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Supporting Bottom-Up Innovations through Farmer Innovation Contest that Champions the Best Innovator:

A Pilot Study of Thyolo, Salima and Rumphi Districts

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Contents

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Abstract

With evolving challenges faced by agriculture today, farmers tend to be innovators and experimenters than just adopters of technologies. Since farmers know best their environment and socio-economic status, it is thought that they become creative and come up with relevant solutions to their farming problems. Bottom-up innovations could complement the highly promoted technologies developed by scientists in addressing the numerous challenges facing agriculture. Therefore, this project seeks to identify the best innovations developed by farmers in Thyolo, Salima and Rumphi districts of Malawi. Using farmer innovation contest that rewards the best farmer innovators, outstanding innovations were identified in the three districts. The aim of this initiative is to enhance farmer innovation potential for the improvement of food and nutrition security and sustainable agricultural value chains. Results show that innovation contest is an effective way of identifying innovations as 144 applications were received from the three districts with Rumphi having the highest applicants. Not all applications were successfully filled nor were unique hence only 85 applications were found to be innovations and not common practices. Out of these 85 innovations, only 24 were successful and were championed in the three districts. The output from this activity is expected to support the development of policy in the Ministry of Agriculture as well as generate information on the returns to investment in agricultural innovations in Malawi.

Background and Justification

Malawi is one of the countries with highest population density in Africa due to increased population growth. On average, there are 0.4 people per ha in SSA compared to 2.3 rural people per ha of agricultural land in rural Malawi (Makombe et al. 2010). Typical cultivation, which is practiced by more than 80% of the population, is characterized by small-scale operating under wide ranging biophysical, climate and socio-economic conditions with limited area to expand the agricultural production (Mloza-Banda, H.R and Nanthambwe 2010; Ngwira et al. 2012) Consequently, the high population density leads to soil degradation and water pollution (Bidogeza et al. 2009). This coupled with climate change effects makes the situation unbearable especially for the resource poor farmers.
The climate sensitive nature of agriculture in Malawi cannot be overemphasized. Concerns have been raised by government agencies and other stakeholders of the negative effects of climate change on agricultural productivity in the country. Climate change is causing devastating effects on agricultural production resulting into food insecurity (Ajao & Ogunniyi 2011; Acquah et al. 2011; Kreft et al. 2015). These impacts vary in magnitude in different agro-ecologies and affect farmers differently. Unless the challenges facing agriculture in Malawi are addressed, Malawi shall continue to fail to achieve food security.

There has been increased emphasis on the role of innovations in development and agricultural growth in Africa. In June 2014, the Heads of State and Government of the African Union put agriculture on top of Africa's agenda through the Malabo declaration. In January 2015, they identified strategic actions areas for implementation of the Malabo declaration and commitments such as support agriculture for the development, dissemination and adoption of technologies and innovations. Furthermore, the Science, Technology and Innovation strategy for Africa 2024 (STI Strategy 2024) also strongly accentuate the potential of innovations. Therefore, the German Government acknowledged this innovation potential through introduction of Program of Accompanying Research for Agricultural Innovations (PARI) and wants to support the improvement of food and nutrition security and sustainable agricultural value chains through Green Innovation Centers (GICs) in 12 African countries and India implemented by the GIZ. Significant and sustainable improvements along the entire value chains are key if enhanced production and higher incomes are to be achieved in an agricultural system characterized by small farms, productivity, organization, marketing and processing. This is to say, sustainable development of the whole agricultural and food sector would mean adopting locally adapted innovations thus bottom-up innovations.

Since farmers know best their environment and socio-economic status, they tend to become creative and experiment different ways of overcoming the agricultural problems being faced. They either develop new technologies or modify the research technologies to adapt their local environment. It is evident that such practices actually help build resilience of farmers against shock due to changing weather as well as food insecurity (Tambo &

Wünscher 2014). But scouting for agricultural innovations can be a tedious process as some farmers tend to hide their creativity. Farmer innovation contest aims at finding farmers who are engaged with and are passionate about managing their agriculture and value chains in a way that supports productive agriculture, reduces greenhouse gas emission or in a sustainable manner.

Therefore, this project sought to identify the best innovations developed by farmers in Thyolo, Salima and Rumphi districts. The output from this activity is expected to support the development of policy within the ministry as well as generate information on the potential returns to investment in agricultural innovations in Malawi. As a centre of excellence for agricultural technology generation, the Department of Agricultural Research Services (DARS) implemented this activity in partner with the Department of Agricultural Extension Services and the Farmers Union of Malawi as a body which represents farmers.

Purpose of the study

The purpose of PARI is to contribute to sustainable agricultural growth and food and nutrition security in Africa and India. Whilst the rationale of the innovation contest rests on the notion that incorporating bottom-up innovations generated by the rural stakeholders (farmers) can foster more prosperity in agriculture. These innovations developed by farmers could complement the highly promoted externally driven technologies in addressing the numerous challenges facing agriculture.

Specifically, the study was set to;

- To identify the best innovations developed by farmers in Thyolo, Salima and Rumphi districts
- to acknowledge farmer creativity and create awareness of what other farmers are doing so to enhance innovativeness among farmers in Malawi
- to make policy recommendations for the development of market-oriented technologies

Literature Review

Most countries in Sub-Saharan Africa (SSA) rely on agriculture as a main tool for reducing poverty and improving food security. This is evident by the majority (about 90%) of rural people depending on agriculture for their livelihood (Asfaw et al. 2012). To achieve enhanced productivity and high agricultural growth, there is need for significant and sustainable improvements along the entire value chains. Sustainable improvements entail incorporating the farmer produced innovations in the formal and externally driven innovations produced by research (PARI project document).

With many challenges hindering smallholder farmers to adopt externally developed technologies, it is argued that innovations by farmers can play an important role in improving rural livelihoods by increasing household income, consumption expenditure and thereby improving food security (Tambo & Wünscher 2014). This shows that farmers' ability to experiment and innovate is very important element as far as participatory process of

research and technology development is concerned. Scientists all over the world are acknowledging farmers' ability to experiment and innovate. Different challenges and farmer's socio-economic conditions determine the nature of farmers' experiments and innovations (Leitgeb et al. 2011) and with small amount of incentives made available to local innovators motivate their innovativeness and make the process sustainable and reduces the tendency of hiding the technology (secrecy) (Wongtschowski et al. 2010).

Malawi Government through the Department of Agricultural Research and other development agencies has put considerable efforts to develop agricultural technologies and practices for improved agricultural productivity and its value chains. Numerous improved technologies and knowledge have been disseminated in Malawi but uptake by farmers is limited (Jere 2007; Thierfelder et al. 2015). With the changing economic and climatic environment, local farmers engage in informal experimentation and develop new technologies or modify and adapt external innovations to suit their local environments (Tambo & Wünscher 2015). Such practices are claimed to play an important role in building their resilience to changing environments and addressing food insecurity challenges (Kummer et al. 2012). Farmers' modify existing technologies, invent new practices or experiment with new ideas to adapt to their new changing environment. They often use locally available resources and generate low-cost innovation in many farming systems. Innovations generated by farmers leads to site-appropriate technologies and this improves adoption rate since farmers will value their own knowledge, and this reduces the workload of scientists to manageable proportions (Tambo & Wünscher 2014). Consequently, according to (Reed et al. 2007), there is need to support farmer experimentation by identifying the innovators and engage them in the process of technology development to optimize their innovations and share with other smallholder farmers for them to benefit.

Methodology

This section highlights the process of the farmer innovation contest from innovation identification to selection of winners.

Identification of Innovations

There are several methods which can be used to identify innovations e.g. household survey, key informant interviews, snowball sampling etc. But this study used farmer innovation contest that rewards winners. Farmer innovation contest is considered the best to use because farmers tend to hide their experiments or knowledge therefore championing successful innovators is one way of motivating them to bring out their innovations. The promising innovations could potentially be researched further, refined and eventually disseminated to other farmers. This can certainly increase uptake of technologies among farmers. In addition, this initiative will motivate other farmers to be creative or rather to think critically on the ways to solve their farming challenges.

Site selection

Farmer innovation contest was launched in Malawi around August, 2016 in Thyolo, Salima and Rumphi districts. The three districts do not only represent the three agro-ecologies in the country but are also the Green Innovation Centre impact areas. Furthermore, these districts were strategically chosen due to their proximity to DARS satellite research institutions for easy operationalization of activities.

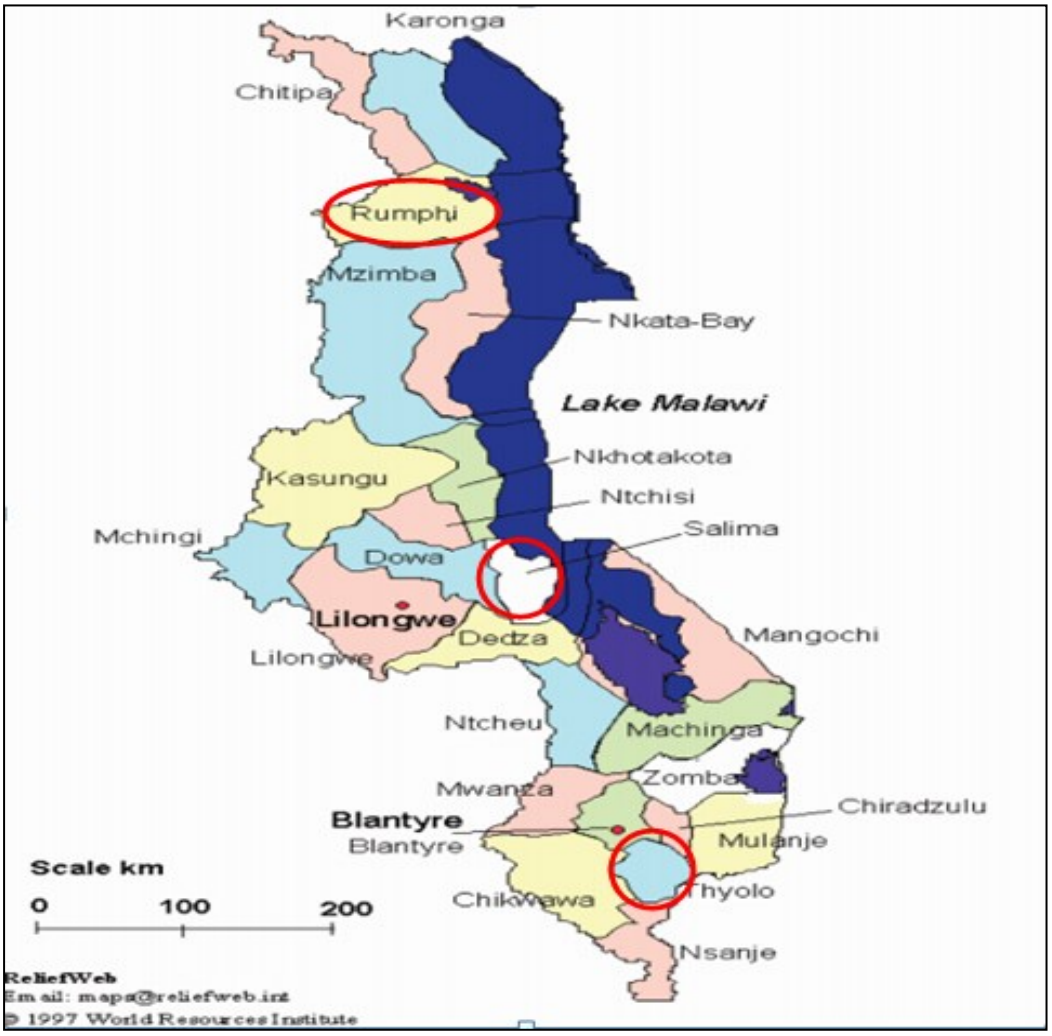

Figure 1: map of Malawi with the three pilot districts of the innovation contest

Malawi is divided into four agro-ecological zones based on altitude. These are Lower Shire Valley (< 200m), Low altitude (200-760m), Middle altitude (760-1300m) and High altitude (>1300m). Salima, Thyolo and Rumphi represent the low, medium and high altitudes.

Creating awareness of the contest

To create awareness on the contest, three approaches were used; (a) extension contacts, (b) radio announcements, and (c) radio programs. First was the extension contact and on this activity, training of research technicians and field officers from government, NGOs and FUM was organized in the three districts.

Figure 2: Training of field officers in Thyolo

The purpose of the district trainings was to: (i) launch the farmer innovation contest among research technicians, NGOs and government field officers and all stakeholders; (2) train field officers on enumeration thus; how to scout for the innovations, how to motivate farmers to apply, verification of origin of an innovation and help farmer complete the form; (3) inform stakeholders on the roadmap and timelines. After the training, application forms/ questionnaires were left with the field officers to start scouting for innovations in their extension planning areas.

The second approach was radio announcement. Radio announcements advertising the innovation contest were launched with Zodiak and MBC 1 radio stations. A one minute jingle was produced in two local languages, thus Chichewa and Tumbuka, and was aired on these two radio stations. The jingle was aired twice a day for 30 days and a week after the radio advert termination was the closing date of the application for the competition. The jingle contained information on the contest like when it was valid, where to apply, who is eligible to apply and the prizes to win. The two aforementioned radio stations were chosen because

they have increased listenership and wide coverage in the three districts. In addition to the above mentioned efforts, the last approach was through DAES platform. The Department of Agricultural Extension and Services has existing agricultural radio programs on different radio stations and using this platform, a program on the innovation contest were featured in their radio programs hence more publicity. A question and answer session where farmers interested in the competition could call-in and ask questions, was also part of the program.

Evaluation of innovations

After the closing date of application for the contest, the questionnaires were collected from the respective District Agricultural Development Offices and the research stations. A team of experts, in the fields of extension, livestock, gender and environment, fisheries, science and technology, crop breeding and rural development together with district officers from the three implementing districts, were invited to participate in evaluation and verification of the innovations. The team agreed on the following seven selection criteria to be used in evaluating the innovations: innovativeness or originality, economic viability, social acceptability, easiness to apply, gender responsiveness, locally available resources and environmental sustainability. A 5-likert scale was used to score each criterion with; 1=very low, 2= low, 3=average, 4=high and 5=very high. The innovations were ranked based on their overall sum of scores from all the committee members.

Following evaluation process was verification of the short-listed applicants. Based on the total cumulative score from the entire criterion per individual, top 5 innovators per each of the three categories per district were short-listed for possible winning. As mentioned before, the three categories of winners are; male, female and youth innovators and in each category, meaning 15 innovators were supposed to be short-listed for further verification per district and 45 innovators in the three districts.

The methods/approaches used during validation or verification of innovations exercise includes; actual observations on the innovations, farmer demonstration on the use of the innovations, probing more questions to verify the information on the forms, validation of information with follower farmers of the innovation, validation with extension officers and general individual assessments. To get all the information needed for decision making on the winners, the following guiding questions were used; (1) history of the innovation i.e. how the idea come about, (2) materials and methods, (3) if they have shared the knowledge and to how many people, (4) if not shared, what could be the reason, (5) general specifications of the innovation, including demonstrations, (6) the prizes they would like to get if they are to win the contest. By end of each district verification exercise, the teams discussed to reach a consensus on the winners depending on what is on the ground.

Results and Discussion

The study aimed at identifying the best innovations in Thyolo, Salima and Rumphi districts. It is important to note that almost all applications were received from individual farmers

than groups. Results of the contest show that 144 applications were received with Rumphi district recording the highest applicants. Not all applications were successfully filled nor were innovation hence after cleaning, only 85 applications were found to be unique and not common practices as shown in Table 1. After a tough application process and expert analysis, only 24 winners were identified and awarded in the three districts. Most innovations were from the field of animal husbandry followed by those from crop management. Those from livestock had topics on management of new castle disease in chicken and African swine fever in pigs, African shampoos for ectoparasites and feed. The crop management practices included pest and disease control measures, weed control and grafting methods. No application was received neither from trade nor processing.

Table 1: categories of the applications

Category	Number	Percent
Animal husbandry	33	38.82
Crop management	19	22.35
Storage	10	11.76
Soil fertility	9	10.59
Farm equipments/ tools	6	7.06
Irrigation	6	7.06
Tree/ forestry management	1	1.18
Fisheries	1	1.18
Total	**85**	**100.00**

Most innovations were developed to save production costs like pest and diseases, veterinary cost and storage. This shows that cost-effectiveness of an innovation is key in farmer adoption of a technology. These results are similar to those found by (Tambo & Wünscher 2014) where innovations were identified to save production costs like pesticides, storage and veterinary cost. As much as most farmers have been using their innovations for awhile, adoption rate among other farmers is low. This can be due to issues of Intellectual Property Right (IPR). Majority of farmers are not willing to share their innovations with other farmers as they would like to remain the owners of the innovation.

Innovation ranking and identification of winners

Table 2 has detailed information on the innovation ranking and the average scores. As mentioned earlier, this is the agreed criteria which was used in the evaluation; innovativeness or originality, economic viability, social acceptability, easiness to apply,

gender responsiveness, locally available resources and environmental sustainability. A 5-likert scale was used to score each criterion with; 1=very low, 2= low, 3=average, 4=high and 5=very high. The average scores for the innovation on the seven criteria are; 2.68, 2.97, 2.99, 3.04, 2.90, 2.96 and 3.17 for originality, cost effectiveness, socially acceptability, environmental sustainability, easiness to apply, gender responsiveness and locally available resources, respectively. From these score, it shows that easiness to source resources or materials is important in technology development. On the contrary, originality scored the lowest of all seven criterions. This can be due to fact that most of the innovations received were not purely original but modifications of some known practices or indigenous knowledge.

Each criterion was given equal weight, meaning gender responsiveness of an innovation is as important as originality or environmental sustainability, hence, they all have a weight of 14.3 % as shown in Table 2. Averages were computed to come up with the ranks of the innovations. However, the equal weight assignment should not be advised as it later came out that, some weak innovations were scoring high than good innovation. For instance, innovation like those of aloe vera, neem would score high in almost all criteria as they will be locally found in the communities, they are both socially acceptable and gender responsive and all yet originality might be very low. When averages are computed, this innovation ranks high yet there is not much innovativeness. For that reason, Malawi team did not entirely rely on the ranks but also verification results. Some innovations maybe rank high on the results table but after verification they drop whilst other innovations were elevated in the rank. These analyses were based on verification team consensus not individual judgments.

Table 2: List of farmers and their scores

No.	Name of innovation	Originality (14.3%)	Economic (14.3%)	Social (14.3%)	Environ (14.3%)	Ease (14.3%)	Gender (14.3%)	Resources (14.3%)	Overall score (100%)
1	Artificial Irrigation pump	4.67	4.00	4.00	4.00	3.33	3.00	3.67	3.81
2	Kalonde Di-Station maize planting method, with its planting device	4.33	3.33	4.00	3.33	3.67	4.00	4.00	3.81
3	Brooding eggs with river sand	4.00	3.67	4.00	3.67	3.67	3.33	4.00	3.76
4	Artificial actellic	2.67	4.00	3.67	4.00	3.33	3.67	4.67	3.71
5	Broad spectrum for crops, livestock, fertility	2.67	4.00	4.00	4.00	3.67	3.00	4.00	3.62
6	Weed Control (witch weed)	4.00	4.00	3.67	3.33	3.33	3.33	3.33	3.57
7	Maize Sheller	3.67	3.33	3.67	4.00	3.00	3.67	3.67	3.57
8	Crop protection using Black jack and Delia	3.33	3.33	3.00	4.00	3.67	3.67	3.67	3.52
9	Hatching chicken eggs in maize bran	3.00	3.33	3.67	3.33	3.67	3.67	4.00	3.52

10	Bitter Nkhanyanga fruits to control aphids and leaf blight in vegetables	3.33	3.67	3.67	3.67	3.00	3.33	3.67	3.48
11	Using aloe vera to cure and prevent new castle disease	1.67	3.33	3.67	4.00	4.00	3.67	3.33	3.38
12	Coffee stem borer control using Banana leaves (mapupu)	3.67	3.67	3.33	3.33	3.00	3.33	3.33	3.38
13	use of citrus fruits as a rootstock	3.00	3.33	3.33	3.33	3.67	3.33	3.67	3.38
14	Self made irrigation system with controllable water tank for efficient use of water	3.67	3.67	3.67	2.67	3.33	2.67	4.00	3.38
15	Maize seed storage with Velvet Beans mukuna (kalongonda) juice	3.33	4.00	2.33	3.67	3.33	3.00	4.00	3.38
16	Thombozi chipeta	3.67	3.33	3.33	3.33	3.00	3.00	3.67	3.33
17	Velvet beans as oral treatment for chickens	3.00	3.67	2.67	3.67	3.33	3.00	4.00	3.33
18	Katupe: Local shampoo	2.67	3.67	3.67	3.67	2.67	3.00	3.67	3.29

19	New castle treatment (Bwemba and sisal)	3.33	3.33	3.33	3.33	3.00	3.33	3.00	3.24
20	Multiplication of apple rootstocks	3.67	3.00	3.33	3.67	3.00	2.67	3.33	3.24
21	Crop storage with Tephrosia Vogelli and Vernonia Imygdalina (Mluluzga)	2.33	3.33	3.00	3.33	3.67	3.33	3.67	3.24
22	Prevention of new castle by using Mvunguti (savage) fruit plus pepper	2.33	3.33	3.67	3.67	2.67	3.33	3.67	3.24
23	Seed storage with Cassava stem ashes	2.00	3.00	3.00	4.00	3.67	3.00	4.00	3.24
24	Detox for chicken to cure new castle	2.00	3.00	3.33	3.33	3.67	3.33	3.67	3.19
25	Post harvest handling of grains	3.33	3.33	3.33	2.67	3.00	2.67	3.67	3.14
26	Pesticides for aphids	2.67	3.00	3.00	3.33	3.33	3.00	3.33	3.10
27	Manyoka trees to control worms	3.33	3.00	3.00	3.00	2.67	3.33	3.33	3.10
28	Ants repellant tank	2.33	3.00	3.00	3.33	3.33	3.33	3.33	3.10

29	Newcastle treatment using Molinga leaves and seeds	2.33	3.00	3.33	3.00	3.33	3.33	3.33	3.10
30	Warm ash to treat diarrhoea	3.00	3.00	2.67	3.67	3.00	3.00	3.33	3.10
31	Bridge irrigation	3.00	3.00	3.00	2.67	3.33	3.00	3.67	3.10
32	Chicken medicine for new castle	2.67	3.00	3.33	2.67	3.00	3.33	3.67	3.10
33	Newcastle medicine	2.33	3.33	3.00	2.67	3.33	3.33	3.67	3.10
34	Nthupa plant plus Tobacco used to control ectoparasites and cure livestock (Pigs)	2.33	2.67	3.00	3.00	3.33	3.67	3.67	3.10
35	New castle curing herb (Chitimbe tree)	2.67	3.33	3.33	2.67	3.33	3.00	3.00	3.05
36	Fish pond innovation	2.33	2.67	3.00	3.33	3.33	3.33	3.33	3.05
37	Nyachirambo livestock booster	3.00	3.00	3.00	3.33	2.67	3.33	2.67	3.00
38	Fertilizer vaccine for New castle	3.33	2.67	2.33	3.00	3.33	3.33	3.00	3.00
39	Tree/ forest management	3.33	3.00	3.33	2.67	2.67	3.00	3.00	3.00
40	Muwawani balk for African swine fever	3.00	3.00	3.33	2.00	3.33	3.33	2.67	2.95

41	Use of Mvunguti fruit and Muwawani tree to treat chickens	2.67	3.00	3.33	3.33	2.67	3.00	2.67	2.95
42	Heysopen (cure for respiratory infections in livestock)	2.33	2.67	3.33	3.00	2.67	3.33	3.33	2.95
43	Chizgutu	2.67	2.67	3.33	2.67	3.00	3.00	3.33	2.95
44	Use of Futsa for crop storage	2.33	3.00	3.33	3.33	2.67	2.67	3.33	2.95
45	Basal and top dressing manure	3.00	3.33	2.33	3.00	3.00	3.00	2.67	2.90
46	Local refrigerator	3.00	2.67	3.00	2.67	2.67	3.33	3.00	2.90
47	Control and management of apple woolly aphids	2.33	2.67	2.67	3.67	3.00	3.00	3.00	2.90
48	Rat trap using a Big pot or pail	2.67	2.67	3.00	3.33	2.67	3.00	3.00	2.90
49	Rapid chicken multiplication	1.67	3.00	2.67	3.00	3.33	3.33	3.33	2.90
50	Maize storage using Mphavumba	2.67	2.67	3.33	3.00	2.33	3.00	3.33	2.90
51	MT4	3.00	2.67	2.67	2.00	3.33	3.33	3.00	2.86
52	Pellete manure	1.33	3.00	3.33	3.00	3.00	3.00	3.33	2.86

53	Termite pesticide	2.33	2.33	3.00	3.00	3.33	2.67	3.33	2.86
54	Tefronas	2.00	2.33	3.33	3.00	2.67	3.33	3.33	2.86
55	Bean seed storage with Nthupa	2.00	2.67	3.00	2.67	3.00	3.33	3.33	2.86
56	Use of neem leaves for New castle	2.00	3.00	3.00	3.00	3.00	2.67	3.00	2.81
57	Kasankhanya for soil fertility enhancement	1.67	3.00	3.33	3.00	2.67	2.67	3.00	2.76
58	Dummy calf	3.00	2.33	3.00	3.00	2.33	2.67	3.00	2.76
59	Controlling pests in citrus fruits trees	2.33	3.00	3.00	2.33	2.67	3.00	3.00	2.76
60	Multiple grafting method	1.67	3.00	3.33	3.00	2.67	2.67	3.00	2.76
61	Control of stem canker using cassava spills in apples	2.67	2.67	2.67	3.00	2.33	2.67	3.33	2.76
62	Irrigation system	2.00	2.67	3.33	3.33	2.67	2.67	2.33	2.71
63	Kalongonda "velvet bean" for new castle treatment (Mucuna pruriens)	3.00	3.00	1.67	3.33	3.00	2.67	2.33	2.71
64	Nelia for curing new castle and diarrhoea	2.33	2.67	3.00	2.67	2.00	3.33	3.00	2.71

65	Heat retention to immature calf birth	3.33	3.00	2.67	3.00	2.00	2.00	3.00	2.71
66	Crop protection using different types of trees	3.00	2.67	2.33	2.33	2.67	2.67	3.00	2.67
67	Manure from ash, human urine and maize bran	2.33	3.33	2.00	2.67	2.67	2.67	3.00	2.67
68	Canal linkage	2.50	2.50	2.00	2.50	3.00	3.00	3.00	2.64
69	Liquid fertilizer	3.33	1.67	2.67	3.67	2.33	2.67	2.00	2.62
70	cassava grater	2.00	2.33	3.00	3.00	2.67	3.00	2.33	2.62
71	Manure from maize bran and tobacco residues	1.67	2.33	2.67	3.00	2.67	3.00	3.00	2.62
72	Using Urine as topdressing fertilizer	2.67	3.00	1.67	2.67	2.67	2.67	3.00	2.62
73	Storing maize using maize bran	2.67	1.67	2.67	3.00	3.00	2.33	2.67	2.57
74	Uvili vaccine for New castle disease	3.33	3.00	2.33	2.67	2.67	2.33	1.33	2.52
75	Anti Rabies vaccine	2.33	2.33	2.67	2.67	2.67	2.33	2.33	2.48
76	Organic manure from human urine madeya and dung	2.00	3.00	1.67	2.33	2.33	2.33	3.67	2.48

77	Sprayer innovation	2.33	2.33	2.67	2.67	2.33	2.67	2.00	2.43
78	Using ash to control termites in maize fields	2.33	2.67	3.33	2.00	2.00	2.33	2.33	2.43
79	Lito to control new castle	2.33	3.00	1.67	3.00	2.33	2.00	2.67	2.43
80	Termite control in field crops	2.33	2.67	3.00	1.33	2.00	2.67	2.33	2.33
81	Bio-pesticides and bio-fertilizers	1.50	2.00	2.00	2.50	1.50	2.00	2.50	2.00
82	Increasing chicken production using motherof antihill and tephrosia	2.33	2.33	2.00	1.67	1.33	1.67	2.00	1.90
83	Raised water harvesting tank	1.33	2.00	2.00	2.00	2.00	1.67	2.33	1.90
84	Artificial method of protecting monkeys from damaging crops	2.00	2.33	2.33	1.67	1.00	1.33	2.33	1.86
85	Use of combretum molle for protection during bee harvesting								

Note: the list is not in any particular order

Case studies

This section will highlight some of the outstanding innovations in the three districts. As already pointed out, as much as these innovations form part of the winning team, some do not rank as high based on the average scores but after verification, the teams recommended that they elevate in the ranks.

Case study 1: Self made irrigation system with controllable water storage tank for efficient use of water.

The effect of stressors such as drought and dry-spells appear most magnified in Malawi where both land scarcity, especially in Thyolo as much land is taken up by tea estate, and poverty are high. Enhancing agriculture growth through increased production and productivity in irrigation based small-scale farming is the right response to this growing challenge. Small-scale irrigation has the potential to contribute to improved food security and higher rural incomes in Malawi. Here is a case of Mr Thukuta Nandolo a self-trained irrigation engineer who originates from Khonjeni in Thyolo district. The 67 year old small-scale farmer, who has only attained the first three years in Malawi's formal education system, developed this innovation based on the irrigation system he used to see when he was working at the tea estates in Thyolo district. The initial experimentation of this innovation traces back in 1988 and only succeeded in developing an effective irrigation system in his backyard in 2013. He built a high-force manual water pump from locally available materials such as scrap metals, plastic papers, and bamboos. He mounted it on a shallow well to pump water into bamboo water tank that was elevated in a mango tree which is about 3 meters above the sea levels. Water flows with gravity into bamboo pipes and dispersed by self-made sprinklers. He also made a treadle pump and a ground water reservoir in readiness for low water pressure. His investments in the project was estimated at MK200, 000 ($270) since inception. The only challenge faced with this innovation is that of reliable water source as most reservoirs dry up in the hot-dry months of September, October and November but he has overcome this problem by having a gauge inside the tank to help manage his irrigation scheme during the lean months. The innovator is considered the best male in Thyolo not only because of his ability to design a least-cost irrigation system, but also his ability to mount an effective irrigation system with sufficient water pressure to irrigate the crops and suffice for domestic use as well.

Figure 3: Water pressure

Figure 4: Self- made water pump

Case 2: Multipurpose Maize sheller.

Mr Mckenzie Gondwe is a 61 year old farmer and carpenter who hails from Rumphi, the northern part of Malawi. He was awarded the first place in the male category in the innovation contest for his exceptional work on multipurpose maize sheller. Mr. Gondwe, is a well-known innovator as prior to this contest he had already won an award in the '90s for his outstanding work on one man sheller innovation which he displayed during the Agricultural show. Like most farmers in

Figure 5: Multipurpose sheller

Figure 6: Improved on man sheller

Malawi, one of the major crops he cultivates is maize and along with its cultivation comes the challenge of shelling which is exacerbated by lack of cost effective shelling tools and higher costs associated with hiring of shelling machineries. This is what drove him to come up with the innovation. The multipurpose maize sheller that he created is a modification from his original Sheller that he made in the'90s which had only one cob placement. Unlike its prototype, the modified version is a wooden frame that has 5 cob placements, two from each side and one in front. The cob placements are fitted with wire nails where maize is inserted and wound through the wires, the wires act as the teeth that pull the grains off the cob until there are no grains left. The shelled maize comes out the hole provided by the wooden frame. Aside from shelling the maize, the frame also acts as a chair, stool and table, hence the name multipurpose maize sheller. From his estimation, one man sheller has the capacity to fill a 50 kg bag of maize in one hour whilst this multipurpose sheller with 3 people can fill the same amount in 20 min.

Case 3: Nyachirambo livestock booster

Nyachirambo is a 41 year old resource poor female farmer from Rumphi district. As a small scale livestock farmer, Nyachirambo thought cost of producing livestock was high as feed is expensive and so is immunization and other medication. Using common knowledge of the medicinal effects and nutritional benefits of some crops, Nyachirambo thought of coming up with her own booster which does not only help with increased productivity of livestock through enhanced growth but also prevents them from disease attacks.

Figure 7: Only one cup booster to a basin full of bran

This female farmer mills together dried soybean grain, dried pumpkin seed and dried moringa to come up with a high protein concoction. The concoction is given directly to livestock or can be mixed with bran as shown in Figure 7. This innovative lady has not shared the knowledge with fellow farmers as this is her source of income as she sells the product. Some people bring their sick livestock for a month so that it can be treated with her concoction and she collects money in exchange for this service.

Case 4: Nthupa plant plus Tobacco used to control ectoparasites and cure livestock wounds

Using indigenous knowledge of using nthupa for fishing, Lisbon Mbale, a 21 year old farmer from Rumphi district, thought of applying the idea to livestock. This innovative potential came about when this young man's pigs were attached by external parasites and could not afford to take his pigs to veterinary. Remembering what he used to do when he was younger, he thought of using nthupa to suffocate the ectoparasites. He thought if the root could kill fish then there is a possibility of it killing ticks and all those parasites. He just thought of mixing the roots of nthupa with water and foam it like shampoo then bath the pigs.

Figure 8: Lisbon's foaming nthupa and his clean pig and piglets

To his surprise, not only did the mixture killed the parasites in few days but also dried the wounds and were healing. Nthupa is a tuber which looks like cassava and is well known for killing fish when fishing. Nthupa is used for prevention and control of external parasites. Ever since he started using this innovation, his pigs are clean and healthy which eventually increases production of pigs. Apart from this, Lisbon is using nthupa as a local actellic for storage pests. So far, he has only tried on seed grains but not on food grains. The tuber is proving effective in controlling weevils and other storage pests. Asked what he would like to do with the prize money, this young man would like to invest in vocational training to further his agricultural knowledge.

Award ceremony

The award ceremony was conducted in Salima district only on the 27th May, 2017 because the available resources then could only manage to purchase gifts for one district. This auspicious occasion was graced by the Director of Agricultural Services, Dr Wilkson Makumba and other top government officials and implementing partners. The turn up of farmers was great as about 116 adults attended the ceremony out of which 49 were male and 67 female, not to mention the numerous children who were also present as shown in Figure 9.

Figure 9: Group of women and children at the award ceremony

To create awareness on the ceremony, the Salima Agricultural District Division (ADD) public address system known as mobile van, went in the surrounding villages a day before the event for announcement of the ceremony. During the ceremony, the mobile van was playing agricultural music for entertainment as well as voice projection.

Figure 10: Salima ADD mobile van with public address system

As already mentioned, applicants were divided into three categories (male, female and youth) and in each category three people were awarded. Consequently, Salima had 9 winners namely; Jaziel B. Chanzamaluwa, Skenala Pilingu, Sailes Hassan, Mwatintha Evasi, Augustin Vincent, Friday Lobiamu, Benadeta Anderson, Lustika Mtsekwe and Nelece Mkupatira.

In each three categories, the first prize received the following: 1 bicycle, 1 wheelbarrow, 1 knapsack sprayer, 10 bags of fertilizer, 3 packs of 5kg maize seed, 2 hoes, 2 pangas and protective wear (gumboots, dustcoat/overall, raincoat); second prize had; 1 bicycle, 1 wheelbarrow, 1 knapsack sprayer, 5 bags of fertilizer, 2 packs of 5kg maize seed, 2 hoes, 2 pangas and protective wear (gumboots, dustcoat/overall, raincoat); and lastly the third prize comprised of; 1 wheelbarrow, 1 knapsack sprayer, 5 bags of fertilizer, 2 packs of 5kg maize seed, 2 hoes, 2 pangas and protective wear (gumboots, dustcoat/overall, raincoat).

Figure 11: Winning team with a truck full of gift items

Figure 12: The Director of Agric. Research left, handing over prize to Gogo Lustika

Gogo Lustika is in her early 80's and started farming many decades ago when she was a teenager. Gogo Lustika became third position in the category of women and she is proud of herself for such an achievement. In appreciation for the award, she mentioned that she has never dreamt of being awarded for her innovativeness in agriculture, not to talk of in her old age. This contest is first of the kind and she is happy that she is one of the pacesetters in farmer innovation in her area. The gogo was grateful to the sponsors for choosing her despite being old. She further narrated that she is rest assured that next growing season she will have input supplies of which she always struggle to buy due to lack of enough money. Lustika promises to continue imparting the knowledge to her neighbors and grandchildren.

Figure 13: The 2017 farmer innovation contest winning team in Salima District

Conclusion

The study was set to identify the best innovations developed by farmers in Thyolo, Salima and Rumphi districts which can potentially be researched further and refined for dissemination. Using the innovation contest that rewards the best innovators, about 85 innovations were received. After a tough expert evaluation and field verifications, only 24 innovators were found to be winners of the contest. Irrigation innovation is the top ranking innovation. Most innovations received are not novel but reinventing the wheel by modifying the indigenous knowledge. In addition, majority of the innovations received are from animal husbandry followed by crop management. Cost-effectiveness of an innovation seems to be an important factor if a technology is to be adopted. That said, the highest average score was from locally available resources which is further justifying that cost-effective of materials is important. Farmers in the pilot districts plus few from other districts are aware of the innovation contest and hopefully this will enhance their

creativity in finding solutions to their agricultural challenges. As earlier stated, innovativeness among farmers can potentially increase farmer incomes and food security. This has been true in certain instances as some innovators do sell products and services from their innovations. This has led to some farmers not sharing knowledge of their innovations. Innovation contest has been such a success in Malawi, the next step is to identify promising innovations for further analysis. Lessons can be drawn from this work to improve development process of technologies in the Department of Agricultural Research Services and other development agencies. Engaging farmers in technology development seem to be a common sense reaction if formal technologies are to be taken up.

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