Agricultural Research & Technology
Open Access Journal
ISSN: 2471-6774

Juniper Publishers
key to the Researchers

Research Article
Volume 19 Issue 3 - January 2019
DOI: 10.19080/ARTOAJ.2019.19.556093

Agri Res & Tech: Open Access J

Innovation Platform - As Effective Extension Approach to Introduce Rhizobia Technology in Southern Ethiopia

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Submission: October 09, 2018, **Published:** January 11, 2019

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Abstract

Conventional research and technology transfer approaches have been dominated by top-down and linear approaches, where technologies are extended from research to extension and then to farmers. Innovation platform (IP) are established to solve bottleneck of linear approaches as well as increase innovative capacity of small holder farmers and chain actors. Rhizobia are sound environment-friendly organisms that fix nitrogen from the atmosphere in legume. This decrease the dependence on chemical nitrogen fertilizer and leading to sustainable production. The use of effective rhizobia strains of inoculants in nitrogen deficient soils have potential benefits that producers are advised seriously to inoculate their crops. To thus, local innovation platform was established to introduce rhizobia inoculants. The objective of this paper is testing local level innovation platform as tool of extension approach for technology development, dissemination and improve innovative capacity of smallholder farmers. The results show that it is better than conventional extension approaches with high trust in between stakeholders, strong information exchanges and empowerment of poor farmers. I conclude that well established Innovation platform had be resulted to increase innovative capacity of smallholder farmers.

Keywords: Rhizobia; Environment; Rhizobia inoculants; Sustainable production; Smallholder farmers; Nitrogen fertilizer

Abbreviations: IP: Innovation Platform; CADU: Chillalo Agricultural Development Unit; WADU: Wolaita Agricultural Development Unit; MPP: Minimum Package Programme Approach; PADEP: Peasant Agricultural Development Extension Project; T&V: Training & Visit; NEIP: National Extension Intervention Programme; PADETS: Participatory Demonstration and Extension Training System; MoA: Ministry of Agriculture; ADPLACs: Agriculture Development Partners Linkage Advisory Councils; FPR: Farmer Participatory Approaches

Introduction

Conventional research and technology transfer approaches have been dominated by top-down and linear approaches, where technologies are extended from research to extension and then to farmers. Teaching of farmers about "best practices" developed by researchers, with no or low participation of farmers in their identification or development. Unfortunately, this often resulted to low adoption of new technologies [1], even widely accepted participatory research and development methods which emerged in the 1980s as innovative methodology is still failing to understand or take full account of farmers socio economic priorities [2], involvement of institutional and police decision [3]. This linear transfer of technology' approach or 'Diffusion of Innovations' [4], become bottleneck for research and development; shifting towards "systems thinking. Innovation platforms are inclusive, equitable, dynamic spaces designed to bring heterogeneous actors together to exchange knowledge and take action to solve a common problem. The key issue is bring all stockholder to innovate within the entire system and or solving of problems on spot for the benefit of stakeholders [1,5]. There are numerous technologies are produced and developed in research centers. The use of these technologies was very low due to lack of strong technology dissemination approach [1].

To solve the problem of adoption of new technology, innovation platforms are increasingly used for research and development initiatives as vehicles to bring stakeholders together as a platform or coordinate activities by individual members [6,7]. a network configuration as agriculture extension approach. It is a space for learning and change. equitable, dynamic spaces designed to bring heterogeneous actors together to exchange knowledge and take action to solve a common problem [8]; with different backgrounds and interests [6]. The members come together for the purpose of defining, analyzing and prioritizing agricultural problems, and exploring, designing, implementing and monitoring agricultural innovations to deal with these problems [7]. In doing so, Platform aims to fostering agricultural innovation by facilitating the interaction and collaboration within

networks of stakeholders. The nature can be both technological as well as institutional or a combination of these. It also divides innovation for productivity [9]; natural resource management and approach for institutional change. It integrates scientific and local knowledge in innovations that can have impact at scale [9,10]. The approach use mix of a group representatives from different actors via a participatory process [6,11]. The representatives of farmers' associations, cooperatives, traders, agro-processors, agro dealers, researchers, extension workers, NGOs, and government policy makers are meet regularly, articulate their views, and negotiate joint strategies for action [12,13]. In Ethiopia, experimentation with innovation platforms began with the start of value chain development projects [14].

Low soil fertility is of major problem in Ethiopia. Major nutrients N, P, and K with low organic matter conversation extraverted the problem [15]. In addition, continuous cultivation without replacement of nutrients [16]. Use of fertilizers to replenish soil nutrients is one of the major ways of counter balancing the low soil fertility [17], but the nutrients applied in mineral fertilizers by the smallholder farmers remain low due to high price [15,18]. The negative effect in production and application to soil are critical for environment [19]. Legumes are attractive environment-friendly crop fix atmospheric nitrogen through symbiotic relationship with soil microbes, Rhizobium [20]. Rhizobium inoculation is the way of improving legume crop nitrogen fixation ability and then resulted to improvement of soil fertility [21]. Generally, accredited for stimulating growth and reduce cost of inorganic nitrogen fertilizers. The use of appropriate rhizobial strains in nitrogen deficient soils have potential agronomic benefits that producers are advised to seriously [21-23]. The overall objectives the study was to test local level innovation platform as extension approach for technology development, dissemination and improve innovative capacity of farmers.

Methodology

The sites

The study area is located in Southern Nations, nationalities, and People's Region (SNNPR) approximately 285 km south of Addis Ababa in the Rift Valley in Hawella Tula Sub City Administration of Hawassa City, which represent humid lands of SNNPRS of Ethiopia. The area is characterized by semi-highlands, with very small average farmland in well-known inset based agro-forestry farming system.

The rhizobium strain isolated from Ethiopia and tested in laboratory and experimental field condition in the SOILMAN project were introduced for common bean and soy bean [24]. The inoculants that are prepared in Finland by Elomestari Ltd Company with selected strains named as HAMBI 3556 (HBR5), HAMBI3562 (HBR10) and HAMBI3570 (HBR53) for haricot bean and HAMBI (TAL379), HAMBI3513 (SBR2B) and HAMBI3520 (SBR8B) for soy bean was given to IP members. Half of recommended NPS fertilizer were used in planting time.

Data analysis

The collected data were analyzed using statically software stata 12. Quantitative data will be used to see what change happen in perception of farmers in knowledge and their innovative capacity. Qualitative information used to compare with the past extension tools and activities of the farmers.

Framework of the study

Survey was carried in two kebele with randomly selected 60 households at 2014. Four focus group discussion were made to collect primary data by using structural interview. Visiting of each interview farmer field to observe their farms. Husband and wife from each household were participated in interview and in focus group discussion. Similarly, the selection and assigning of facilitator from Hawassa University who have experienced in different project. Partners were selected based on the lower implementation level (Woreda and kebele- the lowest political administrative units).

one of the existed type of network s are one to five cell which mostly used for political control of farmers are large number of "cell" is not easy to manage. Therefore, this forced to platform process design and initiative taking to establish new innovation platform. Continuous discussion with farmers and extension agents we agree to work on the inoculants technologies. Establishing of innovation platform was the entry points to adaptation, dissemination and evaluation of technologies that was alternative way of extension approach. Farmers training center were used as experiment site for mother trail to test the effectiveness of technologies with and without of inoculants and chemical fertilizer. In addition, farmers were participated by using in their own farm continuously and refine innovations with their socio economic condition.

Through the process – testing and feed-back loops the new technology can be integrated into the farming system . The IP activity itself is expected to influence other aspects in society than farming, through the new networks, modes of communication and capacity of participants it creates. These new assets in turn may reflect back on the activity of the Innovation Platform, through strengthened innovation capacity, making it a reflexive innovation process stated by André et al. [25]. The framework builds on innovation systems thinking. Scientists and partnering stakeholders jointly design and implement experiments under real-life conditions. Experimental design, inputs needed, implementation mechanisms, monitoring and analytical methods are chosen jointly, and the criteria and indicators for assessing results are devised jointly. The innovation itself is reviewed in the beginning to assess whether it should be tested as it is or experimented with in a revised form, considering local realities. Once the results are available, these are analyzed together to make a decision whether or not the innovation is found suitable by fellow the innovation approach [26]. The framework was basically modified from Shut et al. [27], that shows flow diagram to support decision-making in Figure 1.

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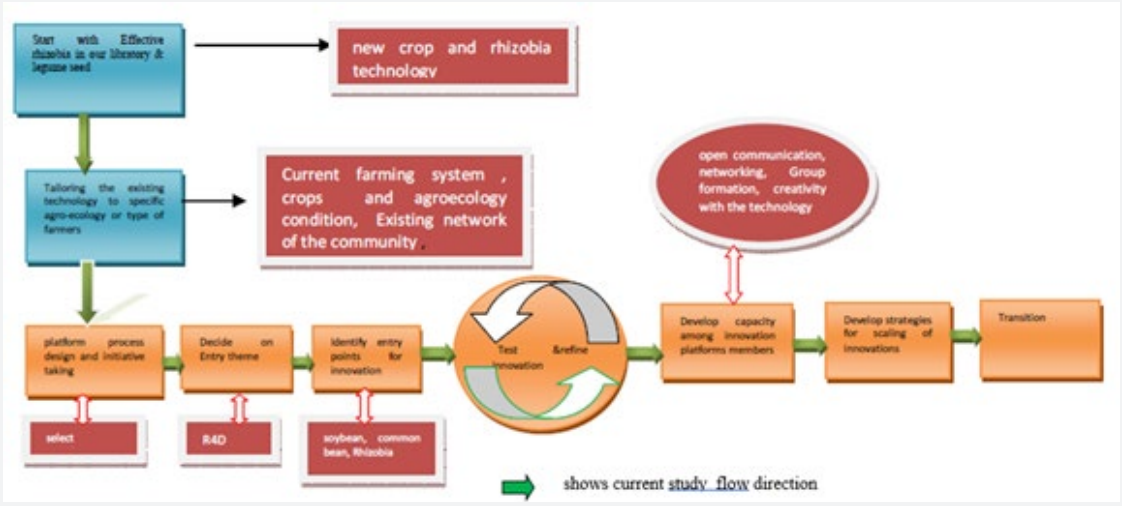

Figure 1: Flow diagram to support decision-making adapted from Schut et al. [27].

Literature Review

Definition of terms

Innovation: There are numerous definition for innovation in different literature. Innovation is a social process by which knowledge is created, diffused, accessed, adapted, and, most critically, put into use in economically and socially significant ways [6,10,28,29]. Innovation is about coming up with a better process, creating a new product, improving an existing one, opening a new market, finding a new source of supply or a creating a better way to organize ourselves. Innovation is about what's new and what's next. It's about that exciting leap forward into uncharted territory. Innovation is also about what works better. It's about that incremental step forward that makes old ideas new again and repurposes the familiar into the unexpected. Innovation whether small or incremental, large or disruptive is about change. Innovation is applying the idea under real-life conditions. The other most important definition is new information introduced in to and utilized in an economic or social process [13,30,31]. Innovation combine 'hardware' e.g. technologies such as new seed varieties, and 'software' e.g. a seed multiplication system that requires new social organizational arrangements [29], and new combinations of existing knowledge [13]. So, innovations may be technical, organizational, institutional, managerial, related to service delivery or policy.

What is innovation platform (IP)?

Definition of IPs: A forum for learning, action and change involving a group of actors with different backgrounds and interests [5,7,10,32,33], but also space for negotiation, conflict and dealing with power dynamics [34]. Innovation platform (IP) is like a cooking pot to which the actors involved jointly contribute to problem diagnosis, identification of opportunities, coordination, experimenting, learning and implementing of ideas to address problems in a value chain [35].

Innovation system

The term 'innovation system' reflects a framework for working that recognizes the range of research and non-research, public and private actors involved in the process of creating, adapting and putting into use information and technology for socially and economically useful purposes [1,6], with the institutions and policies that affect their behavior and performance [1]. A group of organizations and individuals involved in the generation, diffusion, adaptation and use of new knowledge and the context that governs the way these interactions and processes take place is called an innovation system [36].

Agricultural extension

There is no single definition of extension which is universally accepted or which is applicable to all situations. Extension is an informal educational process directed toward the rural population. This process offers advice and information to solve their problems. Extension is concerned not just with physical and economic achievements but also with the development of the rural people themselves. Extension is a process of working with rural people in order to improve their livelihoods. According to the World Bank extension is defined as a "process that helps farmers become aware of improved technologies and adopt them in order to improve their efficiency, income and welfare" [37]. It serves "a service of information, knowledge and skill development to enhance adoption of improved agricultural technologies and facilitation of linkages with other institutional support services. Anderson [38], defines the terms agricultural extension and advisory services as "the entire set of organizations that support and facilitate people engaged in agricultural production to solve problems and to obtain information, skills and technologies to improve their livelihoods"

History of Agricultural Extension system in Ethiopia

Agricultural extension works in Ethiopia began in 1931 with the establishment of the Ambo Agricultural School and the first

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agricultural high school offering general education with a major emphasis on agriculture [39]. However, a formal extension was started only after the establishment of the Alemaya College of Agriculture. Extension is underway in the country for over 70 years. Over this period, several developments as well as extension approaches were employed side by side [39]. The 'comprehensive package' approach was introduced in 1967 by projects such as Chillalo Agricultural Development Unit (CADU) and Wolaita Agricultural Development Unit (WADU), which were funded by the World Bank. It was succeeded by the minimum package programme approach (MPP) and the Peasant Agricultural Development Extension Project (PADEP), which used the Training & Visit (T&V) method of extension.

Current extension strategy is determined by the National Extension Intervention Programme (NEIP), which aims to ensure food self-sufficiency, while the present approach, known as the Participatory Demonstration and Extension Training System (PADETS), combines elements of the previous T & V system with the Sasakawa Global 2000 approach. The system is becoming more pluralistic, the public extension program remains a huge, centrally-managed bureaucracy.

Ethiopia's approach to extension centers on a 'pull' based Participatory Training Extension System, with extension teams that have reached one third of farmers [40]. In 2008, under the leadership of the Ministry of Agriculture (MoA), new institutional arrangements known as Agriculture Development Partners Linkage Advisory Councils (ADPLACs) have been established at different levels to promote alignment and collaboration among the major stakeholders in the agricultural sector. The ADPLAC, as a multi-stakeholder platform, consists of layered linkages: national, regional, zonal and district level platforms. The MoA acts as a central coordinating body that facilitates linkages and communications across the different levels. The common features of most of the extension models are focusing on transfer of technology that was generated from the research systems, top-down, state managed, based on donor funding, address the agricultural production system.

The link of Innovation platform and agricultural extension

Extension programs were originally conceived as a service to "extend" research-based knowledge to the rural sector in order to improve the lives of farmers. The traditional view of extension was very much focused on increasing production, improving yields, training farmers, and transferring technology. Today's understanding of extension goes beyond technology transfer to facilitation, beyond training to learning, and includes helping farmers form groups, deal with marketing issues, and partner with a broad range of service providers and other agencies. It can be a set of organizations that support people engaged in agricultural production and facilitate their efforts to solve problems; link to markets and information [27,41,42], integral and central to innovation systems and that focuses on facilitating interaction and learning rather than solely on training farmers [43]. The service needs to embrace linkage facilitation through collective actions and multi-stakeholder platforms as key function, and extension staff need to have appropriate set of skills and competencies [44,45], are the key similarity with innovation platform. Schut et al. [27]. Perhaps the most important purpose for extension is to bring about the empowerment of farmers. Extension provide the information and services needed and demanded by farmers and other actors in rural settings in developing their own technical, organizational, and management skills and practices [46], and promoting new technologies or new ways of managing crops and farms by linking farmers in the innovation system [27,41,45]. Similarly, Innovation platforms enhance empowerments of stakeholders through dealing with the opportunity and the way of treating problems in the value chain.

In the begging of extension, Scientists were considered as the innovators and farmers were recognize as target audience with the goal always being to improve productivity of a single commodity. In the 1970s, Farming Systems perspective aimed at understanding constraints faced by the farmer while the scientific input was interdisciplinary, and the work was conducted on-farm. Farmers were consulted, but scientists remained as the key source of knowledge and innovation. In 1990s farmer participatory approaches (FPR) was coming with scientists and farmers as co-creators of new knowledge was directly relevant to the farmers' livelihoods. The new approach recognized the importance of farmer engagement in the knowledge development process but failed to recognize institutional constraints and the usefulness of multiple actors besides the technologies. Towards the end of the 1990s, the innovation Systems Approach and its actualization through Innovation Platforms was introduced. This approach unlike FPR includes institutions and policies which are regarded as major obstacles to adoption of improved methods [45].

Extension communication and adoption of innovation

Communication play a key role in innovation and extension. Transfer of technology or diffusion of new information to user needs appropriate communication method for successful relationships to share knowledge [47]. In participatory action research greater knowledge sharing through communication have encouraged and gave them more confidence in the technology adoption and liking with markets. Despite the advent of modern information and communication technologies, face-to-face discussions and physical visits have been recognized as success factors in building stable relationships [48,49]. with their own shortages. Effective and frequent communication, including physical visits, was shown to have a direct positive impact on relationship [50,51], but reaches very few farmers. thirteen different types of communication tools were used Africa rising project in Ethiopia [13] respectively. The use of different tools may have result better adoption rate.

Rogers and Shoemaker [52], have identified five basic attributes of innovations, which contribute to different rate of adoption. The five attributes are: Relative Advantages, Compatibility, Complexity,

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Trialability and Absorbability: which the results of an innovation are visible to others. The easier it is for an individual to "see" the results of an innovation, the more likely he is to adopt it [53]. Similarly, factors that affecting adoption as nature of innovation and Other factors are presented in Table 1.

Table 1: Factors influencing adoption [39].

Nature of innovation	Other factors Influencing Adoption			
	Personal Factors	Socio-economic Factors	Psychological Factors	Other Factors
productivity	Age	Caste	Aspirations	Culture
Stability	Income	Education	Risk orientation	Values
Sustainability	Extension participation	Social- participation	Economic motivation	Farm Size
Economic viability	Knowledge	Socio-economic stats	Cosmopolite	Farm income
Operational feasibility	Local leadership	Formal groups	Attitudes	Farm power
Matching Farmer's Needs				
Marketability				

According to Chopeva et al. [54], adoption factors have been generally divided in motivating, de-motivating and social-demographic characteristics. The group of factors motivating the agricultural innovation includes receiving of higher yields; profit; Time saving; lower pollution and nature protection. Similarly, unfavorable geography and alleviate disadvantageous economic conditions motivate to adopt technologies. The group of demotivating factors having negative impact on the decision for innovations are financial, market, lack of necessary information and social-psychological factors that unwillingness for risk taking and Lack of necessary qualification and skills (Table 2).

Table 2: Socio economics of IP members and their family.

	Criteria	No	%		Criteria	No	%
Education of HHs	Illiterate	197	46.5721	No of Households	M	204	48.22695
	1-4	112	26.47754		F	219	51.77305
	5-8	67	15.83924	Fam size of HHs	Less than 0.5 ha		35
	9-12	28	6.619385		0.5 to 1.0 ha		41.67
	10+1	11	2.600473		1.0 to 2.0 ha		13.33
	10+2	5	1.182033		2.0 ha &above		10
	10+3	3	0.70922	Average Animals own	cow	2	17.4
	BSc	0	0		Oxen	1	8.7
	MSc	0	0		Aquein	0.3	2.6
Age of HHs	>5	93	21.98582		Politury	5	43.5
	6-20	132	31.20567		Sheep	1.2	10.4
	20-35	91	21.513		Goat	2	17.4
	35-60	88	20.80378	Major income of HHds	Farm	56	93.33333
	>60	19	4.491726		off farm	4	6.666667

Results and Discussion

Socioeconomic characteristics of IP members

The average land holding was 0.8 hectare with minimum of 0.2 to maximum of 3 hectare of land total 77% having one hectare or less. Most of the household are illiterate especially old aged group. Almost half of population was under 20 years. The livelihoods of interviewer are based on agriculture production both crop and livestock expect 6.6% have get income from of farm activities (Table 2). In our data the mean household size is 6.6 persons, ranging from two to 11. The mean number of children is 3.4.

Effectiveness of the model (process design and facilitation)

Stakeholder analysis is critical to identify key actors and their roles. It can also help identify who might create barriers and who might act as mediators. This helps ensure that the right people are included from the start. The result of baseline survey was identified their problems and possible opportunities in study sites. A window of opportunity to introduce rhizobia inoculants for haricot bean and soybean was identified and agree with farmers to establish IP. Platform process design and initiative were introduced the rhizobia technology in the farming system, Inoculants and improved seeds were used as an entry points to assure smooth and effective engagement with communities and institutions. The technology was new for the study area. The absence of tailoring network was enforced to participatory action research for developing. The woreda agricultural office support the work and themes were identified. This process results 90% of members built their trust in between the stakeholders, arouse their interest and keep their spirits high. This agree with Justice and

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Wünscher [45], states that farmers have the capacity to innovate, experiment and adapt, and are viewed primarily as innovators themselves rather than implementers of innovation. The selected stakeholders had been meeting every month to develop future action plan of IP to share the role and responsibilities. Both wife and husband were participated in the meeting and knowledge workshop. Continuous discussion with farmers in every stage and testing of the rhizobia in FTC with rhizobia alone, rhizobia and half NPS fertilizer, fertilizer alone and without any input as demonstration mother trail.

A facilitator must be neutral and objective to work with all, and accountable to the platform chairing of meetings; following activities, ensuring that commitments are taken seriously, that promises are kept, and that the platform is moving towards achieving its objectives. To these facilitators were equipped with competences, time, and financial resources to do their job. The facilitator invite IP member at least once in month for meeting, Any problem that was happen in past time will rise and discussed. In discussion some question may solve by informing one to other at spot. Different organization and their experts invites to participate and respond those questions that are raised on specific activities. This address specific issues with concerned stakeholders and will also facilitate innovation processes. The facilitator invites those Soil Scientist and Nutritionist at planting and after harvest to train them how to use inoculants and soy bean recipes preparation respectively. The nutrition training was given for women farmers and health extension agents of the kebele. Similarly, plant protection expert and marketing expert are invited to give training in control of pest and alternative market for collective products by establishing primary cooperative respectively. The result shows almost 90 % of respondents perceive high trust in between farmers and Extension agents. The result agree with Lamer et al. [55], shows that the composition of the Innovation Platform may differ during the different platform phases and functions [42]. The result shows that facilitation increases trust in between stakeholders, stimulate and support stakeholders to work as a self-organized and self-managed group. Development agents skills were improved to facilitation and well understood the linkage of extension for innovation platform. The result shows that extension workers were motivated to participate. The results imply that extension workers were primarily motivated by purposive benefits to achieve their organization's goal. This agree with study Mamusha and Beamlak [42], shows that facilitation appears to be a key function of extension services in Ethiopia and that extension agents need to have a set of skills to facilitate interactions and learning among farmers, service providers, and processing and marketing actors.

IP study shows that farmers are motivated to participate in meeting and exchange of information. Almost 94% are participated during planting and final evaluation. The farmers were motivated to participate 46, 25, 20 and 9 percent by social, material (input), economic and both social and material benefits. This also agree with Schut et al. [56], shows that material benefits, economic benefits, social benefits, or by both two or more benefits. This results to Improve interaction, knowledge & information flow [10]. The conflict may arise after one year of implementation of the project by farmers to include in to IP members by those who are leading one to five Hiwassi (cell) team (organized as development network team by government).

The performance of BNF innovation platform

The interest of farmers to use rhizobia for common bean or soybean are the key points for the performance of innovation platform. Different wealth status, education level and age groups are participated in IP; half of them are women's, and 70% of them are poor and 23% young people's below age 35. To address this problem agronomic practices that improve soil fertility status, increase food security and minimize shocks of climate change were included by inviting those responsible organization. Market is not a key issue in case of this IP. Improving the Productivity of lands is taken as core to deal with farmers in innovation platform. Farmers had be seen the potential nodules in their plots and FTC when the crop starts flowering and seed setting. Farmers perception is higher in the number of pods per plant and number of seed per pod with bigger grain size of inoculated legumes. Generally farmers perception for the use of this best strain to increase both biomass and grain yield accepted unless the loose of yield by drought occurrence in the main season. The result agree with Mwangi and Kariuki [57], reveled that widen the range of variables used by including perception of farmers towards new technology. According to Ayse et al. [58] age, education level, and income level of the farmers, operational goal of the farm, participation in extension studies, making use of mass media means and benefitting from agricultural incentives were influential on the adoption of innovations to a great extent.

Dealing with IP members about suitable place time and day for meeting helps to participate without absent. Participatory approach with matrix ranking were used to identify constraints and opportunities and possible solutions. Additional, demonstration of inoculants effect by trial and error method, and exchange of the information through discussion. Different stakeholders with diversity of knowledge sources accessed and used by IP members [6].

Facilitation of the platform were carried by technology transfer expert of Hawassa University, selection is based on past experience in rural development works and well known of the language and culture of the farming community. The result of study implies that actual, respect norms and culture create mutual respect with constructive interaction. The result agree with Schuet et al. [27], shows that documentation and learning systems that provide continuous and short-term feedback can contribute to better understanding of platform performance and what actually contributes to the IP's impact [6,10].

Resources or time allocated by different actors to IP related actions and activities including meeting, training and cross field visits of IP members supported through project. The creation of

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knowledge and skill to innovate in their farm and together were the output of IP. Some farmers are interested to innovate by testing the effectiveness of inoculants, use of ash for cutworm protection and intercropping of soybean in their farming system. The most common constraint within two seasons was the observation of low soil fertility in some of our farmers field may reduce the effectiveness of rhizobia inoculants (pink color maize and weak performance of common bean). The soil test result of the study shows that plant available phosphorus in the soil was very critical problem in the areas than any other nutrients (Appendix 1). Cutworm damages the newly emerged seedling may solved by application of ash surrounding stem of bean were sharing of knowledge by one another farmers and protection expert. Lack of enough support from extension agents may result to some farmers left their land for weed infestation. Soybean as new crops for the area were not easy to integrate even, they aware of importance because of open land shortage. Occurrence of drought in 2015 was the most devastate effect on crop yield and also effectiveness of inoculants. Some farmers have rising a risk of fair on the supply system of inoculants that agricultural office had not reach with the rhizobia when the project stop to delivery. The interest of farmers to participate in IP was the performance of legumes inoculated with rhizobia and the information sharing by IP members for outsiders that attracts to use the technology.

The farm household intervention did not measure actual biomass or yield, but rather focused on the farmers' subjective view regarding the effectiveness of the technology. One of the questions asked in the post-intervention survey was whether yields had increased, stayed the same or decreased compared to two years prior. Forty-two percent of the respondents reported smaller yields, the main reason being drought. This is not surprising as the year 2016 was particularly dry in Ethiopia with devastating effects on large areas, although Sidama was not one of the worst affected areas. However, a clear difference in responses could be seen between the respondents who had been part of the IP and those who had not. Eighty-eight percent of those who reported smaller yields had not been part of the IP, while 71% of those reporting higher yields had been participants. Out of all IP members 60% reported higher yields. These responses likely reflect the result of the technology itself, but it also reveals a positive and optimistic attitude among IP participants, suggesting that the IP experience was a positive one. Part of the technology offered to IP participants was growing soybean, which was new to the area. In the post-intervention survey 34% of respondents reported changes in the crops they grew, most had started planting soybean. Interestingly three households not part of the IP also reported growing soybean. This indicates that the information from the IP has spread in the community. This suggests the IP may have an impact for the wider community, rather than being limited to participants. The result agree with EGWU and Williams [59], shows recent innovations are highly profitable, superior an simple to understand and should be compatible with the existing values, norms, past experience and needs of farmers have easily adopted. Dusengemungu et al. [60], increased production, productivity and incomes are core to food security. The IP was a mechanism for developing value chains that provided incentives and means for access to and adoption of technologies for increasing productivity. In recent times, IPs are being facilitated as a strategic tool by researchers and/or extensionists for the dissemination and adoption of new technologies. A well organized IP can effectively coordinate production and marketing activities to upgrade food value chains and make them more productive [10,35].

The soil analysis data and crop symptom in farmers field shows that phosphorus is critical. Nitrogen derived from cover crops through biological fixation can be made more effective if sufficient phosphate is available. Since soils in tropical areas typically face phosphorus shortage, applying phosphate fertilizer or rock phosphate will be helpful in increasing overall input efficiency [21]. The Result of IP evaluation shows 90 % of participant have seen as better to increase the capacity of all stakeholders through getting the technology that boost both haricot bean and soybean yield.

Empowering of poor vulnerable people specially women's

All respondents mentioned that their role in the community had changed. Most stressed the fact that they had become innovative farmers or otherwise had the opportunity to share the new experience with others in their community. The importance of this new status or role was found both in the responses of the men and women. But Enhanced innovation capacity is one of the most sustainable outcomes that innovation platforms can strive for change in policy that support rapid adoption or widespread implementation of new policies [5,6,32].

The special attention will be given for farmers to improve the productivity and negotiating others to bring in to similar vision and goals. The process helps to develop innovation capacity of peoples in the entire system. It is important to take care not to forced to shape the platform with facilitator interest unless bring trust on issue discussed to innovate. This agree with Reij and Waters-Bayer [61] and Wambugha [10], shows that farmers request information about the technology & share information through their network. An innovation platforms are a worthwhile idea because we know that meaningful change happens in networks of interdependent actors, who cannot change if others do not simultaneously change [5]. Facilitating of this complex issue needs well understanding of the interest of platform members. Consequently, plausible promises developed by the project were to be successful tested, adapted and accepted by stakeholders as 'innovations' was used.

Past experience of extension was not supporting that initiation and many innovative farmers not supported. An innovation platform encourages the farmers to innovate. Those who are specially educated play a key role by demonstrating how to intensify and/or diversify current farming systems. These innovative farmers are interest in pursuing new crops soybean or rhizobia inoculants to increase their farm income. Inoculation with rhizobia will reduce dependence on chemical fertilizers as they fix

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atmospheric nitrogen, so improving soil fertility and increasing crop yields. Since farmers, most of whom are poor or women's, rely on low input rain-fed farming systems, can be inter-cropped to promote increased on farm-biodiversity and thus more reliable, diverse food production. Such diversity enables small holders better to adapt to changing climatic conditions, than homogenous industrial agriculture with its technological packages. Legumes are a source of good protein which supports both household economy, when sold, and nutrition when consumed [17]. All of the IP members said they were optimistic about the future and felt their capacity had greatly improved. Sixty-four percent stated that they expected their income to increase over the coming years, or that they would be more productive. IPs can be of value in developing and testing scalable technological and institutional innovations [6,27,32]. Therefore, government and other stakeholders need to invest in extension service in sensitizing new innovations as potential to increase adoption rate as well as farmers productivity and income [62]. Empowerment, first and foremost, requires awareness which is fed by knowledge. Mixed-sex groups can be more effective where joint action is required, such as in natural resource management. In order for women to participate actively in mixed-sex groups, the groups must address women's problems and should be set up to allow the participation of more than one member of a household, if required. Mixed groups should also allow for women's voices to be heard. A case study on Ethiopia found that meetings with only women or with an equal number of men and women increased women's willingness to voice their opinion [63]. Improving women's and poor farmers access to agricultural technologies, information, credit services, education, training and enhance participation in IP as key for empowerment to change their livelihoods. It is important to formulate national police that closely linked to women and poor farmers activities. To be empowered the women's; national police which support women in control and utilization of agricultural resources must be implemented. well planned for from the onset and members should be empowered through the right systems to facilitate the scale up process [64].

Conclusion and Recommendation

One of the most important things that Innovation Platforms do is building their members' capacity to innovate. This is a crucial function. Innovation capacity is vital if the Innovation Platform is to achieve its aims. The meetings provided a new forum for discussion and participation, different from other forms of extension activity. Farm land size, age and education level have the most important to adopt new technology and innovate with his/her experience implies when the new technology will be started. IP as a stakeholder's network as a complete set of heterogeneous agent's smallholder farmers, extension agents, government officials, market traders, and so on. One of limits of this study was missing limit bud in or one to five networks leaders in to IP. Even fewer studies examine technology adoption or household welfare as a function of such networks.

IPs that are demand-driven and participatory allow the IP members to work on issues and problems that are relevant for farming system. Through their ability to bring together local and scientific knowledge, IPs can guide informed decision-making about which innovations are technologically sound, financially feasible, and politically and socio-culturally acceptable. Developing a legal entity around an IP can enhance its sustainability in terms of its independence, (financial) benefits for its members, and its potential to become certified and access credit. Establishing of farmers cooperative is the most suitable on the context and specific focus of the IP.

In general, we see excellent IP results in rhizobia technology dissemination that increase the needs of community to continued using of the technologies including both seed and inoculants. The challenge that farmers are not sure about how buy the inoculants was not answered. There is only one company in a country supply inoculant for all region. Similarly, the company may not produce the study inoculants for the market. The establishing of inoculants production infrastructure either in private or public organization in the region with supply system was crucial. To solve for future, it is important to develop project to scale up and scale out for transition. Similarly, we observe IP was better from conventional extension approaches, supply of strong information exchange and market linkage may result better adoption of technologies. The IP was a mechanism for developing value chains that provided incentives and means for access to and adoption of technologies for increasing productivity [60]. The potential for upscaling and out scaling of innovations depends on the characteristics of the Dense collaborative network facilitate the exchange and dissemination of information organizations at different administrative levels have to be connected to each other, so that information and other resources can flow easily across different levels. To ensure processes of out scaling and upscaling, information and knowledge has to flow among organizations located within and across different levels [61,65].

Acknowledgement

This work was part of SOILMAN Project financed by University of Helsinki is highly acknowledged. We also thanks to Hawassa University, Sidama Elito Cooperative Union and the staff of Hawella Tula Agriculture office who help at IP establishment and evaluation. Special tanks also for farmers who participated in IP and agree to interview.

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