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Innovation systems for food security in rangeland margins, sub-Saharan Africa

Jocelyn Davies^{A*}, Ian Watson^B, Fafa Sow^C, Andrew Hall^D, Aminata Mbengue^E, Souleymane Ouedraogo^F and Kumuda Dorai^G

^ACSIRO, Desert Knowledge Precinct, Alice Springs, NT 0871, Australia. E: jocelyn.davies@csiro.au, Ph: 08 8950 7152

^BCSIRO, PMB Aitkenvale, QLD 4810, Australia. E: ian.watson@csiro.au, Ph: 07 4753 8606

^CISRA, CRZ Dahra ISRA, PB.01, Senegal. E: sowvet2002@yahoo.fr, Ph: +221 77 619 10 92

^DCSIRO, GPO Box 1700, ACT 2601, Australia. E: andrew.hall@csiro.au, Ph: 0424 156 105

^EISRA/LNERV-Dakar, Sénégal. E: aminatambengue51@yahoo.com, Ph: +221 77 416 69 01

^FINERA, Station de Farako-Bâ, 01 BP 910, Bobo-Dioulasso 01, Burkina Faso. E: osilamana@yahoo.fr, Ph: +226 70 26 47 19

^GLINK Ltd., Canberra, Australia. E: kumuda.dorai@gmail.com

*Corresponding author and presenter

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Introduction

Failure of traditional research and technology delivery to make a substantial difference to food security in sub-Saharan Africa has led to approaches that take a systems view of innovation. Innovation emerges, not just from research, but through a continuous process of sharing, combining and making use of ideas and information that come from many different actors. Innovation is understood not just as technical change, but as changes in modes and organisation of production, marketing, research practice and policy settings (Hall and Clark 2010). Interactions amongst actors, and their outcomes, are greatly influenced by institutions: cultures, norms, routines and policies. These shape the practices of all actors including researchers. In recent years in sub-Saharan Africa a mechanism to build the relationships and institutional settings that promote interactive innovation has taken operational form as ‘innovation platforms’ (IPs). These are usually local-level multi-stakeholder groups with an agenda of enabling innovation that strengthens production and associated value chains. They are sometimes nested with similar fora at regional or national scales for policy change and broader market influence.

A case study

Our case study, from the village of Thiel in the central north of Senegal, used an IP to promote innovation in an extensive livestock production system in order to enhance food security. An underlying constraint is poor livestock nutrition, including a feed gap during the 9 month dry season. The IP was formed in 2012 after a rapid diagnosis survey identified potential to enhance food security by strengthening the dairy value chain and intensifying livestock feed production. The IP involves veterinary agents, researchers, local development actors and producers from three ethnic groups with distinct agricultural and/or pastoral traditions. Although the social setting and production systems are very different to Australia, the expansion of cropping into rangelands to support production increases has some parallels.

In 2012 livestock sales were by far the biggest source of household income in Thiel. Peanuts were the main commercial crop, followed by maize. Women in 80% of households produced milk from a small proportion of the household’s cows, contributing strongly to family nutrition and marginally to income. In the 3 month rainy season average milk yields were 2.16L/cow/day. Production halved during the dry season (Anon 2013).

A forage variety of cowpea and a peanut meal fodder supplement were introduced by researchers from 2012. We draw on interviews with IP members (n=10) and a stratified random survey of

households (n=80) to describe positive outcomes and impacts of these innovation by late 2014, the IP's role, and some limitations.

Innovation and change in Thiel

Production changes: Women reported 50% increases in milk production (average increase 1.31.L/cow/day) and men reported 50% to 150% increases in sale prices for livestock fattened on cowpea forage. One large producer noted that not only have his revenues increased, his expenses have also come down.

Changes in the market: Increased local demand for better livestock feed was reported, because producers have seen its impact on animal nutrition.

Access to farm inputs: In 2014 50% of households introduced to forage cowpea were using it for livestock feed. Those who harvested and sold the seed to other producers considered this highly profitable.

Changes in local capacity: Producers said their interaction with researchers brought new and better integrated knowledge on a range of aspects of livestock production. The local agri-economic development association had used information gained at IP meetings to put new economic opportunities into action, supplying livestock feed.

Changes in the capacity of the R&D system: Producers said researchers became more responsive to producer demand "by following the needs of the IP". The District Government is looking at using the IP to carry out training and extension activities and forming IPs elsewhere.

Policy changes: Cropping is prohibited by land use laws in the extensive sylvo-pastoral zones around Thiel. However indications are that cowpea growing is now tolerated, being regarded as forage production rather than agriculture.

Livelihood and food security impact: Increased milk production is improving children's health. Some women have new and rewarding income sources through making and selling peanut fodder cakes.

Impact on social capital and on cultural gender norms: Promoting exchange of knowledge amongst IP members has led to more trust and better social linkages. The IP appears to have facilitated increased collaboration amongst ethnic groups in the adoption of these new practices. Women are experiencing better access to decision making because of the focus on milk, which is considered to belong to women. Researchers have helped to change gender norms, by making a point of asking women for their opinions.

Sustaining innovation and making it systemic

While not new technologies, growing cowpea for hay and using peanut cake for feed supplementation were new to Thiel producers. Cowpea forage production in 2014 was still only sufficient for supplemental feeding of a small proportion of livestock during the first part of the dry season but producers are confident it will continue to grow. However growth will face constraints in this dry and variable climate. For example, producers relied on external seed sources when planting their 2014 forage cowpea crop because insufficient rain the previous year meant little seed was produced and harvested for subsequent plantings.

Changes in gender norms in Thiel are institutional innovations that are important because increased gender equity supports modes of economic growth that directly benefit children, youth and families (Scanlan 2004). Growth in milk production means women now have surplus milk to sell. However markets within Thiel are limited and the IP has no clear plan to progress its members' ideas about establishing a milk collection point, to facilitate local processing or transport to the nearest

commercial dairy, two hours away on unformed tracks. Institutional change from the Thiel IP beyond the local scale, including in R&D system capacity and policy, is only nascent and is critical to fostering stronger market connections. For example, processing and transport of dairy products would be greatly facilitated by better access to electricity and a better road while the milk collection point itself will need sound business planning and finance for capital costs. More engagement between the IP and non-local actors from outside the agricultural sector will be important for influence on the deeper level controlling institutions that are important to developing stronger dairy market connections. On the other hand, livestock market linkages are already quite strong. The premium paid for fattened animals generates incentives for producers to use available forage for fattening, a male dominated activity. Intra-household income sharing cannot be assumed and, in the absence of a milk market, income benefits from narrowing the feed gap are likely to accrue most directly to men.

Intensification of livestock production in Thiel can be expected to continue in parallel with more customary extensive pastoralism, in which herders (often hired labour) move animals around sylvo-pastoral areas according to the availability of feed. The persistence of extensive production indicates that addressing rangeland degradation—a neglected area in the Sahel (Turner 2011)—is another important arena for innovation and institutional change to enhance food security in Thiel, as elsewhere in sub-Saharan Africa. Public and private sector collaboration for increased dairy and livestock production such as in Thiel will need to integrate across the quite separate institutional domains of agriculture, water resource management and rangeland management if impacts of intensified production on the sustainability of natural resources, such as have become apparent in Australia's semi-arid regions, are to be avoided.

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