interact, there has been limited analysis that has unravelled how and why such platforms contribute to innovation processes and systemic change (Catherine et al., 2012).

Rationale

The challenges for smallholder women and men farmer livelihoods are multifaceted and need comprehensive solutions, especially in the drylands of Asia and Sub-Saharan Africa where agriculture plays an important role for individual farming families and economic development of rural communities. Living in marginal environments with frequent threats from climate variability and often depending on fragile soils, farmers are facing unprecedented difficulties to make their living, as their natural resource base is also dwindling, with superimposed pressure by climate change. At the same time, they often fail to capitalize on promising opportunities, e.g. to produce for the emerging urban markets with an increasing demand for quality nutritious foods such as pulses and meat. The interplay between external drivers, such as ecological factors, access to information and markets, political decisions, policies and power balances, as well as the internal conditions, like social and gender relations, distribution of knowledge and wealth can influence the ability of farmers to manage their resources and to respond to opportunities in a sustainable way. These factors can hinder farmers from moving up a development pathway, such that they remain stuck in poverty.

To address such complex situations research for development started to promote IPs as one approach to find innovative solutions. It is based on the recognition that as the challenges and the social, economic and environmental dimensions grow, researchers need to engage more actively with a wider spectrum of actors to find solutions context specific constraints. From a dryland systems perspective special consideration is on generating appropriate innovations (technical, social, institutional) for environments that are often marginal and remote, where farmers are often vulnerable and operate under high risk, and enable farmers to be proactive in order to capture existing opportunities.

A number of efforts have been made to facilitate IPs by CGIAR centers in the recent years. To address the problems faced by most complex dryland systems and vulnerable communities that are dependent on them, the CRP-DS initiated research for development activities with IPs as key component as its major flagship activities across regions. In CRP-DS the IPs were facilitated and promoted as vehicle to achieve increased resilience and sustainable agricultural intensification spurred by science and innovation with participation and contribution by all relevant stakeholders.

CRP-DS adopted IPs operated in diverse socio-economic environments and addressed wide ranging problems across the value chains with an overall aim to develop and promote strategies that can boost productivity, manage natural resources, improve value chains, and adapt to climate change. Some innovation platforms focused on single issues while others dealt with multiple aspects of the farm livelihoods. There are different types of IPs based on commodity or crop and value chains.

Several studies have tried to shed light on the performance of IPs by studying and revealing key processes and outcomes, but these studies are often based on external (mainly qualitative) assessments during mid-term and end of project evaluation (e.g. Schut et al., 2015; Swaans et al., 2014; Adekunle et al., 2012). In this study, we were interested in tracking the development of IP processes over time and how these are perceived by participants themselves, since this may explain participation and commitment of stakeholders and eventually contribute to the success of the IP.

Hence the present efforts as part of CGIAR research program on Dryland Systems attempts to achieve the following objectives.

- Enhance the understanding of different IP approaches in terms of process and framework, key drivers and sustainability of the business models.
- Ascertain the impacts of varying IP approaches.
- Document lessons learnt and way forward.

Experiences under CGIAR Research Program on Dryland Systems

With its roots in innovation systems theory, the Innovation Platform is the real world implementation of the concept. Is innovation a new way of interacting? Does it refer to new policies, or added value? Does it increase performance and generate positive impacts? And finally, does innovation only refer to research outputs, or can it also encompass processes? Debates surrounding these questions kicked-off in the Dryland System's workshop, which initiated a discussion on a framework to inform the development of innovation platforms for the CRP-DS (DS, 2014). Broadly, it was agreed that development innovations are the result of complex and unpredictable processes, which result from the cross-fertilization of different experiences and require a mix of technical, knowledge and organizational change.

Partnerships have been an important component for implementation of the CRP Dryland Systems. It involves diverse group of actors: Development agencies; Policymakers; NGOs; Farmers; Researchers; Input suppliers; CGIAR centres; National Agricultural Research Systems; Advanced Research Institutions; Civil Societies and Private Sector. A key requirement is to strengthen interaction among the different actors, organizing them in a way that solves common problems and helps them to effectively take advantage of opportunities. Related to this, an important challenge has been to find common interests and strategies that effectively facilitate positive interactions.

Generally speaking, the objective of the IPs is to catalyse agricultural innovations in the broadest sense of the word. The platforms were meant as the hubs for stimulating technical, organisational

and institutional innovations related primarily to the dryland system intensification and resilience building. Against this background the IP research was carried out in the five flagship regions as listed below:

South Asia (SA)

The Drylands of the South Asia region spans India, Pakistan and Afghanistan supporting more than 1.4 billion people which is one fifth of the World's population. These regions receive a low rainfall ranging from 150-670 mm per annum and are affected by frequent droughts, over exploitation of groundwater, water scarcity, deteriorating soil and water quality, low productivity, weak policies and institutions, malnutrition, continuously decreasing landholding size, low and unstable farm-based livelihoods, persistent poverty and a burgeoning population. Land degradation affects 65 million people across 465,000 km^2 in the region. Food security is dependent on the smallholder farming sector, 84% of landholdings are <2ha in India, which are becoming increasingly vulnerable due to increased climatic variability and market risk. Using limited water efficiently and effectively is the main challenge in this dry region. South Asia region has the highest prevalence of malnutrition in the world with 336 million people chronically hungry and over 46 percent in the children of 0-5 years suffering with malnutrition, Groundwater is a critical resource but, in many areas, has been overexploited. Water tables are declining and water quality is poor. Irrigating crops with poor quality groundwater is exacerbating soil salinization across all vulnerable dryland areas. In areas where there are opportunities to raise productivity and intensify production, the challenges are the shortage of labor and ever-shrinking landholdings which are difficult to mechanize.

Purpose

As part of CGIAR research program on Dryland Systems to boost dryland agriculture in South Asia, the International Crops Research Institute for the Semiarid Tropics (ICRISAT) with its partners facilitated development of multiple stakeholders innovation platforms (IPs) in three regions in India: Western Rajasthan (Jodhpur, Barmer and Jaisalmer districts), Karnataka (Bijapur district) and Andhra Pradesh (Anantpur and Kurnool districts). To speed up the whole research for development process in the regions, IPs establishment at local scale was considered as key implementation strategy. The overall objective was to create an enduring basis for structuring initiatives; for coordinating and bundling efforts; for setting up sustainable structures; and to help realise the sustainable implementation and subsequent impact of Dryland Systems Research on intensification and enhanced resilience of the dryland agricultural production systems and associated livelihoods. The IPs promoted was of two types;

i. IP targeting enhanced technology adoption for improved farming system resilience and associated livelihoods (IPTA)
ii. IP targeting the strengthened commodity value chain for improved farm livelihoods (IPVC)

Besides these two types of IPs, the institutional innovations such as village development committee (VDC), commodity linked women self-help groups (SHGs) and women sub-committee for common pasture management at village level were also facilitated as part of the innovation systems continuum.

Process

Establishment of the IPs was one of the key strategies to implement multi-disciplinary and systems approaches to promote sustainable cropping systems, natural resource management, appropriate crop-tree-livestock integration, gender empowerment and institutional innovations across value chains to enhance farm systems' resilience and sustainable intensification at village level in 15 locations across three action sites (provinces) in India and their scaling up.

The IPTA targeting enhanced technology/innovation adoption and farm system resilience were promoted in all three action sites (provinces): Rajasthan, Karnataka and Andhra Pradesh. The IPVC which targeted development and strengthening of promising value chains was facilitated only in one location in Western Rajasthan based on the felt need of the stakeholders.

Multiple institutions became active members of the IPs. The members include CG centers (ICRISAT, ICARDA, IWMI, ILRI, Bioversity, CIP), national research institutes working in the respective region (CAZRI, CRIDA, Arid Forestry Research Institute, State Remote Sensing Center), State Agricultural Universities (UASD-Bijapur, ANGRAU, Anantapuram), NGOs (GRAVIS, AFEC, CORUS, RSDS, SBMMAS, SURE), KVKs (Barmer, Jodhpur), Industry (Dabur India Ltd), State line departments of agriculture, horticulture, animal husbandry, watershed, rural development, fisheries and seed corporations, commercial banks, Farm science center (KVK) and farmers. The terms of reference -ToR (Annexure) was developed and agreed to by the members of each IP. The co-facilitators of the IPs were: CAZRI and GRAVIS in Rajasthan; UAS-Dharwad -Bijapur station in Karnataka, and ANGRAU regional research station in Anantapuram and NGO-AFEC in Andhra Pradesh. The value chain based IP on medicinal crop of shankhpushpi (*Convolvulus Pluricaulis*) was co-facilitated by KVK, Barmer and Dabur India limited. Besides one to one interactions, at least two IP workshops were organized every year with wider participation of the members.

Both the IPTA and IPVC in each case has had membership from the whole region/district. The institutional innovations facilitated at the village level such as village development committee (VDC), commodity linked women self-help groups (SHGs) and women sub-committee for common pasture management were not supposed to become parallel to existing democratically elected institution like 'village panchayat'. But all these committees/groups had an approval of the village panchayat and one of the executive members of the panchayat was ex-officio member of the VDC. Similarly proactive members of the old watershed committee or common pasture committee were encouraged to become member of the new groups. It was made sure that women were represented in all the committees and IPs.

Initiative and ownership

The process of facilitating the IPs started with characterization of farming and livelihood systems. In the beginning of the project, while analysing constraints and leverage points, and prioritization of potential interventions, the participants of the multiple-stakeholders consultations workshops were encouraged to discuss and propose the formation of IPs. During the workshop the project team had discussed the idea of innovation platform. Iterative discussions and participatory processes as illustrated in figure 1 and figure 2 led to the development and functionality of the IPs.

Structure

Multiple local stakeholders and international partners joined as members of each IPTA in three regions: Western Rajasthan (Jodhpur, Barmer and Jaisalmer), Karnataka (Bijapur) and Andhra Pradesh (Anantpur and Kurnool). The major partners are CG centers (ICRISAT, ICARDA, IWMI, ILRI, Bioversity, CIP); national research institutes (CAZRI, CRIDA, arid forestry research institute, state remote sensing center); state agricultural universities (UASD-Bijapur, ANGRAU, Anantpuram); NGOs (GRAVIS, AFEC, CORUS, RSDS, SBMMAS); farm science centers (KVKs)- Barmer and Jodhpur; Industry (Dabur India Ltd and Jain Irrigation Systems Pvt Ltd); related state line departments (e.g. agriculture, rural development, watershed/ irrigation, animal husbandry, seed corporations, horticulture, fisheries, etc.); banks and farmers. The terms of reference (ToR) was developed and agreed to by the members of each IP.

The co-facilitators of these IPs are CAZRI and GRAVIS in Rajasthan; UAS-Dharwad (Bijapur station) and SBMMAS in Karnataka and ANGRAU regional research station and AFEC in Anantapuram. The local facilitators (innovation brokers) in each case had the responsibility of organizing IP meetings and facilitate interactions among IP members. The cost of facilitation in terms of meetings and travel were sponsored by the CRP Dryland Systems project. However many government departments covered their travel cost.

In the IPVC on shankhpushpi (medicine herb) value chain, the shankhpuspi farmers, KVK- Barmer, Dabur India Limited (industry), GRAVIS, department of horticulture and ICRISAT were the key members of the innovation platform. KVK-Barmer and Dabur India Ltd were the co-facilitators of this IP. One development officer from Dabur, one staff of KVK and representative of the farmers group have the responsibility to facilitated interactions and coordinate the buying back process from farmers to Dabur India Ltd. The facilitation cost is now being shared by industry Dabur India Ltd and the CRP Dryland Systems project.

Innovation brokering

Multi-stakeholders innovation platforms (IP) are a unique approach bringing together stakeholders from across a wide range of sectors along the value chain, with complementing objectives and interests. The stakeholders include a mix from farming communities, NARS, policy-makers, NGO's and the private sector (Issa et al. 2015; Kumar et al. 2015; Rana et al. 2015; Sapna et al. 2015). But there are number of challenges when it comes to how everyday innovation capacity may be improved. How can a production base made up of many farmers organise its demand for knowledge, technology and organisational change? What mechanism will facilitate the search for information? Who will coordinate the networks of interaction needed for innovation? It was found that even when there were strong market incentives for players to collaborate for innovation, linkage formation was still extremely limited, World Bank (2006). How this could be achieved in practice? Who takes the facilitation/ brokering role to help coordinate multiple players and partnerships and linkages?

Presence of an appropriate IP facilitator/Innovation broker is critical for the success of an innovation platform. The facilitators of the IPTAs, for example in Rajasthan, the Central Arid Zone Research Institute (CAZRI) has an advantage of good credibility as an important government institute in the region and the local NGO- GRAVIS had a wide field presence through its number of ongoing projects in Western Rajasthan. For the institutional innovations at lower scale such as village development

committee (VDC), women self-help groups (SHGs) at village level, the NGO and associated Panchayat were the key facilitators. The major task of these local facilitators together with ICRISAT focussed on the following:

Articulating innovation needs and visions and corresponding demands in terms of technology, knowledge, funding, market and infrastructure. This was achieved through systems characterization and diagnosis, technology assessment and prioritization of context specific potential interventions using participatory and systems tools.

Forming networks: Facilitation of linkages between relevant actors through identifying, filtering, and sensitizing the potential members, and making them involve for possible cooperation (Howells, 2006). Initially many members including government departments were a passive and were not sure of the utility of joining the platform. They were encouraged to get involved and participate in the IP meetings/ workshops as well field visits and that led most of them becoming active member of the IPs. The platform was kept flexible; members were free to leave and propose collaboration among limited members.

Innovation process management: Enhancing alignment in the perspective of heterogeneous actors from different institutional backgrounds towards a common goal. This required continuous 'interface management' (Smits et al., 2004); preparing action plan, identifying and mentoring those taking leadership in the IP activities. It included a number of facilitation tasks that ensure that networks are sustained and become productive, e.g., through the building of trust, establishing working procedures, fostering learning for example by sharing live case studies on intensification of farming systems and encourage feedbacks and managing conflicts and equal opportunity to participate (Leeuwis, 2004). It was critically important that the local facilitators (individuals/ institutions) fully understand their role to facilitate interactions, linkages and synergies among members helping them to innovate to find solutions to their challenges.

Opportunity to provide and get feedbacks from different IP members on the usefulness and impact of the project/activities implemented by a particular IP member (department/institution/actor) and identifying synergies with the other stakeholders was the first attraction for different stakeholders to stay as member of the IP.

The role of *innovation broker (facilitator)* was very important in catalysing the innovation by bringing multiple actors together and facilitate their interactions. This facilitation has to continue until some of the IP members (local stakeholders) take that role. In South Asia none of the innovation brokers (facilitator) was a third party, but they were also part of the coalition undertaking research for development on contract or providing public service as also observed by Howell, 2006. The role of innovation broker was taken up more actively by one of the IP member in case of value chain based IP. In case of Shankhpushpi value chain based IP, the industry partner- Dabur India Limited played an active role as facilitator. It also coincided with their own business interest to ensure the quality produce and timely supply of the herb biomass to the industry. The farmers (producers group) also started complementing the facilitation efforts besides KVK.

Nevertheless in case of the IPs targeting enhanced technology/innovation adoption for enhancing farming systems resilience and income at regional level, it was difficult to get a willing IP member to take up the role of facilitator. None of the member (including government departments) had budget

allocation for innovation brokering or facilitation activity as part of their programs. These were the major challenges to enable IPs to play their useful role in nurturing and managing innovations.

Figure 1: Innovation platforms development process targeting agricultural technology adoptions and rural livelihoods improvement

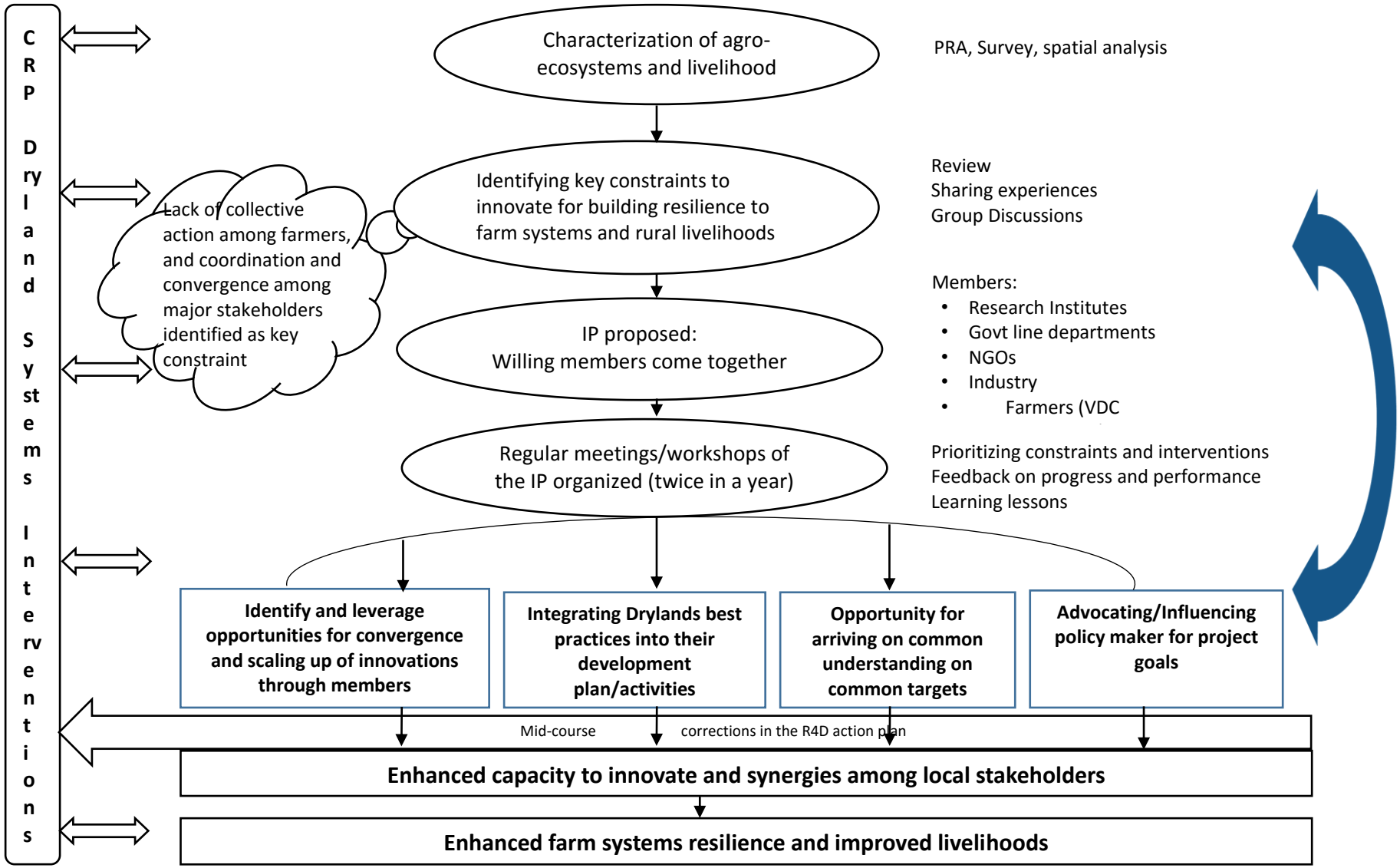
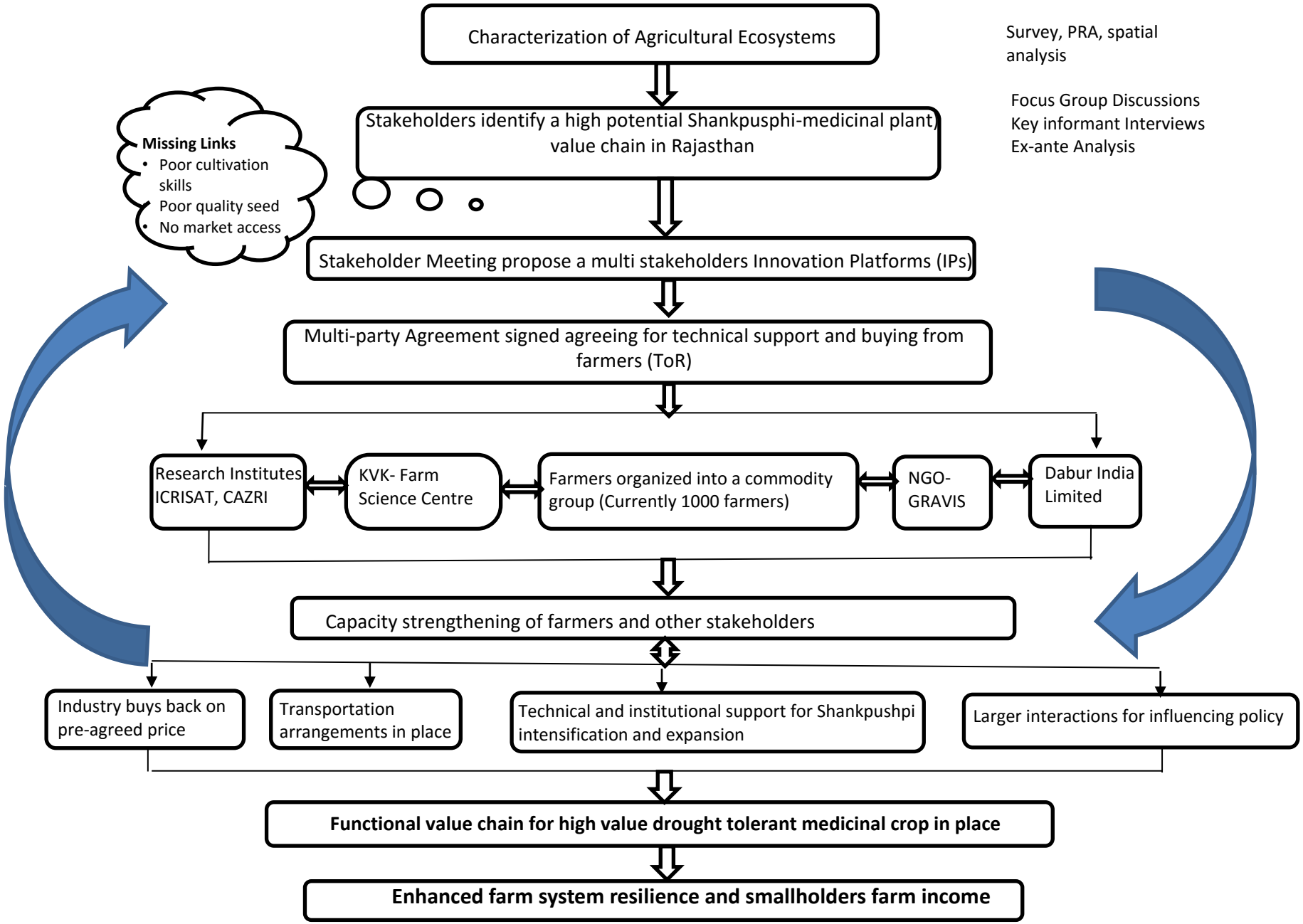


Figure 2: Innovation platform development process targeting value chain development-a case of medicinal herb in Rajasthan, India



Impact

The IPs typically included a mixture of farming communities, national research and extension systems, policy-makers, international and regional organizations, civil society and non-governmental organizations, the private sector, and development agencies. All of these are paramount to the identification and prioritization of the most relevant problems and constraints to be addressed, and to facilitate adoption of policy, technologies, and other innovations intended to improve food security and livelihoods in dryland systems. Furthermore, researchers got opportunity to work directly with local stakeholders to better understand and address the complex interactions between socioeconomic and biophysical components within dryland systems.

In this program ICRISAT along with partners' used multi-disciplinary and systems approaches to promote sustainable natural resource management, appropriate crop-tree-livestock integration and institutional innovations across value chains to build farm systems' resilience and sustainable intensification in 15 villages at three action sites (states). Nevertheless the proposed outcome remain the scaling up of innovations in the whole region in each of the action site.

The IPs in three regions have been involved in identifying, analysing and prioritizing constraints to respective agricultural livelihood systems; identifying leverage points and options, testing and refining various solutions, strengthening capacity and scaling up (http://www.icrisat.org/newsroom/latest-news/happenings/happenings1684.htm). During the IP meetings the progress of the CRP dryland systems activities in respective action sites was shared with the members with the view to take their feedback and explore opportunity of convergence to upscale the innovations. The IPs helped in concurrently (every year) integrating stakeholders understanding of the context and perspective on different interventions and modifying the project plan of activities and facilitate convergence with appropriate development actors/ departments. The major focus in Bijapur and Anantpuram was to identify context specific climate smart interventions and suitable short duration crops/cultivars to intensify kharif and post kharif fallows and harness the potential of green and blue water for agriculture. The IPs have helped in sensitizing the relevant stakeholders to converge for harnessing synergies in implementing different interventions for improving farm based livelihoods and ecosystems services. In Jodhpur IP meetings for western Rajasthan, a number of convergence opportunities were identified and planned to promote farm type specific interventions for sustainable intensification of arid farming systems through integrated approaches. Rajasthan Seeds Corporation, department of agriculture and horticulture proposed their specific activities on seed production, water harvesting and agro-horticulture as part of integrated farming systems development in the action villages in Jodhpur, Barmer and Jaisalmer districts.

The major contribution of the IPs may be summarized as given below:

- IPs became vehicle to effectively implement and co-design integrated farming systems for enhancing resilience and intensification of dryland farming systems.
- The IPs provided environment to diagnose problems, explore opportunities and find solutions benefiting from the integration of experience and perspective of different actors. The problem which individual members are not able to visualize and solve individually. It also provided diverse actors to come together and work for mutually desirable change using synergies. For example integrating drought tolerant arid fruit trees and sustainably managing degraded common silvo-pasture systems were the biggest challenges in western Rajasthan. The IP could facilitate bringing various actors like state departments of horticulture, watersheds, Panchayati raj & rural

development and the community. That helped in successful adoption of integrated farming systems considering value chains (including context specific cereals, legumes, arid horticulture, agro-forestry, medicinal plants and livestock as part of the farming systems) by more than 2000 farmers and improved silvo-pasture systems by three communities.

- It helped jointly innovate through learning by doing addressing constraints based on systems or value chain analysis and to identify priority entry points. For example one department (for example ATMA) has funds, but not the technical competence for stakeholders/farmers capacity building and the other departments (animal husbandry, horticulture, KVK) have technical competence and targets but insufficient funds. The IP helped jointly achieving the capacity development goals more effectively.
- It allowed non-linear collaborative interactions and relationship building among IP actors and fastened the process to technology and information dissemination. The brainstorming/ focussed discussions among researchers and development departments via IP not only found context specific solutions but also facilitated direct interactions/partnerships among most relevant institutions working for a specific activity.
- It significantly helped in sensitizing and strengthening the capacity of major stakeholders to look at the farming systems and implement various interventions with holistic/ multidisciplinary perspective targeting synergies and holistic solutions towards enhanced resilience and sustainable intensification of dryland systems.
- IP also contributed in strengthening institutional and technical capacity of its members through systematic experimental learning and sharing of best practices.

IPVC: The innovation platform emerged to support the promotion of production and marketing of a locally occurring medicinal herb shankhpushi in Barmer district of Rajasthan has had more visible impact. Identifying medicinal plants that grow wild in the region, motivating farmers to grow them as an intercrop that requires virtually no maintenance and linking them to a manufacturer of Ayurvedic (traditional Indian system of medicine) products has hugely benefited farmers. The profits earned by farmers who grew shankhpushpi (*Convolvulus pluricaulis*) had attracted other farmers. In 2014, 20 farmers in Barmer took up cultivation and next year in 2015, 250 farmers in five to six villages have joined them and later this number has increased to about 1000 farmers in Barmer and Jodhpur districts cultivating and marketing shankhpushpi. Currently shankhpushpi is sold at INR 24 (US$ 0.36) per kg and the seed is sold at INR 1,500-1,600 (US$ 22.7-24.2) per kg. A tripartite agreement with Dabur India Ltd, to buy back the produce is in place and technical backstopping in terms of training the farmers is being done by KVK, Barmer. Based on the feedback from Dabur India ltd, another medicinal plant jeevanti (*Leptadenia reticulata*) was introduced in 2016 and is being cultivated by about 25 farmers. Jeevanti is a climber and planted as an intercrop with fruit trees. A farmer can earn around INR 300-400 (US$ 4.5-6) per plant. Another medicinal plant arna (*Clerodendrum phlomidis*) which is a very drought hardy plant and was used for fencing and roofing now has a buyback rate of INR 15 (US$ 0.23) per kg. This initiative has not only benefitted the farmers but has also sensitized the policy makers. The Principal Secretary government of Rajasthan for the department related to herbal medicines was encouraged to visit the field sites and offered support to upscale (http://timesofindia.indiatimes.com/city/jaipur/Herb-cultivation-benefits-western-Rajasthan-farmers/articleshow/48417637.cms). Integration of high value medicinal crops with suitable market linkages as part of integrated farming systems has resulted in significant increase (more than double) in farm income for dryland farmers. Now >1000 farmers have been integrated into the shankhpushpi value chain and got additional annual benefit of INR 5000 to 45000 each. Now the state government has shown keen interest to upscale this initiative.

The village development committees (12 VDCs) and women livestock keepers' sub-committees for management of CPRs (4) were actively functional. They have played a key role in community mobilization, soliciting community's participation and own contribution for their project activities. The monthly meetings of the VDCs helped community to better understand the constraints and opportunities of the village system from farm to landscape especially the common property resources. It helped not only in promoting innovations for farming systems resilience and sustainable natural resource management, but also very useful in conflict resolutions among villagers.

Divisional commissioner representing 5 districts of western Rajasthan, who was present in IP meeting in May 2016, was impressed with the innovations in the project and committed cooperation on behalf of all the line departments of government of Rajasthan. The respective Joint Directors agriculture at Bijapur and Anantapur sought continuous engagement with programs CRP Dryland Systems and CRP CCAFS for upscaling climate smart innovations. The innovation platforms being facilitated as part of CRP Dryland Systems have given a common platform to the multiple stakeholders to harness synergies and find holistic solutions towards enhanced resilience and sustainable intensification of dryland systems (http://www.icrisat.org/newsroom/latest-news/happenings/happenings1693.htm#1).

Lessons learned

- The innovation platforms provided a common platform to the multiple relevant stakeholders to harness synergies and find holistic solutions towards enhanced resilience and sustainable intensification of dryland systems
- Integration of perspectives of different stakeholders enabled understanding the real constraints hindering creation and adoption of innovations, (in) ability of other actors and find joint cost effective solutions.
- Critical for upscaling was the acknowledgement of heterogeneity within communities and agro-ecosystems
- IPs were perceived to be critically important for the complex and diverse resource poor dryland systems especially for promoting integrated farming systems and sustainable management of common property resources.
- Market led IP formation creates quicker win-win scenarios compared to researcher led approach
- Members' acceptance and ownership was much quicker in case of IP around value chain development of high value commodities like medicinal plant and livestock.
- IPs helped in soliciting real participation of the stakeholders and creating ownership of the project activities. Consequently the implementation was led by community and other local development actors which resulted in greater innovation adoption and benefits.
- IPs made significant contribution to more equitable access to services and sharing of benefits among the different social groups.
- Ex-ante impact analysis was useful to inform on benefits to individuals households, community and development actors to prioritize context specific solutions. Understanding the incentives for individual members was very important to bring change.
- The iterative process is useful in enhancing capacity of stakeholders to achieve desired goals.
- The IP impact was much beyond agriculture. At village level it reduced social conflicts and encouraged villagers for collective action to find solutions for multiple challenges. At regional

level, it enabled the development actors/institutions to create synergies to address various development challenges.

- In a short period of two years IPs became functional and there was a change in behaviour and the way of interactions among the IP members working towards enhancing farming systems resilience and income. However the time was too short to influence the policy.
- More study is needed to get greater understanding on the drivers of systemic change. What makes individual players attitude change through IPs contributing to innovations, synergies and convergence?

Sustainability

The multiple stakeholders' innovation platforms (IPs) in three regions in India: Western Rajasthan (Jodhpur, Barmer and Jaisalmer districts), Karnataka (Bijapur district) and Andhra Pradesh (Anantpur and Kurnool districts) became functional in two years' time and had significant impact as discussed above. The role of innovation brokering and facilitation was critically important for the sustainability of the IPs. IPVC around medicinal herb which is a more compact group has largely become self-driven. The industry partner and the KVK, Barmer has been playing the role of innovation broker. Since the famers (1000) are spread over 70-80 km area and were able to make direct individual contact with IP facilitators, they have not yet become well organized into a group. A specific activity was planned to encourage formation of shakhpushpi farmers group. Currently the IP is sustainable even after withdrawal of ICRISAT as Dabur India Ltd and local KVK take care of the facilitation process. For long term sustainability, the shakhpushpi growers group has to take an active role in facilitation process. It has attracted the attention of policy makers. The process is on to include shankhpushpi cultivation and marketing into the priority list of the government of Rajasthan, which would enable greater public support.

The IP for technology adoption (IPTA): The IPs have considerably helped in changing the mind set of different R and D actors and encouraged interactions resulting in more collaborations and synergies. These IPs have much larger number of members compared to IPVC. For two years a small funding was available from the CRP Dryland Systems for supporting IP facilitation process. However there is no funding available for supporting the facilitation process after the CRP Dryland Systems project ends. The interactions and meeting among the members are continuing and creating synergies, but the frequency of formal IP meetings has decreased. A few government departments have resources that could be used for IP facilitation process, but a little push is still required. Practically two years period was sufficient only to demonstrate a proof of concept. At least two more years were needed to institutionalize the concept of IPTA into the local institutional set up at large scale (whole region).

East and Southern Africa (ESA)

Purpose

The overall focus of the work in ESA is on identifying, evaluating and promoting interventions for sustainable intensification of smallholder agricultural systems in the Marsabit-Yebello-East Shewa action transect in East Africa and in Chinyanja Triangle action site in Southern Africa. As a part of this, three IPs, two in Chinyanja Triangle in southern Africa and one in East Shewa, Ethiopia, were

established and facilitated. These IPs are intended to develop models for sustainable intensification by bringing together relevant stakeholders to plan and work collaboratively by identifying, testing and promoting locally relevant interventions with greater end-user acceptability.

Structure

As indicated above, three IPs were established at the action site level to address key challenges facing sustainable intensification through collective action under widely differing socio-economic and bio-physical conditions by involving a diverse group of stakeholders. Each IP has its own set of objectives depending on the identified challenges across the production to consumption value chains of the commodities relevant for the IP target areas. The initial participation in the IPs is mostly voluntary with likeminded people from research and developmental organizations discussing and identifying key problems and opportunities for sustainable intensification of smallholder agriculture in their respective areas. These discussions are also aimed at identifying a range of potential stakeholders with skills and knowledge to contribute and advance the mission of the IP. The experiences indicate that use of commodity value chains as the main framework is extremely helpful in identifying the constraints and opportunities and in planning the interventions more systematically and efficiently.

Engaging the identified players is the most important but difficult step in the process of setting up an IP, since many of the stakeholders have their own programs and interests and any diversion of their attention from the objectives and targets set for their own programs is often considered as a potential disturbance to their ongoing work. To ensure full participation of all stakeholders, the IP activities must align with priorities and activities of their own organizations. It is also important to ensure that the institutions are recognized and given the lead role for implementing the activities that align well or form part of the institute's official mandate. Hence, a proper structure with well-defined roles and responsibilities becomes an important pre-requisite for active and sustained engagement of various stakeholders. Developing and agreeing upon a structure that is effective, efficient and acceptable to all partners is therefore a key step in the formation and successful operation of IPs.

Since the IPs operated in the region were set up to achieve different goals under different socio-economic environments, each IP has adopted a unique structure that suited well for its operations. In general, IPs were formed with representatives from research, not for profit government and non-government developmental organizations, commercial private sector organizations and farmers and other beneficiaries with one of the organizations taking the coordinating role. Since most of these IPs are formed by research organizations, they took the coordination role during the initial phase. However, the same is transferred to more relevant institution once formal agreements between the IP partners have been reached about the key activities that the IP will be implementing and role various participating institutions have agreed to play. In most instances the coordinating role is taken by the beneficiary group such as farmers or the group that supports farmers like agricultural extension.

The organizational structure that the IPs have adopted follows the type of activities that the IPs have identified to achieve the overall goal. The role of research is limited to providing technical backstopping and capacity building to target groups. The non-governmental organizations are largely

responsible for initiatives such as resource conservation and development. For example, in Ethiopia one of the activities that the IP has taken up is rehabilitation of 150 ha degraded hill slope and the same is coordinated by an NGO with support from EIAR (Ethiopian Institute of Agricultural Research) and Adamitullu Research Center of Oromia Agricultural Research Institute (OARI) and Department of Agriculture. The NGOs played the key role of organizing the communities and developing and implementing bylaws and operating procedures while the research institutions have identified the locally relevant tree species for planting along the hill slope. The department of agriculture which has the mandate to support the reforestation program produced and availed the required seedlings. Similar groups were formed to promote water harvesting and irrigation, greater access to credit through thrift programs and by linking with micro-finance companies, enhancing productivity and profitability of the systems through promotion of improved technologies and providing access to inputs and improved access to output markets by forming trading groups and promoting open auction.

While the IP structure in the initial stages was found to be more informal and need based, they started developing into more formal organizations. Some of the IPs are now registered and have legal status. These IPs have adopted an organizational structure with some or all of the following roles.

- President with a role to preside all IP meetings and represent the IP in its dealings with other organizations or people
- Vice-President performing the duties of President in his or her absence and assisting as needed
- Secretary with a responsibility for all correspondence including recording of minutes of the meetings and communicating
- Treasurer with the responsibility for the finances

Process and impacts

The three IPs, two in Chinyanja Triangle (CT) and one in East Shewa action site, that were formed in 2014 to facilitate sustainable intensification were further strengthened with various research for development activities. Key benefits observed include better coordination and cooperation among the partners leading to faster decision making, more efficient utilization of resources, improved access to quality extension services, stronger links to partners such as local governments and financial institutions for timely financial and technical support, improved marketing to realise better prices and increased effectiveness of the investments by participating organizations.

The development goal of Marara, Tete, CT, IP was to promote market oriented livestock production for improved income and that of Manica was to facilitate crop livestock integration and commercialization of common beans. At both locations, farmers acknowledged progress made in promoting food feed crop technologies, but considered that available options in fodder technology, market development and links to buyers is insufficient. With interventions targeted at these limitations, farmers were able to achieve increased production by expanding area under cultivation and by increasing yields mainly through improved soil fertility and crop management, realize better prices by assembling and selling common beans collectively and improved livestock and draft power through better animal feed management. The collective efforts have also attracted new partners and additional support that included training by FAO on post-harvest management and by CARITAS on sustainable agriculture and sanitation and support by ODEMA to build grain storage facilities. The

Manica IP influenced about 1500 other non IP farmers to adopt improved technologies. The Adamitullu IP, East Shewa, Ethiopia was able to bring together ten different organizations to collectively plan and implement a diverse set of interventions aimed at increasing production and profitability while conserving resources. Through the collective actions, nearly 300 farmers in two kebeles were benefitted by increasing their farm productivity through use of improved crop varieties, increased cropping intensity, more efficient soil fertility management, better use of rainwater by harvesting runoff into farm ponds and using the same efficiently for vegetable production using drip irrigation system, greater access to credit through micro financing companies and through establishment of women thrift groups and better management of common areas through tree planting and area enclosures.

The Adamitullu IP with a focus on sustainable intensification considered three key intervention areas viz., better conservation and utilization of available resources, achieving greater productivity and profitability and generating more income. A number of interventions that contribute to achieve the same were identified, tested and promoted by involving relevant stakeholders through IPs. Among the interventions identified and promoted include intensification of the system with legumes especially with pigeonpea as intercrop, promote irrigation through construction of farm ponds to harvest runoff water with help from Bureau of Agriculture, Government of Ethiopia, introduce and demonstrate the potential of drip irrigation systems to grow vegetable and other high values crops with assistance from an NGO iDE (International Development Enterprises), promoting use of improved varieties of haricot beans by establishing a revolving seed system, enhancing investments by providing access to credit from a micro-finance company to buy inputs and services and common property development work with tree plantation and area enclosure programmes.

One important aspect of the IPs is that all interventions taken up for promotion or further testing and validation were identified through a critical discussion on advantages and disadvantages during the IP meetings. Based on the IP deliberations, the identified options are grouped under three categories – interventions that are readily available for promotion, interventions that need some adaptation to suit local conditions and interventions that need additional research. The readily available options such as improved varieties, water harvesting and small scale irrigation, afforestation, area enclosure and common property management and thrift and credit programs were taken up by the Government and non-government developmental agencies for promotion while those that require adaptation such as intercropping with pigeonpea, screening of potential new crops such as chickpea, mungbean and cowpea for their productive potential and identifying mechanization options for timely conduct of operations were taken up by the research organizations for further refinement to meet local requirements.

In Marara, Tete, interventions were selected based on the resource status and ability of the farmers to take risk. A basket of 6 crops was evaluated by 30 farmers as dual purpose crops for producing fodder for dry season feeding of livestock while achieving food security under variable climatic conditions. Resource poor farmers preferred more drought tolerant food crops and preferred to combine sorghum with food legumes, whereas the better-off farmers with cattle went for maize, fodder and dual-purpose legumes. For all crops, farmers observed the benefits of improved crop management that included early planting, use of higher seed densities, and use of improved early maturing varieties. Farmers appreciated especially the short duration sorghum, groundnut and cowpea varieties for their drought resistance. Pigeonpea was introduced as a new crop. Few livestock keepers opted to intercrop maize with pigeonpea which provided good quality biomass as

fodder for livestock while contributing to the increased maize yields. Intercropping was identified as critical soil fertility management option since availability of manure is constrained by the free grazing of livestock and the cost of inorganic fertilizer is prohibitive for many smallholder farmers. However, pest and disease threats remain a major challenge when legumes are promoted. In Manica, farmers were benefitted by the commercialization efforts of common beans (Phaseolus vulgaris L.). Through demonstrations by 30 farmers who are also members of the IP , greater awareness about the direct and indirect benefits from integration of the systems with legume crops (common beans and mucuna) was created. The positive synergies with crop and livestock integration, reduced dependence on external inputs along with draft power management are mostly responsible for the observed increase in the productivity and profitability of common beans.

In addition to these direct benefits, the operation of IPs has generated a number of other benefits that include change in attitude, demonstration of benefits from collective actions in the production and marketing and equity in access to and distribution of benefits from the adopted interventions. It is expected that the full impacts of these will be realized over the next two years.

Lessons learned

- IPs with relevant stakeholders serve as excellent venues to collectively identify challenges and opportunities that reflect the realities and to co-create practical solutions
- IPS serve as an important mechanism to create awareness and stimulate actors to take actions and have contributed to a clear change in mind-sets of those involved
- IPs encourage stakeholders to take ownership of planned activities and ensure their success generating more benefits in short time
- IPs motivate the partners to pool their resources and work together to achieve more than what they can achieve in isolation. This made it possible to promote diverse set of innovations aimed at conserving natural resources, diversification and intensification of farming systems, collective marketing, better use of common properties and promoting income generating activities as one single program
- IPs made significant contribution to more equitable access to services and sharing of benefits among the gender groups
- Tools are being developed for stakeholder network analyses, participatory pathways development, group dynamic interventions that enhance innovation, market orientation and collaboration for market oriented crop livestock systems
- This is a short period (24 months) and requires more time to reach a tipping point in the shift in mind sets and spread the results to other regions

Sustainability

IPs are basically a multi-stakeholder platform created to address a specific challenge. The need for the IP is expected go down once it achieves the goals set for its operations. However, in many instances collective action becomes an integral part of the solution developed by the IP. In this case continuation of the IP in one form or the other becomes very much essential to realize the benefits continually and sustainably. However, the form and composition of these IPs can be substantially different from the original. In most instances, the IPs after successfully addressing the challenges and setting up a viable and profitable system were found to be transformed into commodity oriented user groups focused on production at scale and collective marketing. Such groups transform themselves into a more formal organization or a legal entity with a proper structure and well established guidelines and by laws for its operations. The likelihood of these organizations to remain in operation for a long time is high mainly because they are created from the ground up, commitment and ownership of the participants who have collectively been responsible for the development, access to quality services and positive economic benefits

West Africa Sahel and the Dry Savannas (WAS&DS)

Purpose

Farming communities struggle with drought, soil erosion, and poor infrastructure. Poverty and a lack of support services make things worse. Cropped areas are expanding and pastures are shrinking, making pastoral and agro-pastoral livelihoods less viable (Dryland Systems Annual Report, 2014). In innovation platforms in Mali and Ghana, work helps farmers increase crop yields and diversify production into vegetables. The interventions were carried out in agropastoral and rainfed systems.

Process

Agro-pastoral interventions: With an objective to understand the process on how can research (ers) in innovation platforms contribute in engaging crop-livestock stakeholders in mixed –farming systems of the semi-arid tropics of West Africa, five innovation platform meetings were initiated by the International Crop Research Institute for Semi-Arid Tropics (ICRISAT) together with national research institutes: Centre for Dryland Agriculture, Bayero University, Nigeria and Institute National de Recherche Agronomique du Niger between February to October, 2014. The trans boundary transect between Nigeria and Niger called as Katsina Kano and Maradi (KKM) five villages was purposively selected as action site. Research and innovation platforms can engage stakeholders for a win –win situation. Demand driven research strengthens innovation platforms: researchers work is better informed, more systematic and more authentic. Researchers help in understanding in the Innovation platforms challenges faced by different stakeholders, through diagnostic exercises, visioning, and needs assessment. Platforms strengthen research by feedback so that it is more likely to be adopted. Researchers contribute to innovation platforms through traditional research, b) by knowledge management and action research; c) enabling environment; d) network brokering and mobilizing funds. However, researchers face constraints associated with innovation platforms

sustainability because of fixed budgets, staff time and resources. For sustainability of innovation platforms it should be governed locally (Sapna Jarial etal, 2015).

Rainfed System interventions: The major focus was to improve agricultural productivity, benefit sharing (equity, gender and youth) of WASDS intensive rain-fed systems whilst minimize agriculture-induced land degradation and climate-driven vulnerability. The specific objective was to promote the current regional science-policy platforms to catalyze systems change towards sustainable intensification and reduced vulnerability. Methods used were participatory development of partnership models for technological transfers. Technologies and practices promoted were ranked by smallholder community representatives involved in 2 district-level Transformative Scenario Planning (TSP) processes initiated at Lawra and Koutiala and other preferred technologies and practices were identified by TSP stakeholders.

Impact

The district-level platform organized capacity strengthening and awareness building on national agricultural policy instrument directly involving about 1,294 men and 1,098 women with specific focus on climate change adaptation.

Finally district-level science-policy platforms initially focused on climate change adaptation would be influencing national policy design in the larger context of agricultural intensification and vulnerability reduction in the long run. Stakeholders and scale actors would collaborate to visualize coordinated pathways for agricultural intensification across the entire transect. This leads to improved stakeholders' understanding of national agricultural policy instruments (and their strengths and weaknesses).

It was demonstrated that how research (ers) in innovation platforms can contribute in engaging crop-livestock stakeholders in mixed –farming systems. A main implication of the project was that Innovation platforms are worthwhile ideas in mixed (Jarial et.al., 2015) context because positive change can engage stakeholders for a win –win situation. Innovation platforms can be instrumental for need based- context fit quality research for development and are dependent on need and motivations of stakeholders.

A key policy issue is the sustainability of innovation platforms as mechanisms for enhancing innovation requires funding, planning and institutional structures and procedures. This points to the need to monitor management of researcher managed innovation through innovation platforms. This work also highlights the role of researchers' in bridging knowledge gaps, capacity strengthening and broker of innovation. However there was a need of number of areas for future research such as: strengthening value chain interaction, role of communication in innovation platforms for effectiveness and costs of operating innovation platforms (efficiency) and sustainability of Innovation Platforms. The future research should investigate how to monitor management of innovation through researcher managed -innovation platforms vis-a vis local governance and further should investigate whether and how different ways of monitoring can be combined to satisfy the needs of both donors of innovation platform and its stakeholders.

Overall reflections

IPs are increasingly seen as a promising vehicle for agricultural innovation in developing countries (Kilelu et al., 2013; Swaans et al., 2014). They are important mechanisms for stimulating and coordinating interactions in innovation systems and are seen as a promising vehicle to foster a paradigm shift in agricultural research for development (Schut, et al., 2015). Platform as intermediaries provide the spaces to experiment with different ways of aligning technological and institutional dimensions that are necessary for successful innovation. That reduces transactions cost and opens up new opportunities. The dynamic nature of innovation processes point towards seeing platforms as dynamic evolving networks instead of static structures. Having a better insight how platforms co-evolve with innovation processes, and vice versa, may give insights on how to optimize platforms in terms of composition and governance. This would be the subject for future work.

Sustainability

The challenges facing agricultural development, particularly in developing countries dominated by smallholder farming are increasingly framed in the context of weak innovation systems and capacities in the growing literature on agricultural innovation systems (Kilelu et.al, 2012). Innovation systems (IS) approaches emphasize the collective dimension of innovation pointing to the need to effect necessary linkages and interaction among multiple actors. IS thinking also pays attention to the co-evolution of innovation processes, arguing that successful innovation results from alignment of technical, social, institutional and organizational dimensions. These insights are increasingly informing interventions that focus on supporting multi-stakeholder arrangements such as innovation platforms as mechanisms for enhancing agriculture innovation.

Most of the literature on the sustainability component of IPs even though in the initial stages were extensively studied in African context (Martey et.al., 2014; Cullen et.al, 2013; Enuku et al, 2013; Hounkonnou et.al, 2012; Paassen et.al, 2014; Schut et.al, 2014 and Sanyang et.al, 2016) while very few studies were undertaken in other parts of the world (Swaans et. al, 2014). The studies mainly projected on the establishment, participation, processes and arrangement of various multi-stakeholders and understanding the dynamic nature of IPs in the area of agricultural value chains, food systems, and natural resource management. The detailed understanding resulting in the sustainability and its long term impact on the smallholder dryland agriculture is yet to be realized.

Sustainability of IPs is influenced by power dynamics that in turn impacts platform processes for inclusive innovation. Findings suggest that while IPs may achieve some short-term success in creating spaces for wider participation in decision-making processes, they may be significantly influenced by forms of power which may not always be visible or easily challenged (Cullen et.al, 2013).Sustainability element has also been attributed to lack of incentives, innovative institutional governance structures and policy processes to accelerate uptake and utilization of IPs (Enuku et.al, 2013). One of the constraints mentioned is also about the mobilization of multi stakeholders/actors and their success is limited in contentious environments (van Paassen, 2014).

Various authors have identified the potential relevance of innovation system approaches for inclusive innovation, with a specific focus on the marginalized poor (Swaans et.al, 2014). The studies (Swaans et.al, 2014) also emphasized on the importance of social organization, representation, and incentives to ensure a ‘true’ participatory innovation process, which is based on demand and

embedded in the context. Critical to this is a flexible planning process stimulating incremental change through so-called innovation bundles (i.e. combinations of technological, organizational, and institutional innovations) and reflexive learning (systematically challenging constraining factors). Furthermore, local institutions embedded in norms and values are crucial to understand people's decisions. Due to weak linkages between value chain actors, innovation brokers have a vital role in facilitating the innovation process (Swaans et.al, 2014).

Our experience as part of CRP Dryland Systems found that the presence of a pro-active innovation broker/ facilitator (individual/organization/collective group), potential incentives for every member and commonality of the purpose were the key drivers for sustainability of the IPs. Greater and quick incentives for shakhpushpi growers as well as herbal company (Dabur) in the IPVC, made it more acceptable and sustainable as compared to IPTA. The sustainability of IPTA was more challenging. Though the members of IPTA had a common agenda of enhancing farming systems resilience and sustainable intensification, but still the individual members had diverse goals and the context (diverse farm activities for different farm types) was more dynamic in the face of increased climatic variability. Every situation might need different type of arrangements. Overall, IPs are a promising model for inclusive innovation, but they require a careful assessment of and adjustment to the institutional context.

Moving Forward

The Integrated Agricultural Research for Development (IAR4D) approach that promotes enhanced engagement of relevant stakeholders in participatory action research is central to the design, testing and evaluation of agricultural technologies as well as for scaling up and out of promising technologies (Hall et al., 2003; Adekunle et al., 2012). The necessity of engaging other stakeholders apart from researchers is driven by the realization that innovation does not arise only from a simple process of transferring knowledge from research to end-users but necessitates a process of interaction and learning from diverse sources whereby the agricultural research organizations are part of a much larger constellation of knowledge producers (Hall et al., 2003). The emphasis of the collective nature of innovation is the core of the agricultural innovation systems framework (Lundvall, 2011; Spielman et al., 2011; Hounkonnou et al., 2012; Kilelu et al., 2013; Schut et al., 2015). The innovation systems framework stresses that innovation occurs through the collective interplay among many actors including farmers, researchers, extension officers, service providers, NGOs and private sector. It has to be emphasized that innovations are not just about technology but also include social and institutional change (Leeuwis and van de Ban, 2004).

IP is an example of the operationalization of the innovation system framework in practice (Nederlof et al., 2011; Swaans et al., 2014). They enhance agricultural innovation by providing space for interaction among relevant actors for knowledge exchange and learning (Homann-Kee Tui et al., 2013). According to Hounkonnou et al. (2012), an IP is a multi-actor configuration deliberately set up to facilitate and undertake various activities around identified agricultural innovation challenges and opportunities, at different levels in agricultural systems (e.g. village, country, sector or value chain). The configuration of IPs varies according to the theme, sector and value chains or commodities covered (for example crop, livestock, natural resource management). There is also variation in terms of status, formalization and modes of communication, which in most cases are through organization of regular meetings (Nederlof et al., 2011; Homann-Kee Tui et al., 2013). At the local level, the IP

shapes, monitors and evaluates the action research on the ground and serves as a mechanism for adapting to changes, for learning, and capacity building of actors to access and use relevant knowledge (Pali and Swaans, 2013; Kumar et al., 2016). Local level IPs can facilitate information exchange and knowledge among actors, as well as the coordination and integration of the activities being implemented by various agencies and promote a better understanding among main players. In addition, IPs at community level serve to reduce tendencies of conflict, build trust, promote joint action implementation and provide opportunities and mechanisms for need-based capacity building of relevant actors (Hall et al., 2003; Pali and Swaans, 2013; Swaans et al., 2014; Kumar et al. 2016).

The underlying hypothesis here is that IPs can achieve changes that none of its members could have achieved on their own. At the production end, IPs can facilitate linkages between farmers, input providers, government extension services and researchers. In support of this, the sub-Saharan Africa FARA Challenge Programme reported in its assessment of 32 multi-stakeholder platforms in eleven countries in Africa that IP-served communities had more linkages with external actors than those without (Adekunle et al., 2012). For IPs to be "networking for innovation", there is need for different actors to have a shared vision, well-established linkages and information flows, conducive incentives for cooperation, market opportunities and conducive legislative and policy environments (Klerkx et al., 2012). The benefits of platform participation should be visible to encourage active engagements of the stakeholders over time (Boogaard et al., 2013).

The successful 'proof of concept' of IP need to ensure that the local actors (government extension services/private sector/farmers group) has the prominent role as an innovation broker/ facilitator with provision of small budget for facilitation. It could be possible to trigger such policy and institutional changes through pilots, ex-ante impact assessment, capacity strengthening and informing and influencing policy makers. In the country like India which has a vast set up for extension services by the union and provincial governments supported by private sector and civil society organization, it would be appropriate that government extension departments take the lead to facilitate IPs for technology adoption in each district. But the capacity strengthening of extension services on IP approaches and reforms in the institutional set up of the government extension department would be a pre-requisite. However to promote the commodity value chain based IPs the other actors like private sector and NGOs could play the role of innovation broker or facilitator.

One of the challenges of IP is systematic monitoring and evaluation (M&E) of its key processes and outcomes (Klerkx et al., 2012). To address this challenge, a host of approaches have been developed to monitor and evaluate the activities of IPs using both quantitative and qualitative methods (van Mierlo et al., 2010; Pali and Swaans, 2013; Cadilhon, 2013). Unlike result-oriented monitoring and evaluation (M&E) which is often applied in evaluating results against pre-defined objectives and indicators, the approach to monitor and evaluate IP activities should be more flexible, participatory, and reflexive as IPs interact and affect the environment within which they operate (van Mierlo et al., 2010).

The IPs could play an important role in SSA where technology-driven productivity growth has largely failed. It is well documented that the development of an enabling institutional context was a necessary condition that preceded the phenomenal productivity growth in industrial and Green Revolution countries (Hounkonnou et al., 2012). Such a context is mostly present for successful SSA export crop production, but that the context is pervasively biased against SSA's smallholder food

production. The innovation platforms could play an important intermediary role in stimulating and influencing innovation processes. That could shape co-evolutionary processes, fostering institutional and organizational innovation, which have been indicated as the main limitations facing smallholders in SSA (Hounkonnou et al., 2012).

The platforms intermediates in building and organizing the processes, such innovation processes cannot be managed or the direction controlled (Hekkert & Negro, 2009 ; Hall & Clark, 2010 ; Klerkx et al., 2010; Leeuwis & Aarts, 2011). Various tensions that emerge point to the unpredictability of innovation processes, which cannot be managed as expected in platforms. While these tensions can potentially open windows of opportunity for new innovation. It is a challenge that how the platform embedded learning and feedback processes to re-align with emerging issues. Innovation processes are dynamic and thus require an adaptive and flexible approach to steering such processes. The policy-makers can embrace new pathways to development when they see positive impacts on beneficiary communities, even if those impacts are localized. IPs are increasingly being mainstreamed in agricultural development programs and projects and policy-makers and their advisers at local and national levels especially in SSA are increasingly familiar with the use of IPs as a pathway for agricultural R&D that promises to impact the livelihoods of the poor and vulnerable. For example, in parts of Burkina Faso, Sierra Leone, and The Gambia, where IPs had positive impacts on stakeholder relationships, attitudes, and behaviour, as well as on livelihoods of poor rural households, policy-makers at local, regional and, to some extent national levels, engaged and started to mainstream IPs in projects, programs, strategies, and policy frameworks (Sanyang et al, 2015). The intensity of interactions and relationships among IP actors convinced them that social capital is a powerful tool for fomenting organizational, institutional, and technological innovation.

The impacts of innovation platforms, such as 'innovation capacity' are intangible and hard to quantify. There is often a time lag between a platform's activities and its impact and many actors are involved, each perhaps claiming success and making attribution difficult. It is also hard to separate the effects of a platform: has farmers' income been increased by the platform or by something else? It should also be noted that every platform is different with different players and as such benefits may vary.

That the IP is a powerful tool for promoting agricultural development is suggested by Hall, Sivamoha, Clark, Taylor, and Bockett (2001); Ekboir and Parellada (2001); Clark (2002);Watts et al. (2003), and Hounkonnou et al. (2012). It has been demonstrated that innovation platforms are important mechanisms for stimulating and coordinating interactions in innovation systems. Platform as intermediaries provide the spaces to experiment with different ways of aligning technological and institutional dimensions that are necessary for successful innovation (Kilelu et.al, 2012). The dynamic nature of innovation processes point towards seeing platforms as dynamic evolving networks instead of static structures. Having a better insight how platforms co-evolve with innovation processes, and vice versa, may give insights on how to optimize platforms in terms of composition and governance. A key concern is whether IPs in AR4D challenge or reinforce existing technology-oriented agricultural innovation paradigms. For example, stakeholder representation, facilitation and institutional embedding determine to a large extent whether the IP can strengthen systemic capacity to innovate that can lead to real paradigm change, or are merely 'old wine in new bottles' and a continuation of 'business as usual'. Institutional embedding of IPs and – more broadly – the transition from technology-oriented to system-oriented AR4D approaches requires structural changes in organizational mandates, incentives, procedures and funding, as well as investments in

exchange of experiences, learning and capacity development. Understanding these concerns, more research is needed to gain more in-depth insights.

Table 1: How different IPs are placed in terms of process/framework, key drivers and sustainability

Region	Innovation platforms	Members	Framework used	Key drivers	Sustainability/ stage of the IP
South Asia (Rajasthan)	Integrated Systems Approaches for Improving Agricultural Livelihoods in an Arid Ecoregion of Western Rajasthan	State line departments of agriculture, horticulture, animal husbandry, watershed, rural development, fisheries and seed corporations, commercial banks, KVK , NGOs and farmers (village development committee) and R & D institutions	Common platform enabling co-creation of solutions for enhancing resilience and intensification of farm systems, integrating multiple perspectives, synergies and convergence	• Champion innovation broker/ facilitator • High demand for integrated farming system development • High frequency of drought • Challenge to address high climate and market risk	• Fully functional and effective during project period (2 yrs) • The process is on through informal meetings and interactions • Local extension services need to take up the role of facilitation with budget provision for the activity.
South Asia (Rajasthan)	Development of medicinal plant (Shankhpushpi) value chain in Western Rajasthan for enhancing farm systems' resilience and income	Dabur India Ltd, KVK, Shankhpushpi growers, NGO and R & D institutions	• Linking producer to industry with strengthening technical skills and knowledge on market attributes • Pre-agreed prices for the products • Farmers free to choose market	• High potential of increased household farm income • Assured market • Participatory demonstrations	• IPVC is functioning well with about 1000 farmers participating directly. • Post project facilitation has been taken up by industry member and KVK.
South Asia (Karnataka)	Systems Approaches for Improving Agricultural Livelihoods in dry district of Bijapur	District government departments of agriculture, horticulture, animal husbandry, watershed, rural development, fisheries and seed corporations, commercial banks, KVK, NGOs and farmers (village development committee) and R & D institutions	Common platform enabling co-creation of solutions for enhancing resilience and intensification of farm systems, integrating multiple perspectives, synergies and convergence	• Champion innovation broker/ facilitator • High awareness on the benefits of convergence • Challenge to address high climate and market risk	• Fully functional and effective during project period (2 yrs) • The process is on through informal meetings and interactions • Local extension services need to take up the role of facilitation with budget provision for the activity.
South Asia (Andhra Pradesh)	Integrated Systems Approaches for enhancing resilience and sustainable agricultural intensification in Anantapur district	State line departments of agriculture, horticulture, animal husbandry, watershed, rural development, fisheries and seed corporations, commercial banks, KVK NGOs and farmers (village	Common platform enabling co-creation of solutions for enhancing resilience and intensification of farm systems, integrating multiple perspectives, synergies and	• High demand for integrated f arming system development • Frequent adverse impacts of climatic variability	• Fully functional and effective during project period (2 yrs) • The process is on through informal meetings and interactions • Local extension services need

		development committee) and R & D institutions	convergence	• Challenge to address high climate and market risk	to take up the role of facilitation with budget provision for the activity.
ESA	Improving livestock markets	Government departments crops and livestock, IIAM, Total land care (NGO),	• Improving marketplace institutions • Improving infrastructure facilities • Improving access to markets • Improving information flow and confidence in markets Providing access to credible information	• Addressing a challenge that lead to substantial benefits • High market volatility • Fodder shortage and poor feeding habits	• The IP is functional and continue to operate on its own • The IP has a formal structure and organization • Farmers are taking he lead role with support by extension department
WCA	Engaging crop-livestock stakeholders in mixed – farming systems	Government departments crops and livestock, research institutes, NGOs	• Common platform enabling co-creation and assessment of solutions for enhancing resilience and intensification of farm systems, integrating multiple perspectives, synergies and convergence	• Champion innovation broker/ facilitator • High awareness on the benefits of convergence	• IP was functional and effective during project period (2 yrs) • The process is on through informal meetings and interactions

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RESEARCH PROGRAM ON
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The CGIAR Research Program on Dryland Systems aims to improve the lives of 1.6 billion people and mitigate land and resource degradation in 3 billion hectares covering the world's dry areas.

Dryland Systems engages in integrated agricultural systems research to address key socioeconomic and biophysical constraints that affect food security, equitable and sustainable land and natural resource management, and the livelihoods of poor and marginalized dryland communities. The program unifies eight CGIAR Centers and uses unique partnership platforms to bind together scientific research results with the skills and capacities of national agricultural research systems (NARS), advanced research institutes (ARIs), non-governmental and civil society organizations, the private sector, and other actors to test and develop practical innovative solutions for rural dryland communities.

The program is led by the International Center for Agricultural Research in the Dry Areas (ICARDA), a member of the CGIAR Consortium. CGIAR is a global agriculture research partnership for a food secure future.

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