

PIP Impact Report



“Changes in peoples’ motivation, land health and farm resilience: an impact assessment of the Integrated Farm Planning approach (PIP)”

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Abstract

This study investigated the impact of the PIP approach within the three provinces of the SCAD project in Burundi. In total 202 farmers were surveyed, with the analysis focused on impact in the three key-elements of the PIP approach: motivated people, healthy land, and resilient farming systems. The results of this impact assessment study show that the PIP approach has led to profound and quick changes, especially in farmers' motivation and mind-set, but also in the concrete actions that they undertake to improve the quality of their land and farm. The longer farmers work with the PIP approach the more they become motivated to invest in their farm. This results in more resilience, where farmers with a plan diversify their crops and income sources, driven by enhanced collaboration and trust within each village. The transfer of knowledge – about PIP creation and best practices – from farmer-to-farmer is determinant for this success. The correlation analysis done proves that there is a significant correlation between the key-elements *motivated people* and *healthy land*. This shows that investing in motivation and land health, by means of the three PIP principles of empowerment-integration-collaboration, actually works and will lead to more resilient farming systems and sustainable local development.

Keywords: PIP approach, Burundi, integrated farm planning, intrinsic motivation, farm resilience.

The pdf file is free of charge and can be downloaded via the website:

<https://www.wur.nl/en/Research-Results/Research-Institutes/Environmental-Research/Programmes/Sustainable-Land-Use-1/Sustainable-production-systems/The-PIP-approach-proud-farmers-better-soils-more-food.htm>

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Summary

This study investigated the impact of the PIP approach within the three provinces of the SCAD project in Burundi (Gitega, Muyinga and Makamba). It covered four different generations of PIP farmers and compared results with no-PIP farmers outside the project area. In total 202 farmers were surveyed, more or less equally divided over the three provinces and over the PIP generations. Next to basic farm data and household characteristics, the study focused on impact in the three key-elements of the PIP approach: motivated people, healthy land, and resilient farming systems. The results of this impact assessment study show that the PIP approach has led to profound and quick changes, especially in farmers' motivation and mind-set, but also in the concrete actions that they undertake to improve the quality of their land and farm.

Farmers' intrinsic motivation to invest and stay on the farm and in the village was identified as a crucial factor. The study also revealed that intrinsic motivation grows in time, and that the longer farmers work with the PIP approach the more they become motivated to invest in their farm. This results in more resilience, where farmers with a plan diversify their crops and income sources, driven also by enhanced collaboration and trust within each village. The transfer of knowledge – about PIP creation and best practices – from farmer-to-farmer is determinant for this success. The study evidences that even farmers in the adjacent villages are rapidly acquiring more knowledge, mainly driven by their willingness to learn, experiment and improve once they have a PIP.

The correlation analysis done in this study proves that there is a significant correlation between the key-elements *motivated people* and *healthy land* for all considered generations of PIP farmers and provinces. This shows that it is essential for any rural development project to first invest in these two pillars of a solid foundation for sustainable development. That farmer motivation and good stewardship of land are a flywheel for development is evidenced by the fast changes observed in the adjacent villages. Surveyed farmers in these villages affirm that within less than one-and-a-half year both farm and living conditions have already improved, and that they are more willing to stay in the village than before. This shows that investing in motivation and land health, by means of the three PIP principles of empowerment-integration-collaboration, actually works and will lead to more resilient farming systems and sustainable local development.

1. Introduction

This report provides an analysis of changes in peoples' motivation, land health and farm resilience resulting from the Integrated Farm Planning Approach (PIP) as implemented in rural communities of Burundi. It is based on an impact assessment study done in 2017, about three years after the first farmers in the Gitega Province of Burundi became engaged in the project "Fanning the Spark" – hereafter called SCAD (*Solidarité Communautaire pour l'Auto Développement*). SCAD was implemented by Alterra (now Wageningen Environmental Research – WENR), HealthNet-TPO, Achmea and the local partner Réseau Burundi 2000+. After the closure of SCAD, which worked in three provinces of Burundi (Gitega, Muyinga and Makamba, see Figure 1, green dots) its agriculture related activities, particularly the PIP approach, were continued by WENR and RBU2000+ under the project PAPAB (*Projet d'Appui à la Productivité Agricole au Burundi*).



Figure 1. Burundi and the SCAD provinces

Although this report is named PIP Impact Report, in fact, measuring impact after only three to four years of work is not possible. Furthermore, even when a certain impact would be measured, it is always uncertain as to what extent this impact can actually be attributed to a project or intervention. Hence, this impact assessment focuses on "outcome level", with outcomes being conceived as the "changes in behaviour, relationships and activities of people involved". In our case this means that this impact assessment report focuses on changes in motivation for farming among smallholder families, the social cohesion in the village, farmers' sense of stewardship to restore the land and invest to keep it in good conditions, the investments in sustainable land management practices, better farming, more resilient farming systems, and better living conditions for the household. Throughout this report these changes will be highlighted and explained, and although referred to as "impact", most of these measured changes are at outcome level.

As mentioned, the core approach of both the SCAD and PAPAB projects is the PIP approach (from French 'Plan Intégré du Paysan'). It is an approach that empowers farmers to be responsible stewards of their land, and it fosters resilience-based stewardship. Crucial here are the terms **resilience** and **stewardship**. Resilience is the ability of a (farming) system to continue providing its ecosystem services even under shocks (e.g. due to extreme weather events) and stress (e.g. human-induced erosion or soil fertility loss). Stewardship is the acceptance (by farmers) of the responsibility to safeguard natural resources as an integral part of the ecosystem. This requires a significant change in mind-set, both among smallholder farmers and in policymakers.

The starting-point of the PIP approach is that in order to work towards resilient farming systems, first a solid foundation is needed of motivated people and healthy land. While many other approaches often start with "implementing solutions", the PIP approach first builds this foundation. With a dynamic process of vision building, planning, learning and action, the PIP approach generates an ever-increasing number of proud farmers who realize that their land is their main asset, and who feel able and intrinsically motivated to invest in their farms. This is a huge change, because once this foundation is laid, collaboration with other stakeholders and integration of new activities further drives wide-scale change. The following three "PIP principles" are therefore crucial in the approach: empowerment, integration and collaboration. Applying these principles to smallholder farmers means building their capacity and motivation to experiment with improved practices, to learn from others, and to undertake collective action to scale-up resilient farming village-wide. As this a major change in mind-set, in which "farmers by default" (without alternatives) gradually become "farmers by choice" (land stewards, sustainable entrepreneurs), this impact assessment emphasizes "changes in behaviour"; i.e. doing things differently, better, based on learning and the intrinsic motivation to improve.

In a nutshell, the PIP approach starts in a village with farmer innovators (PIs, from French: 'Paysans Innovateurs') who spread their knowledge to next generations of PIP farmers. These PIs are trained in several topics, ranging from crop management to soil erosion practices, and make with their family members an integrated farm plan: the PIP. A PIP consists of two pictures, one with the farm's current situation and one with the vision of the farm household (see Figure). Most important is that the PIP also includes a concrete action plan. This motivates the family to plan and invest in their future. Next, PIs transfer their knowledge through farmer-to-farmer trainings in competitions, disseminating this way the awareness and intrinsic motivation throughout the village and beyond. As such, an increasing number of farmers is reached, laying the basis for more trust, collaboration and sustainable development within the villages.



In the following chapters we explain about the set-up of the study and characteristics of the interviewees, and then dive into the results of this study, i.e. the impact of PIP on “motivation, land health and farm resilience”, as well as correlations between these PIP categories.

2. Set-up of the study

The survey was designed to assess changes (in behaviour, practices and the way farmers deal with their farm, the land and its natural resources) as much as possible in quantitative terms: investments (in land management, fertilizer, livestock, the household) and changes in behaviour and motivation. This was not an easy task, and only after having done the survey we realized that not all data was actually useful and did provide us the right and expected information. For instance, the desire to measure yield changes due to PIP was not accomplished, as not enough data was collected for most crops, and furthermore because the numbers (of yield, and land size) given by farmers appeared not to be reliable. Even when most prominent outliers were eliminated from the dataset, yield data still often didn't fall within the expected (normal) range. Therefore we decided not to use the yield data collected this time.

Flaws in the survey set-up and dataset were also detected in several questions relating to behaviour/motivation of farmers, as well in the calculation of some other factors. Often this was due to the kind of questions asked (not well understood by the interviewee) but often missing or unreliable data was also caused by the contracted interviewers, who carried out the survey too fast, and without checking the data given by the farmers or even during data entry in the form. These issues were only discovered after having finished the complete survey, and crucial lessons were learned concerning the importance to work with very-well trained and committed interviewers: those who only want to get the best data out of the survey, and not just do a "fill the survey" exercise. Nevertheless, despite these flaws, more than enough reliable data was collected in the survey, and this report presents everything that could be retrieved from the data base; all together showing a very insightful picture of the impact of PIP on different generations of farmers, and in the different provinces where SCAD was active. The following variables are therefore at the basis of this study and will be dealt with along the presentation of the results:

Generations of PIP farmers & time

This is the most crucial variable of the study, given that we want to understand foremost how the impact of PIP differs across PIP generations, and hence how impact differs when farmers have been working with PIP for a longer time. These differences across PIP generations have a lot to do with debates on "adoption of technologies", in which a distinction is often made between Innovators, Early adopters, Early majority, Late majority and Laggards (Leeuwis, 2014). In our case, the Innovators are often the PIs, the lead farmers who are chosen by the village to become a PI or farmer trainer, because they are more future-driven, often already with a different mind-set and intrinsic motivation, and more willing to change and innovate. However, at the same time, it is not true that farmers of later PIP generations are less innovative or active: on the contrary, even in the third and fourth generation PIP farmers, real innovators and early adopters can be found, but they appear in later generations simply because they haven't had the opportunity to start earlier and become involved in PIP. Hence, although these farmers will follow later, this doesn't mean that they are adopting PIP elements less, or less quickly. We will see in this study that farmers from later generations are sometimes evenly or more motivated than the earlier generations, but that their investments in practices is lower because they have started later with PIP creation. Since time is a very important factor in establishing change, we will see that the more time people have worked on the realization of their PIP action plan, the more extra income they are able to generate, and the more intrinsically motivated they become to continue investing in PIP activities and farm improvements. Throughout the report we will explain this in the text.

It is furthermore important to emphasize that technical/agronomical workshops with farmers (mainly about better crop and land management) were only held with the PIs; not with other generations of PIP farmers. The assumption of the SCAD project was that knowledge would be transferred "automatically" or according to a natural process from these PIs to the other farmers, especially during the PIP competitions, but also spontaneously. Hence, this knowledge transfer was not pushed or organized by the project, although of course – with the support of the DPAAE, the local extension service – whenever needed and possible technical assistance was given to any farmer who requested this. Nevertheless, in general we can state that the knowledge acquired by later generations of PIP farmers was mainly the result of spontaneous farmer-to-farming transfer of this knowledge. Again, time is an important factor here that will distinguish earlier (PIs) and later generations of PIP farmers (in the original SCAD villages and in the adjacent villages).

Provinces & time

Another crucial variable throughout the study are the different Provinces, which is – again – closely related to the time that PIP farmers have been involved in PIP activities when this study was carried out (August 2017). Differences between provinces (but also between communes, although not presented in this report) should therefore be read while taking into account that the PIP approach was not introduced in all provinces at the same time. We started in Gitega (2014), then Muyinga (one year later) and finally (soon after) in Makamba, but the process of scaling-up to the next generations was a bit faster in both Muyinga and Makamba compared to Gitega. Next to the aspect of time, also local differences (both biophysical as well as socioeconomic) influence the results of the study when Provinces are compared, and these will be highlighted there where they are applicable and useful to rightly interpret the results.

Gender

A third variable which was taken into account in the study was gender, and both male (60%) and female farmers (40%) were interviewed. However, it was decided not to take differences between male/female into account in this report, as it could be wrongly interpreted as a gender difference, while in fact the PIP approach aims to involve both husband and wife (and other household members) in all stages. This implies that it should not matter if either the husband or the wife is interviewed during the survey, as it was assumed that what was expressed by the interviewee was the current situation of the whole household, and not of the particular (male or female) farmer interviewed. In the analysis we did look several times at differences between male/female interviewees in certain aspects measured, but no big differences were found; confirming our assumption. However, in future studies, the impact of the PIP approach on gender issues is definitely an aspect that needs to be further investigated.

3. Characteristics of farmers surveyed

PIP farmers from generations 1, 2 and 3 that were surveyed for this study came from all the SCAD villages, evenly distributed across the villages and Provinces, and with randomly selected farmers. For the fourth generation, i.e. those PIP farmers from the adjacent (scaling-up) villages, some extra farmers were surveyed in Gitega because much more families have already been reached there in the adjacent villages compared to the other Provinces (Table 1). Farmers without a PIP were selected from villages a bit further away, where PIP was never implemented, and this group therefore functions as the control group.

Table 1. Number of farmers surveyed per generation, divided over gender, province and their totals

	Generation 1	Generation 2	Generation 3	Generation 4	No-PIP	Total
Female farmers	12	22	26	14	12	86
Male famers	18	22	18	25	33	116
Gitega	10	15	13	19	15	72
Makamba	10	15	15	10	15	65
Muyinga	10	14	16	10	15	65
All farmers	30	44	44	39	45	202

Generation 1

These are the PIs, the farmer innovators. In Gitega most PIs started to implement PIP activities in 2014, so about 3 years before the survey for this study was done. In Muyinga and Makamba the PIs started respectively about 12 to 15 months later. The PIs were chosen by the villagers to be the representatives and firstly-trained in the SCAD project, and they received therefore more intensive training than the other generations.

Generation 2

These are the farmers trained by the PIs during the first PIP competition. This was done after the PIs had implemented PIP activities during one growing season, so on average the 2nd generation started half a year later with PIP than the PIs. The specific farmers to be trained by the PIs (with each of them training on average 10 new 2nd generation PIP farmers) were chosen by the PIs, so often we will see that these are their friends, neighbours or relatives.

Generation 3

This is the final tranche of farmers in the original SCAD villages trained during the second PIP competition. Again, this generation started half a year later than the 2nd generation, thus more or less a year later than the PIs. This 3rd generation is trained indistinctly by either 1st or 2nd generation PIP farmers, as anyone willing to train from the first two generations could start training a group of new farmers during the 2nd PIP competition. Some farmers in this 3rd generation are farmers from adjacent villages who participated in the 2nd PIP competition, but these are not sampled in this study.

Generation 4

This is the new generation of PIP farmers in the adjacent villages, after the start of scaling-up activities. This 4th generation of PIP farmers is trained by the 3rd generation PIP farmers from their own village who had already participated in the 2nd PIP competition (as mentioned above). Before training the 4th generation in a PIP competition, these new PIP trainers received an intensive refresher training, and during their trainings were as much as possible supported by SCAD staff and extension workers of the DPAE (extension service) to guarantee the quality of knowledge transfer to the 4th generation PIP farmers.

No-PIP (Control)

These are farmers from other villages where PIP activities have never been carried out, and who have had no or hardly any contact with the SCAD villages or PIP farmers. Villages were chosen which are as much as possible comparable to the original SCAD villages in terms of agro-ecological and socio-economic conditions, trying to guarantee that this is indeed a representative control group for this study.

Table 2. Characteristics averaged per PIP generation

	Generation 1	Generation 2	Generation 3	Generation 4	No-PIP
Average age	48 ^A	47 ^A	41 ^{BC}	39 ^B	45 ^{AC}
Average number of people in the household	6	7	6	6	6
Average farm size (ha)	1.96 ^A	1.78 ^A	1.22 ^B	1.51 ^{AB}	1.53 ^{AB}
Number of plots	8	7	6	8	7

Table 2 shows some basic characteristics of the different PIP generations. The first two generations were on average 48 and 47 years old; the later generations were significantly younger with an average of 41 and 39 years old, respectively (the superscript letters A, B and C indicate if groups are significantly different from each other for a certain variable). The control group averaged between these four groups of PIP farmers. This shows that the selection of PIs is a bit biased in terms of age, and that in general the older more experienced farmers are chosen by the village to become a PI. Next to that, the given Farmer-to-Farmer Training is based on friendship, and most probably the PIs will train 2nd generation PIP farmers during the first competition who are of their own age. Hence, the 2nd generation is about the same age as the PIs, and thus significantly older than the 3rd and 4th generation PIP farmers. These latter two are thus younger, which is logical given that all other interested farmers can join the second PIP competition, and that now younger farmers mostly remain to be trained. Interesting to see that the 4th generation, so the new farmers trained in the adjacent villages, are the youngest (39 years) of all: these can be considered the most spontaneous of all four generations, given that PIP creation here is entirely based upon willingness and interest to join this first PIP competition. In the no-PIP villages a more random category of people with different ages were surveyed, and we see that here the average age is somewhere in between (45 years old). Concerning average number of household members we see no differences among the generations of PIP farmers.

However, Table 2 shows that the average farm size was only significantly different when comparing 1st & 2nd generation to the 3rd generation. The cause of this difference in farm size is correlated to the age difference that was observed before. Again, for the selection of PIs the criteria such as farm's performance, social status and respect in the community, leads most probably to somewhat older people and therefore to farmers with bigger farms, compared to younger farmers. However, the farm size seems to be high in general, compared to Burundian averages. Farmers estimate their land in meters, and they use the distance between two feet for measurements, which might lead to a distortion in the final calculation. We are however assuming that all farmers give a similar wrong estimation of their land size, and that therefore differences in farm size are actually present. The consequence for this study of this too highly estimated farm size is that we don't take it into account during calculations in the analysis (e.g. we wanted to present the amount of organic material used per ha, but refrained from that in this study). Finally, number of plots is also lowest for Generation 3. This is however very variable in size and not much can be deducted from this.

Table 3. Characteristics averaged per province where SCAD operated

	Gitega	Makamba	Muyinga
Average age	45A	43A	42A
Average number of people in the household	6	6	6
Average farm size (ha)	1.39 ^A	1.49 ^{AB}	1.86 ^B
Number of plots	8	7	6

When looking at the same characteristics averaged per Province (Table 3), we see a more homogeneous picture for average age, without any significant differences between the provinces. However, farm size is significantly higher for farmers in Muyinga than in Gitega, although the number of plots is exactly the reverse (8 plots per farm in Gitega and only 6 plots per farm in Muyinga). This can have many reasons and it can differ between different communes or even villages within one province. For instance in Makamba, it is observed that the number of plots is generally higher in Mabanda commune than in Vugizo commune, because in Mabanda commune, they try to split the land in different plots in order to diversify on their commercial crops and as such have more market access to nearby Tanzania. However, concerning farm size, we cannot explain why farm size in Muyinga is so much higher, as our impression is that land pressure and population density is highest in Muyinga, and thus farms are smaller. Further research and analysis is needed to be more conclusive on this issue, but as we decided not to take farm size into account in this report (as explained before due to possible over-estimation by farmers), we do not further elaborate on reasons for these differences.

As a final consequence for the analysis reported, and given that the more the PIP is extended the less selection bias plays a role in the generations of PIP farmers, we have decided in this study to mostly focus our analysis on the differences between on the one hand “the 3rd and 4th generations PIP farmers” and on the other hand “the no-PIP farmers (the control group)”. Although we show all the generations of PIP farmers in most of the figures to see the differences between the different groups, the main focus should be on the generations 3 & 4 and the no-PIP farmers, to see the effect of the PIP approach in its most reliable form. Additionally, when comparing between different provinces, we take all farmers into account who took part in this survey.

In the following sections the results of the study will be presented, thereby focusing – as explained – on the differences between the different generations of PIP farmers and between the three provinces. This will be done for the most salient results concerning:

- Motivated people (Chapter 4)
- Healthy land (Chapter 5)
- Resilient farming (Chapter 6)

4. Motivated people

Motivation to invest in and be a good steward of the farm, the land, and its natural resources, is an essential element of the PIP approach, and one of the two pillars of the solid foundation in which we invest with the PIP approach. Particularly important is the intrinsic motivation, i.e. doing something because one enjoys the activity and is driven to improve, without any external incentives such as food aid or payments. This is what we have tried to capture in the survey, and the main results are presented in the following sections.

Implementation of PIP activities

A first good indicator of motivation is of course the extent to what households have implemented the activities that were planned in the Integrated farm Plan. Figure 2A shows that 10% of the first two generations PIP farmers managed to implement and execute their initial plan completely. According to our information, most of these farmers have already made a new plan, or have adjusted their initial PIP to continue working and improving their farm. Similarly, most of the farmers who are almost done implementing their PIP (about 40% of the PIs, and only few from the 3rd and 4th generation) have new ideas integrated in the original PIP and affirmed having lots of ideas to start a new PIP. Overall, Figure 2A shows clear differences between the four PIP generations, reflecting the differences in time (years/months) already invested in implementing the PIP. The fact that even among the 3rd and 4th PIP generations already more than 50% of the farmers is at least about halfway implementing their PIP, shows that intrinsic motivation to improve and invest in the farm is very high once farmers have a plan and a vision.

Concerning the provinces, Figure 2B also clearly shows the influence of “time working with PIP”. In Gitega more than 30% of the plans are completed or almost done, in Muyinga just less than 30%, and in Makamba about 20%.

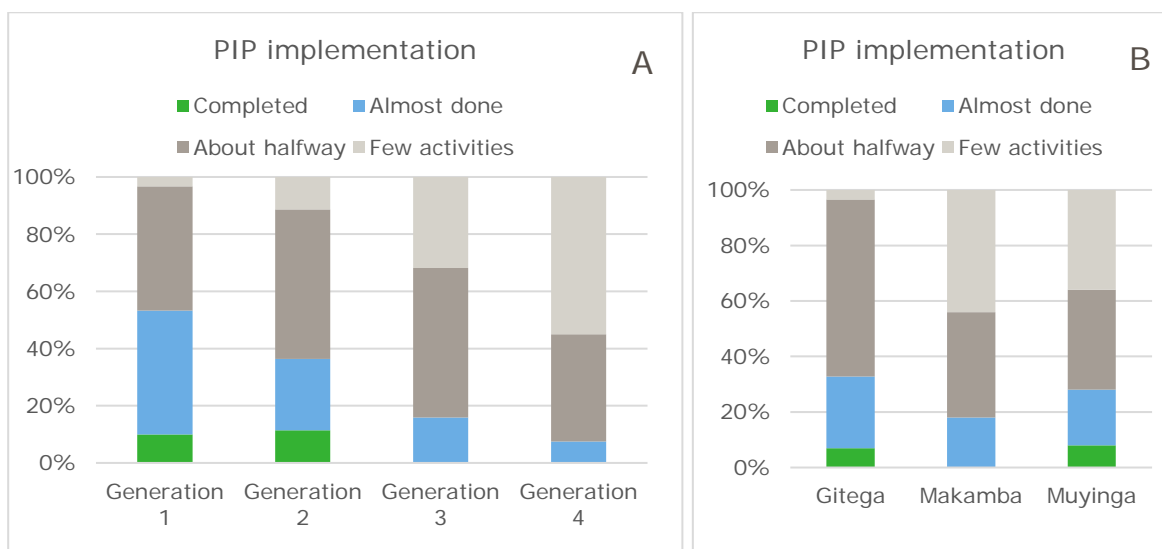


Figure 2. The extent to what PIP has been implemented for different farmer groups (A) and provinces (B)

Changes in farm and living conditions

Farmers were asked to respond to several statements concerning changes over the past three years, from the situation before the PIP started, compared to their current situation. The first statements focused on the changes on their farm and in their lives over the past three years, responding to: “my farm is in better conditions than 3 years ago” “my life is better than 3 years ago” (Figure 3). A clear trend is seen, where farmers from the third and fourth generation show that their farm and life is absolutely better than three years ago. Especially eye-catching is the difference compared to farmers with no-PIP, where more than 30% of the farmers responded that both their life and their farm are worse than 3 years ago, and a similar percentage responded that conditions had remained the same. Also interesting to observe is that all PIP farmers from the 3rd generation responded to these questions with ‘yes’ or ‘yes absolutely’, and only a few percent of

the 4th generation stated that the situation had remained the same. All together this shows rapid change in these generations after starting with PIP: within less than one-and-half year farmers perceive that their farm and live in general have tremendously improved.

When comparing the different provinces (taking into account all surveyed farmers), it shows that the figures are very similar. However, for both statements Gitega is just scoring a bit better, followed by Muyinga, and finally Makamba: this reflects again the sequence of implementation of the PIP approach, and underlines that the longer farmers work with the PIP approach the more it changes their farm and lives. This change is fast, as observed before.



Figure 3. Percentage of farmer response per PIP-generation and Province to the statement “my life is better than 3 years ago” (A1 & A2) and “My farm is in better condition than 3 years ago” (B1 & B2).

Willingness to stay and financial situation

A next series of interesting statements concerning the motivation of farmers involved in PIP as compared to no-PIP farmers concerns their willingness to stay where they live and how much money they have now as compared to 3 years ago (Figure 4). Again we see huge differences, with more than 80% of the 3rd generation and more than 90% of the fourth generation of PIP farmers affirming that they are more willing to stay in their village as compared to 3 years ago; i.e. before PIP. However, for these generations, in fact this is a comparison to less than 2 years ago, which is even more impressive, especially when compared to the control group where less than 50% of the farmers is willing to stay in the village. This is a crucial issue, because farmers who are willing to stay are also more motivated to invest in their farm. One of the reasons that they are more willing to stay is for sure the better financial situation as compared to the before PIP situation. Figure 4 shows that about 90% of the PIP farmers already have more money than 2-3 years ago!

This evidences the fast change and the important quick wins that can be achieved with the PIP approach! When comparing the Provinces there are no big differences in both aspects. However, in comparison to Figure 3, it is now Muyinga which is better of (scoring higher) than Gitega and lastly Makamba. Apparently money and extra income can be easier generated in Muyinga, which is explained by its close location to Tanzania and more business opportunities, which are quickly benefitted from once farmers have a plan and a vision. Nevertheless, it is still impressive that even in Makamba, where the PIP started later, about 80% of the PIP farmers confirm to have already improved their financial situation and being more willing to stay and live in their village. Indeed an essential driver for motivation!



Figure 4. Percentage of farmer response per PIP-generation and Province to the statement "I'm more willing to stay than 3 years ago (C1 & C2) and "I have more money now than 3 years ago" (D1 & D2).

Future prospects

Next to surveying the changes in the past three years, also future prospects were asked for: if farmers expect their life, farm and village to be in better conditions in five years, if they expect to produce more and have more money, if they expect to do more off-farm activities and if they expect their children to have a better life in five years' time. In general, for all these aspects the responses from the different generations of PIP farmers and no-PIP farmers showed the same pattern, with PIP farmers being more positive towards the future than the no-PIP farmers.

The responses to two of these statements are presented in Figure 5. Comparing the 3rd and 4th generation PIP farmers to the no-PIP farmers, two things stand out. First, most farmers in the no-PIP villages also expect their life and farm to be better in the future, but are less convinced as

compared to the PIP farmers (only few say “absolutely yes”). Secondly, over 20% of the no-PIP farmers either think their future will be worse, or, and this has probably a lot to do with a lack of vision, they don’t know. Needless to say that having a more positive future outlook will influence the motivation of farmers to invest in their land and keep it in good conditions.

When comparing the Provinces there are again no big differences, although it is interesting to see that almost all of the no-PIP farmers who have a negative future outlook are living in Gitega. Apparently the future prospects in the other two provinces are better anyway, although the percentage of negative farmers is too small in this sample to draw conclusions here.



Figure 5. Percentage of famers per PIP generation and Province responding to the statement “My own life will be better in 5 years’ time” (A1 & A2), and “This farm will be better in 5 years’ time” (B1 & B2)

We furthermore asked farmers about expected off-farm activities, which shows the same trend: that farmers with a plan seem plan more for off-farm activities in the next five years. In terms of diversification and especially resilience, it’s very good for farmers to create these new forms and sources of income, by not only focusing on the output of the farm itself, but also by investing in new ways of creating income, often in collaboration with other farmers or friends. This is an important contribution also to a more resilient community.

Village collaboration and trust

Next to motivation related questions concerning change in the household and the farm, the survey also looked at the collaboration and trust among the farmers in each village and if the village was in a better condition. The perception that the interviewees have of the collaboration and trust in the village is a very important issue for the motivation of people to invest in their land. These are the enabling conditions, and is emphasized a lot throughout the PIP approach by means of exchange visits, farmer-to-farmer trainings, collaboration in the PIP competitions, and the next stage of village vision development. Hence, differences in these aspects explain a lot about the impact of PIP, especially at outcome level.

Figure 6A presents the farmers' perception of the change in collaboration and trust in the village compared to 3 years ago (this figure combines both aspects in one graph as responses were very similar). In general, farmers with a PIP consider that there is much more collaboration and trust in their respective villages, while farmers without a PIP are far more negative. This also reflects how the PIP approach works at village level: where farmers create a PIP and become more empowered, collaboration and trust grows in the whole village. The difference in this sense with the no-PIP villages is striking. It's furthermore interesting to notice that the 4th generation is significantly lower in collaboration and trust than the third PIP generation. Of course, this generation only started recently with the PIP, but more importantly, the 4th generation is living in the adjacent villages where PIP is only in its first steps (in Muyinga and Makamba only one PIP competition was done when this survey was carried out, compared to Gitega where 2 PIP competitions were carried out in the adjacent villages). Hence, real collaboration is yet to start in these nearby villages, but even so almost all 4th generation PIP farmers confirm that collaboration and trust have already improved.

For the 3rd generation, which lives in the original SCAD villages, it is logical (but equally a nice result) that they are so positive about the changes in collaboration and trust at village level: in most villages the process of village vision development has already started, and this generation has seen how earlier PIP generations have achieved changes and are now leading the village sustainable development. A very similar picture, with almost the same percentages, is obtained when farmers are asked "is this village in a better condition than 3 years ago?" (Figure 6B).

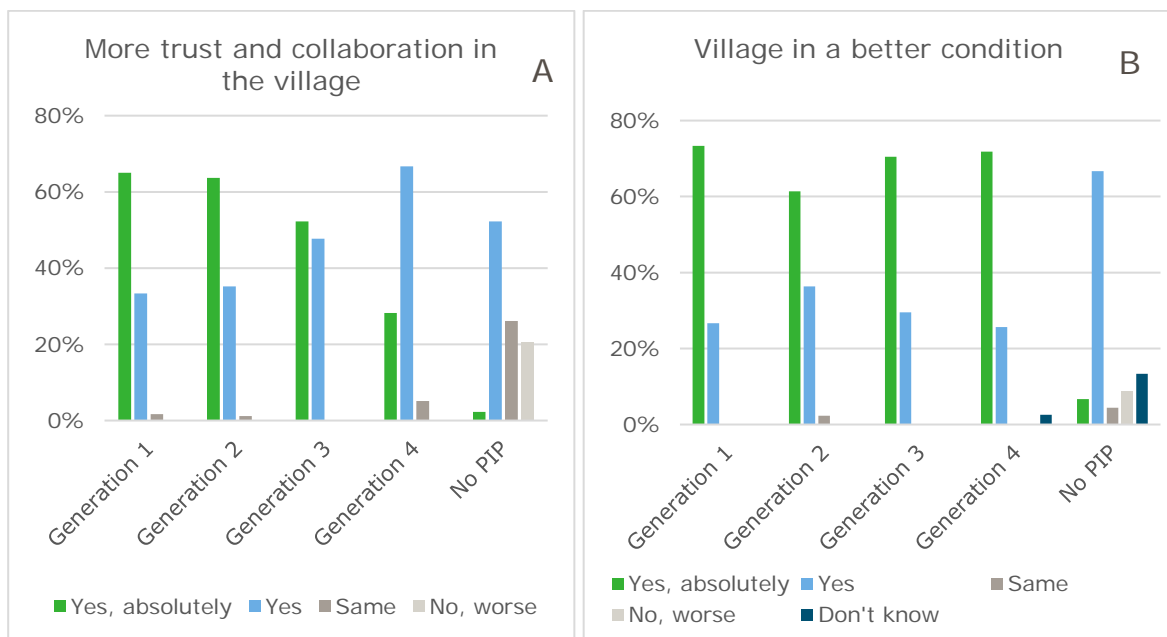


Figure 6. Percentage of farmers responding on changes in collaboration and trust in the village combined (A) and percentage on the question "The village is in a better condition than 3 years ago" (B).

Intrinsic motivation

Finally, in this chapter of Motivated people, we also asked the data collectors themselves to give us their opinion on the intrinsic motivation of the farmers in general, so as a final conclusion of all responses of a certain farmer and the impression that each of them has given during the survey (Figure 7). In order to do so, we emphasized the data collectors that they also had to take into account open questions to farmers in which they were asked to explain how their farm would look

like in 10 years from now, what their objectives are, and what kind of investments they had in mind. But of course, the data collectors foremost had to judge the general impression that the interviewee had given, and compare all surveyed farmers to be able to come to a final judgement.

As Figure 7 shows, for all PIP generations and the no-PIP farmers the pattern is very clear, with a gradually declining intrinsic motivation from the first to the 4th generation, being the least in the no-PIP farmers. This evidences why intrinsic motivation is so crucial in the PIP approach, and gives a hopeful picture towards the future for all farmers working with PIP. The more and the longer one works with PIP and invests in the farm and the land, the more motivated one becomes to continue investing: without any incentives, purely driven by the intrinsic motivation and willingness to improve. It is clear that the PIP is able to break the vicious circle of poverty, degradation, low productivity and despair. It resets the farmers' mind-set, and reverses the behaviour of waiting for somebody else (external agents) to start acting. Farmers can do it themselves, that's what they discover in the very first years (or even months) of working with PIP, when they start working according to their plan and vision, driven by their own intrinsic motivation and the dynamism within the village to improve living conditions together.

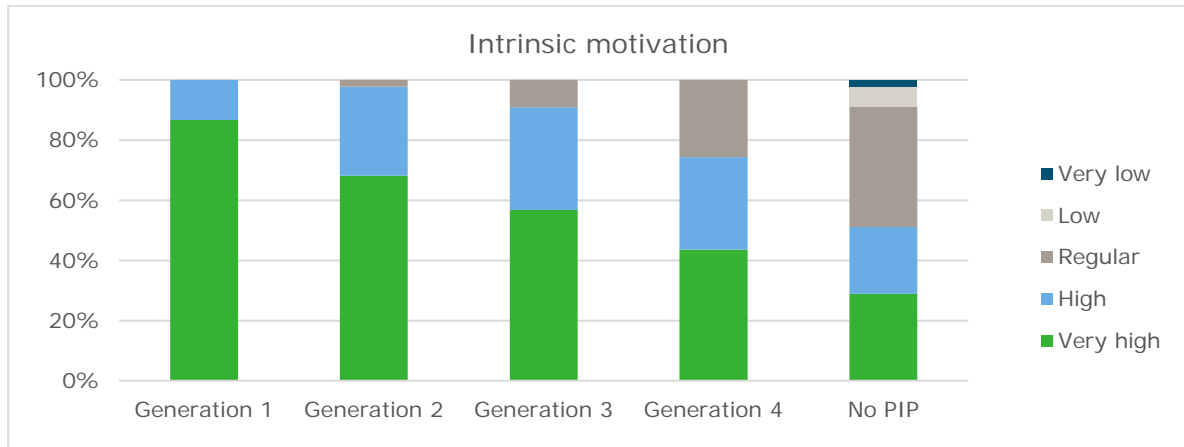


Figure 7. Intrinsic motivation of the different PIP generations and no-PIP farmers, as reflected by the data collectors, after considering all questions and response on past and future changes.

5. Healthy land

Within the PIP approach, fostering investments in land health is considered an essential (second) aspect of the solid foundation for development, as well as for advancing towards a resilient farming system. Since farmers whom are engaged in the project and the PIP approach make a plan based on their vision, this study also analysed to what extent this is translated into real action and concrete measures to improve the health of the land, i.e. its physical, chemical and biological quality. We focused the survey on natural resource management practices, fertilizer use, and on crop & land management practices, and the results are presented and discussed hereafter.

Natural resource management practices

In the survey we asked farmers about (changes in) use of different NRM practices: basic compost pits (the traditional ones), improved compost pits (as promoted by the project, with a proper design and a roof, called compost pit “plus”), contour lines or slow-forming-terraces along the contour line with/without a vegetative component, stone bunds, mulching, agroforestry, gully control, and vegetation borders. Of all these practices, the following 4 generated comparable data along all considered groups of farmers: improved compost pits, mulching, agroforestry, and the contour lines with vegetation (Figure 8).

It is evident from Figure 8 that the longer and more farmers have worked with the PIP approach, the more different NRM practices they have implemented; especially generations 1 & 2 score very high for almost all practices. What furthermore is interesting to see is that the 4th generation (the PIP farmers in the adjacent villages) score higher on “improved compost pits” and “mulching” than the 3rd generation PIP farmers. This shows that these are dynamic and enthusiastic farmers, the early adopters of practices, who spontaneously and due to their intrinsic motivation have started with PIP. In the previous chapter we have seen that overall the 3rd generation PIP farmers score higher on intrinsic motivation, but apparently for these two practices (especially the improved compost pits which can be implemented quite easily) the 4th generation is more enthusiastic.

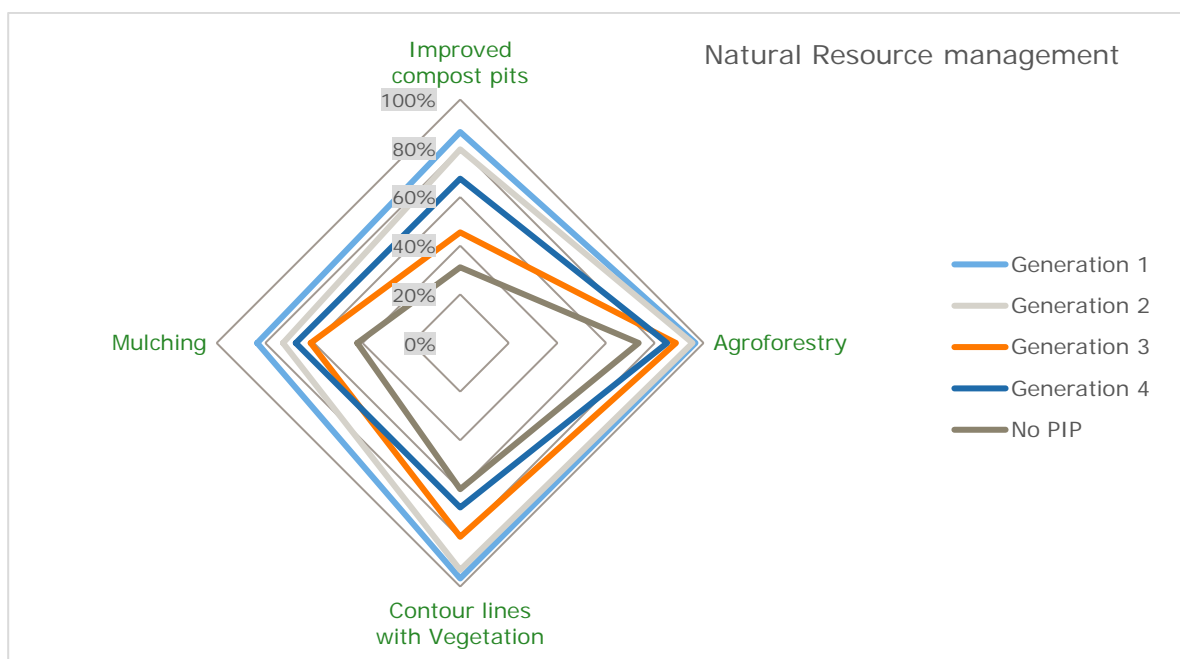


Figure 8. Percentage of farmers applying mulching, contour lines + vegetation, agroforestry and improved compost pits.

Three of the NRM practices will be discussed in more detail in this section: the improved compost pits (discussed together with organic fertilizer use), the contour lines with vegetation, and mulching.

Improved compost pits & organic fertilizer use

Although many farmers already made use of basic compost pits before the project started, SCAD introduced improved compost pits, with good aeration and improved management, which increases the quantity and quality of the compost. Figure 9 shows the use of improved compost pits in more detail, and we can see that even among the no-PIP farmers about 30% already uses

these pits. This is a practice that has been promoted through many projects since a long time, but within the PIP approach the improved compost pits (which require much more work and dedication than the basic ones) were promoted within an integrated strategy. This explains the higher uptake by PIP farmers of these compost pits, who now with a PIP in their mind and on paper, are more intrinsically aware of the added value of improved compost pits compared to the basic ones. As already observed above, the 3rd generation scores lower on improved compost pits than the 4th generation. Again, since making an improved compost pit is not as time consuming as contour lines and agroforestry, this practice is taken up faster by the (more spontaneously enthusiastic) 4th generation PIP farmers; although only recently having started with PIP.

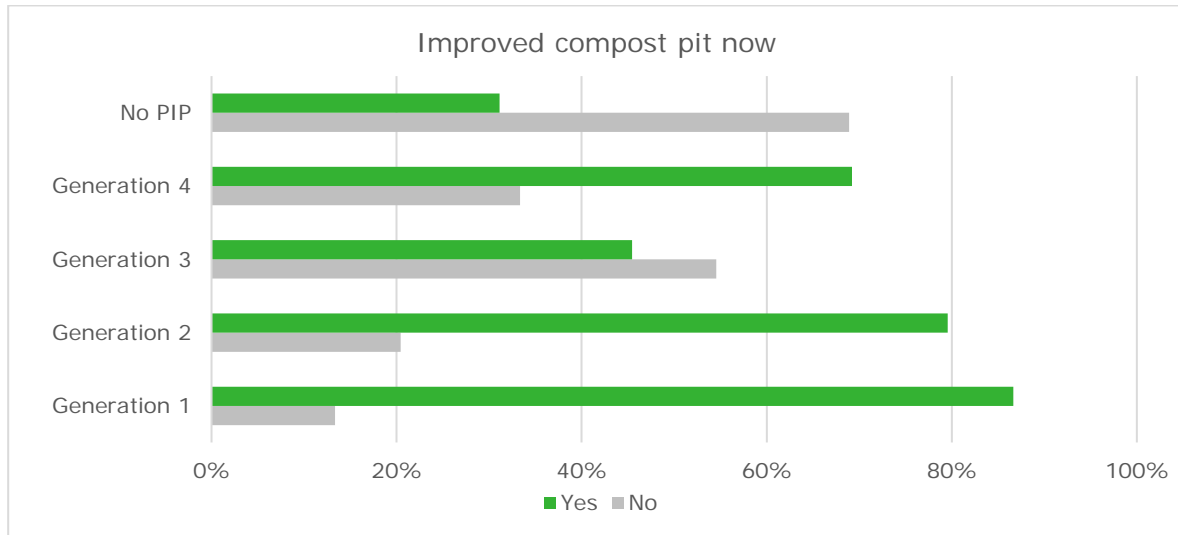


Figure 9. Current use of an improved compost pit by different PIP generations and no-PIP farmers

More insight in the use of improved compost pits and the organic matter produced in these pits is provided by Figure 10. As Figure 9 only asked for the use or no-use of an improved compost pit (but not the number of compost pits per farmer), Figure 10 shows that total amount of organic fertilizer used on the fields is particularly high for the PIs. As most of this organic fertilizer is produced on the farm (both as compost and as animal manure), this shows that most PIs have (much) more than one compost pit. There are evidences of PIs having 6 improved compost pits, which explains the high amounts of organic fertilizer produced. Furthermore, interesting to see here is that the 3rd generation uses more organic fertilizer on the farm than the 4th generation: hence, they have more compost pits and produce also more manure with their (often recently purchased) animals. However, given the enthusiasm of the 4th generation to take-up the improved compost pits, we expect a fast increase also within this generation of total organic fertilizer in the coming years.

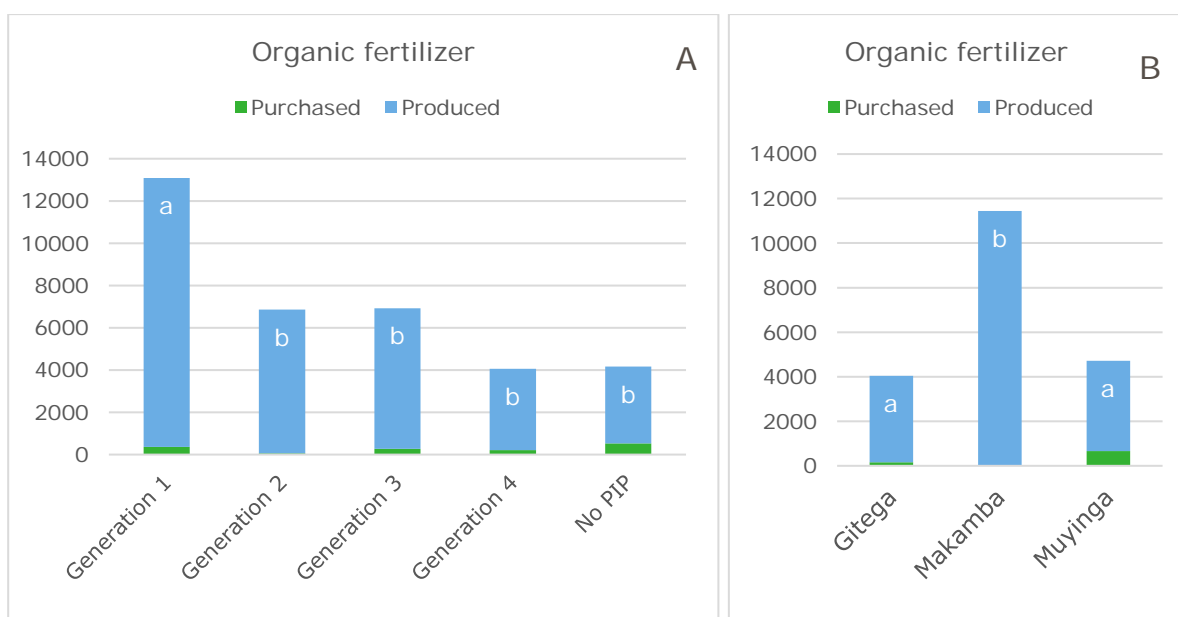


Figure 10. Total organic fertilizer used per generation of PIP farmers per farm (A) and per province (B). Letters indicate significant differences between the different groups.

When looking at the different Provinces and the organic fertilizer used (Figure 10B), we see that especially in Makamba farmers produce huge amounts of compost on their farms. In this Province they hardly buy any organic fertilizer, contrarily to Muyinga where about 15% of the organic fertilizer used is bought. This however is still quite low compared to what is produced on the farm, and is even lower in Gitega (4%) and of course Makamba (less than 1%). All together this shows the importance of compost produced on the farm as input on the fields of the PIP farmers.

Contour lines with vegetation & mulching

The change in use of contour lines with vegetation and in mulching over the past 3 years is given in Figure 11. It shows two rather different situations. For the contour lines with vegetation (the trenches or slow-forming-terraces), we see a clear trend in which earlier generations of PIP farmers have adopted this practice more often than the later generations. For instance, 80% of the 1st generation PIP farmers didn't have such contour lines three years ago but do have them now. This evidences that constructing contour lines is time and labour consuming, and that it is generally not among the first practices that a PIP farmer will implement (opposed to the compost pits which are easier to build). The difference between the 3rd and the 4th generation is due to the same reason, but also important to bear in mind that these contour lines are often constructed in groups, and that collaboration is higher in the original SCAD villages (where the 3rd generation can collaborate with the previous generations). Furthermore, it should be mentioned that contour lines are quite heavily promoted by the Government over the last two years (following the example of terraces in Rwanda), but the impact of this governmental programme is not very high as can be seen by the low uptake of these practices by the no-PIP farmers.

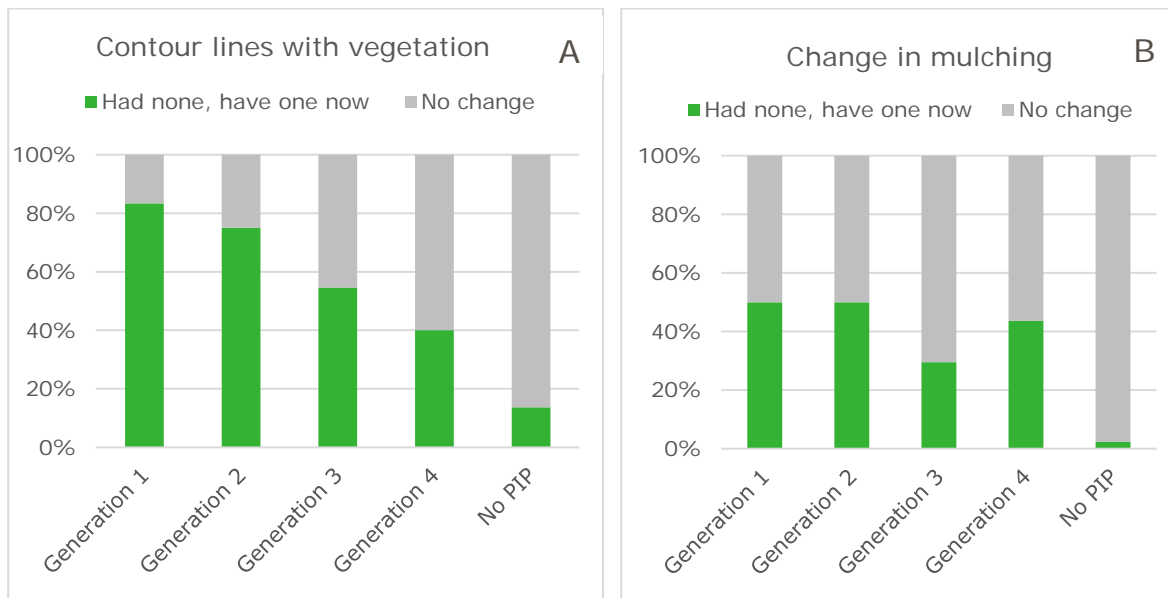


Figure 11. Change in use of contour lines with vegetation (A) and change in use of mulching compared to three years ago (B). Please note that the “no change” can refer to either “I was not doing this practice 3 years ago, and I am still not applying it”, or “I did it 3 years ago and I am still doing it”.

For mulching the picture is different. It shows smaller differences between the PIP generations, which is explained because this practice was only quite recently promoted by the SCAD project. About 40% of the farmers was already doing this practice before PIP started (Figure 8), but now another 40-50% has adopted mulching thanks to the PIP approach, and is now aware of the importance of it, especially in reducing the impact of drought. Furthermore, what is interesting to see is the enthusiasm of the 4th generation as compared to the 3rd. We have seen this trend also for the improved compost pits, and although the 3rd generation is overall more intrinsically motivated, the 4th generation picks-up the less labour demanding NRM practices more quickly.

Fertilizer use

Table 4 shows that in general, among all farmers, most used chemical fertilizer is DAP (78% of all farmers), followed by urea (42%) and KCI (20%). Furthermore, almost all farmers (98%) produce organic fertilizer (compost or composted manure) on their farm, while only 14% purchases it (as seen before, mainly in Muyinga).

Table 4. Percentage of all farmers using or not using chemical fertilizers and organic fertilizers

	NPK	KCl	Urea	DAP	Lime	Org. fert. purchased	Org. fert. own farm
Users of specific fertilizers (% of total farmers)	5	20	42	78	4	14	98
Average amount used per user (in kg)	34	29	21	63	212	2,019	6,460

When we analyse the average amounts of fertilizer use (taking into account only the farmers that actually use a certain fertilizer), we see that the amount in kg of organic fertilizers used per farmer is very high. Normally farmers get advised to use around one or two ton organic fertilizer per hectare. However, if the average produced organic fertilizer is more than 6 tons, and 98% of the farmers produce it on their own farms, this means high amounts of organic fertilizer is produced and used (in the improved compost pits, as we have seen earlier in this report). This would contribute to an increased crop response to mineral fertilizer, improved capacity of the soil to store moisture, a better rooting environment for crops, solving problems with soil acidity, and adding nutrients to the soil that are not present in mineral fertilizers.

From the fertilizers used, DAP is used most often, and in the highest average amount (63kg). This means that DAP is likely readily available and affordable, and a higher production is achieved with more phosphorus, which is lacking in many of the Burundian soils. The low use of NPK and KCl is remarkable, but probably coming from less effects seen by farmers in the field and the higher fertilizer prices, especially for NPK (30% higher than the other fertilizers). Soils therefore should be monitored to see if potassium doesn't start to lack from the soils, as this would decrease crop yields in the longer term.

Crop and land management practices

The survey also asked farmers about knowledge and application of the following crop and land management practises: use of kitchen gardens (or vegetable gardens), use of continuous ridges, use of quinconce (planting in triangle form, or staggered row planting), ploughing along the contour line, well-used crop spacing, well-planned crop rotations, well-planned intercropping, and well-planned row or relay intercropping. These are the most important crop and land management practices in the three provinces, and by means of workshops with PIs these have been promoted by the project. Once trained, the PIs are supposed to transfer this knowledge to the next generations (in the original villages), while the farmer trainers of the 3rd generation in the adjacent villages have to train the 4th generation PIP farmers concerning such practices.

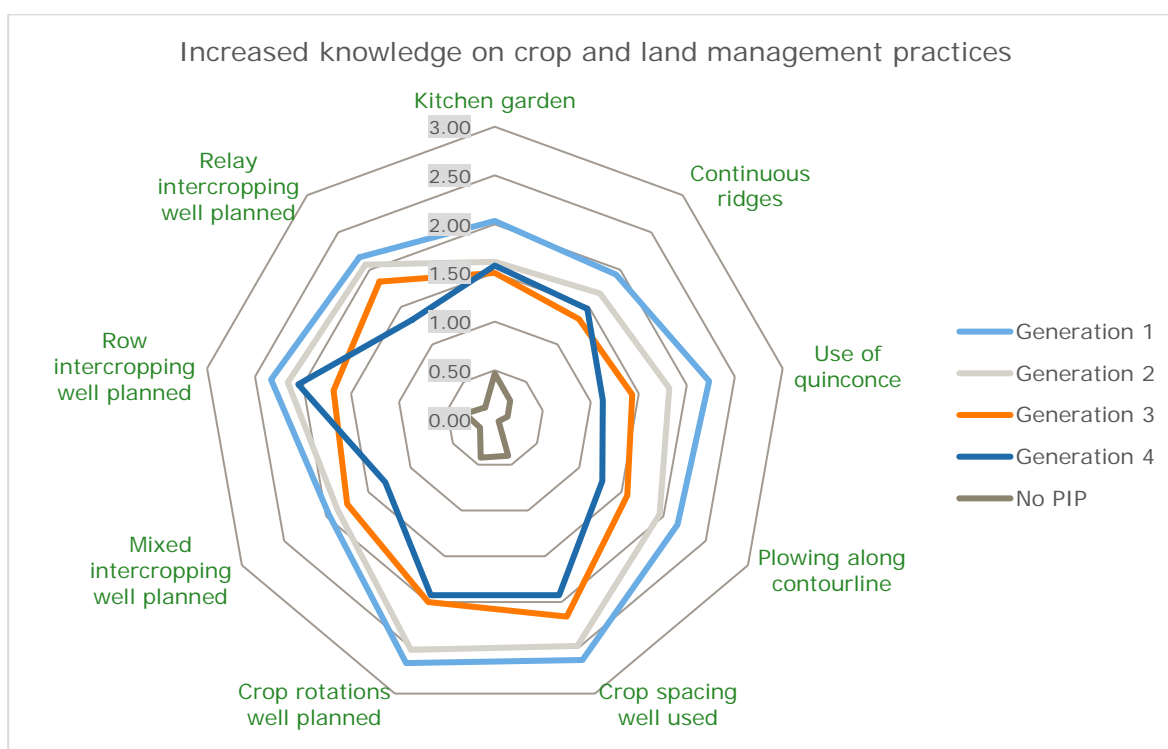


Figure 12. Increase in knowledge about crop and land management practices (from 3 = "much more knowledge acquired over the past 3 years"; to 0 = "no idea what the practice is about").

Figure 12 shows that this knowledge transfer within the PIP approach works very well. A score of 3 in this spider-graph means that farmers have acquired “much more knowledge” about a certain practice over the past 3 years; while a score of 2 means “more knowledge” and a score of 1 “the same knowledge” as 3 years ago. A score of “0” was given if the farmer was not aware of the existence of the practice, hence, when the knowledge level was actually at zero. Starting with the no-PIP farmers, Figure 12 evidences a general complete lack of knowledge of all these practices, with average scores below 0.5, meaning that at least half of the no-PIP farmers has never even heard about these crop and land management practices. Most known is the kitchen garden, but even there the score is only 0.5.

Next best in knowledge are the 4th and 3rd generation PIP farmers, with average scores which mostly lie between 1.5 and 2.0 for these practices. Hence, even although these farmers have only quite recently started with PIP, they have already acquired much more knowledge about all these practices. This is really very important, and a very promising signal for the PIP approach. Solid knowledge about good practices is a crucial outcome: it is something that remains in the minds of all these farmers, being intrinsic and as such contributing to building a resilient farming system. For healthy land this knowledge is essential, because if applied well, these practices will work and restore the productive capacity of the land in a sustainable way.

Best scores on knowledge for all these practices are obtained by the PIs, followed by the 2nd generation PIP farmers. PIs score higher than 2 (more knowledge) on all practices, and best on well-planned crop rotations and well-used crop spacing, the two most basic crop and land management practices. Also the 2nd generation PIP farmers score high for these two practices. On the one hand, this shows that before PIP started in the original SCAD villages, there was very little knowledge, and that a lot of new knowledge was acquired. For some practices that score a bit lower, e.g. ploughing along the contour line, we see that some PIs already had this knowledge before PIP, and of course still have it now (and thus score 1 on this practice). Anyway, in conclusion here, the knowledge transfer in the PIP approach works well, and obtaining knowledge about these crop and land management practices is crucial for enhancing soil health.

Of all crop and land management practises mentioned, most insightful results concerning their “actual use” were visible for the four practices presented in Figure 13. For all these practices the enormous difference in use between PIP farmers and no-PIP farmers is most eye catching. To most of the no-PIP farmers these practices are simply not known, but the PIP farmers show that once they know, they rapidly adopt and apply these crop and land management practices, because they benefit the farmers by improving nutrition availability, soil health, crop production, erosion control, and therewith improving livelihoods.

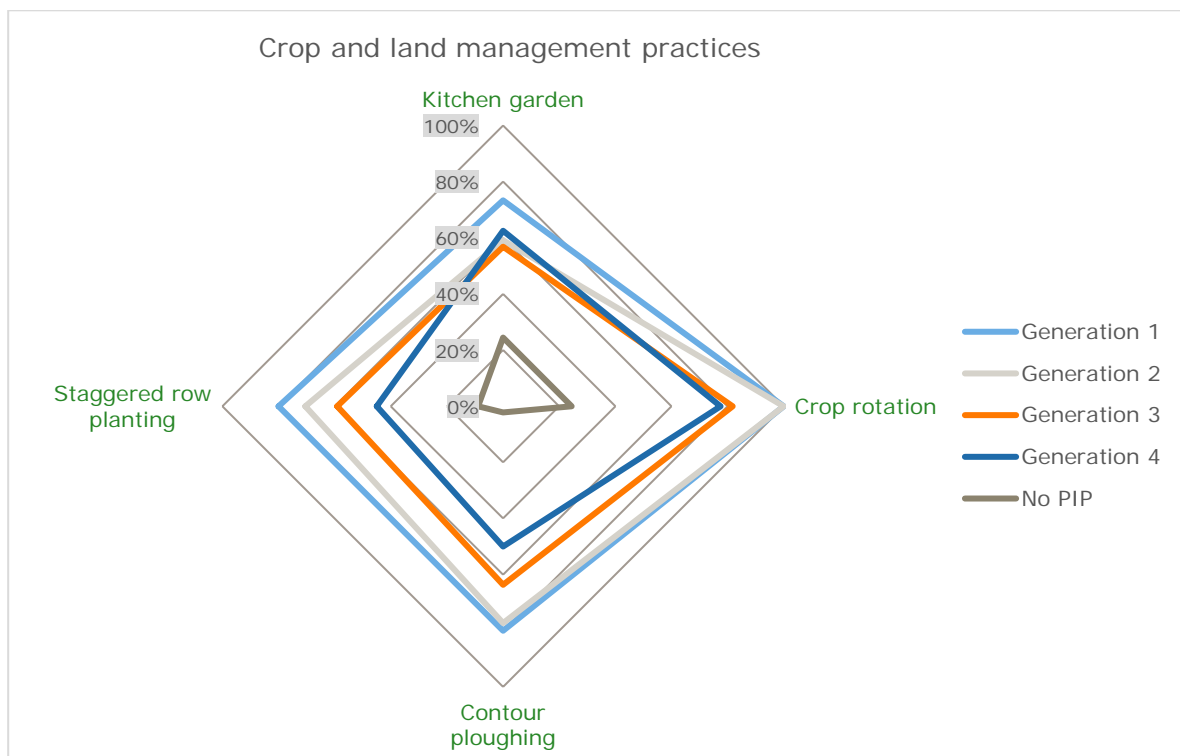


Figure 13. Current use of kitchen gardens, crop rotation, contour ploughing, and staggered row planting

Good crop rotations are now applied by more than 80% of all PIP farmers, and this is of course one of the most basic agricultural practices to be applied by any farmer. Striking however that despite the presence of an extension service in Burundi and so many rural development projects, good crop rotations are only applied by 20% of the no-PIP farmers.

Kitchen gardens are also used by only 20% of the no-PIP farmers, but this percentage can rise quickly to 60% once farmers acquire the knowledge, as evidenced by high percentage use among the 4th generation PIP farmers. PIs are already close to 80%, which is very satisfactory for this crucial practice in enriching crop and diet diversity, where especially some newly introduced vegetables such as beets have become popular within a short time. Nevertheless, a kitchen garden needs a quite secure provision of water and dedication, so it's the average use of 70% among all PIP farmers is a good indicator of PIP impact.

For both contour ploughing and staggered row planting Figure 13 shows a similar pattern: totally unknown by the no-PIP farmers, a rapid uptake by the 4th generation (40%), a higher uptake by the 3rd generation PIP farmers (60%), and the highest use among 1st and 2nd generation PIP farmers with around 80%. Both practices are not at all difficult to apply, but rather only require more awareness that this is better for the soil, especially in avoiding erosion. Hence, it is a change of practice, probably requiring a bit more time, but foremost driven by awareness and a change in mind-set. The increasing percentage from 1st to 4th generation shows that this awareness increases when farmers are working longer with these practices, and when they are becoming more convinced that these are beneficial to them.

6. Farm resilience

With motivated people and healthy land being the key-elements of a solid foundation for sustainable development, enhancing farm resilience is the ultimate goal at farm-household level of the PIP approach. On its turn, farm resilience, the ability of the farm to recover from shocks (particularly climatic shocks such as erratic rainfall), is of course strengthened by healthy land and motivated people who manage the natural resources adequately. In the survey we tried to capture farm resilience in different items and questions, most importantly in terms of diversity (of activities, crops and livestock), food security, and investments (in crops, practices, infrastructure, the household). These items are further analysed in this chapter.

Crop diversity

A first crucial aspect is crop diversity: more diverse crops with different drought tolerance levels and growing periods allow farmers to better cope with erratic rainfall, but also with pests and diseases. The study revealed that PIP farmers currently have on average between 16 to 19 different perennial, annual and vegetable crops on their farm, while no-PIP farmers have only 12. We have already seen in the previous chapter that kitchen gardens are popular among PIP farmers, and that use of vegetables has increased. This is reflected in Figure 14, where vegetables contribute a lot to the change in crop diversity compared to 3 years ago among PIP farmers. The biggest change is among PIs, who have on average 5 crops more than 3 years ago, and the other PIP generations 2 to 3 extra crops, especially vegetables and to a lesser extent perennial crops. Compared to no-PIP farmers it shows that these have even less diverse crops as compared to 3 years ago, although this change is minimal. Differences between PIP farmers and the no-PIP group is however big, and a very important achievement of the PIP approach.

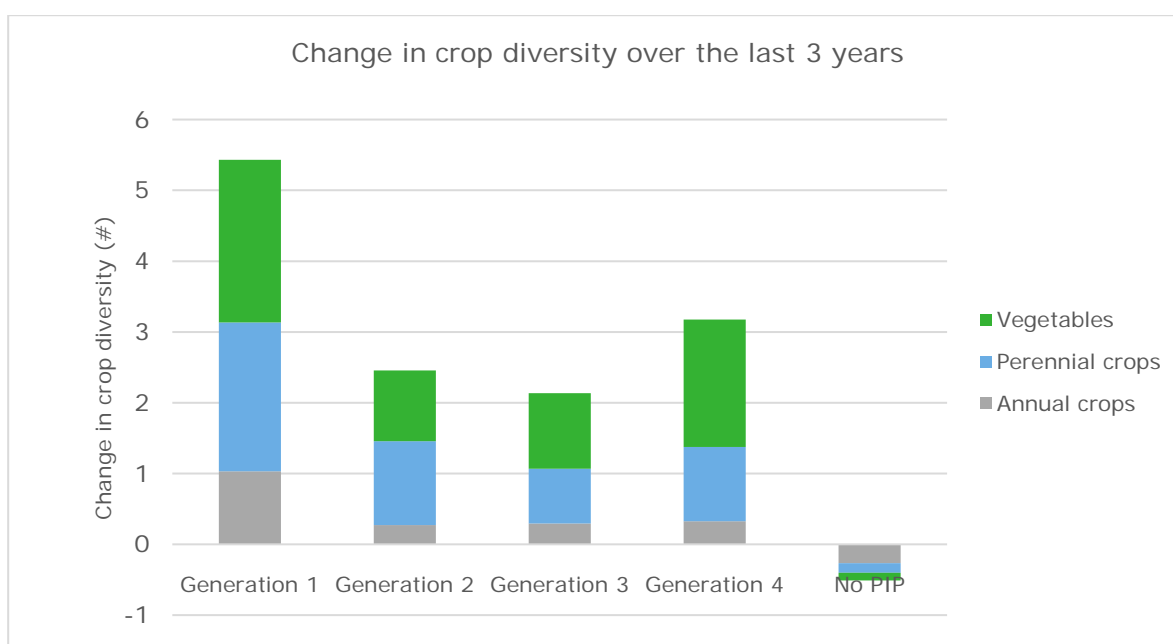


Figure 14. The change in average number of crops (annual, perennial and vegetables) for different generations of PIP farmers, as compared to three years ago.

Related to crop diversity, and very important for income diversification and resilience, is the change in number of cash crops. Figure 15 shows that PIs have in general 4 extra cash crops as compared to 3 years ago, and all other PIP farmers (even the 4th generation!) more than 2 extra cash crops. No-PIP farmers have now less cash crops: a troublesome sign. The biggest change has occurred in Gitega, followed by Makamba. Surprisingly, overall change in Muyinga is lowest, the province where also crop diversity is currently lowest, probably because it is the driest province which somehow limits crop diversification.

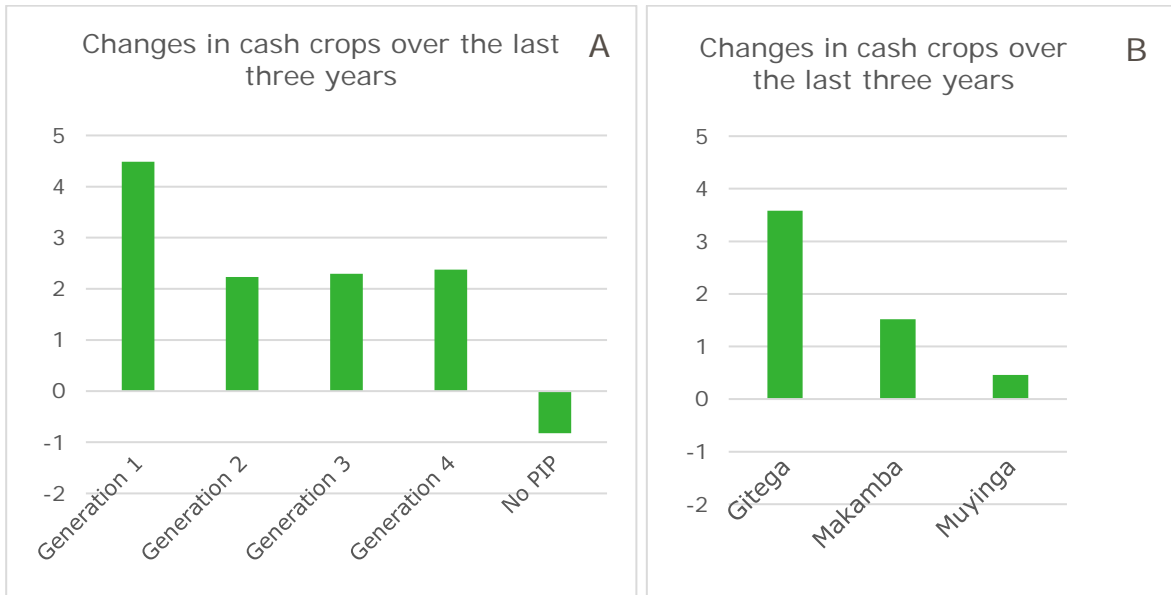


Figure 15. Changes in the number of cash crops produced by households over the last three years for the different PIP generations (A) and per province (B)

However, Figure 16B shows that in all three provinces – hence also in Muyinga – income from cash crops has substantially increased. This evidences that, next to more diverse cash crops in Gitega and Makamba, especially also the total surface (ha) of cash crops has increased among PIP farmers, leading to more production and more income. In total, income from cash crops over the past 3 years has increased for a large majority (85-100%) of all PIP farmers (Figure 16A). This is a very good sign: PIP farmers grow more (and more diverse) cash crops and have found how to commercialize these crops on local markets. This explains also how they have been able to invest so much money in all kind of other activities (as we will see later in this chapter), although for sure other income sources (e.g. off-farm activities) have contributed as well. This change in income from agriculture (cash crops) is definitely one of the biggest short-term changes brought about by the PIP approach, because it will motivate farmers even more to invest in their land and be good stewards of it. Again, the difference with the no-PIP farmers is tremendous (Figure 16A), which confirms the overall positive trend as explained above.

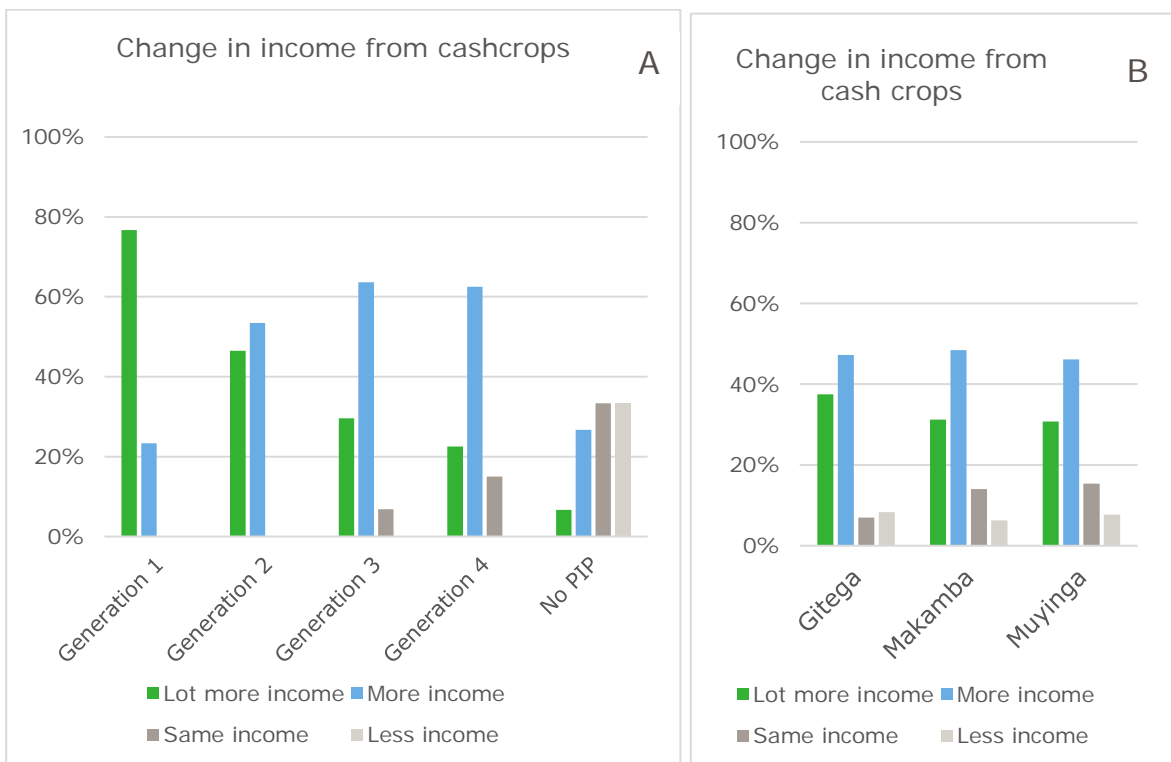


Figure 16. Change in income from cash crops over the past three years (as told by the farmers) by PIP generation (A) and province (B).

Livestock investments

Livestock increase is a debatable issue: too much livestock will undermine the carrying capacity of the land, but some livestock is needed to fertilize the land and enhance a diversified nutrition. Figure 17 compares all PIP farmers with no-PIP farmers, and shows that especially generations 1, 2 and 3 invested significantly more in livestock than farmers without a PIP. Although this study did not ask for change in livestock, Figure 17 shows that the 1st and 3rd generation PIP farmers invested the most in cows over the past 3 years (> 50%), and double the amount of money compared to the 4th generation and no-PIP farmers. Livestock keeping is indeed an important strategy for resilience and is therefore integrated in all farming systems, as it increases good quality and quantity of organic fertilizers and farm outputs. When comparing the provinces, in Muyinga goats are chosen more than in the other provinces, because it is an animal which is rustic and well adapted to the dry conditions of the province. Next to this, goats are also accessible to many households with less financial means. Overall, results are not significantly different between the three provinces.

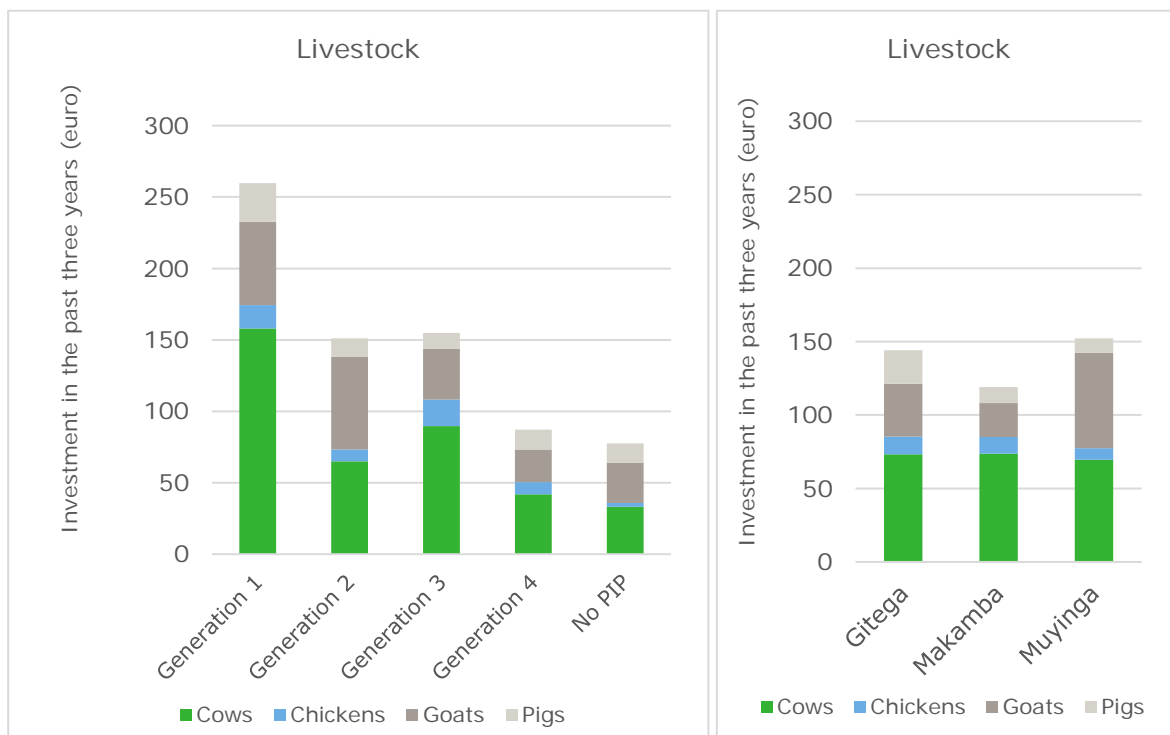


Figure 17. Investments in livestock for the different PIP generations and provinces. Small letters indicate the significant differences between the groups.

Food security

In order to measure food security, farmers were asked for every month of the year if they could indicate whether they:

- (1) suffered from hunger;
- (2) could just manage with the food;
- (3) had enough food;
- (4) had plenty food; or
- (5) had plenty food and could even sell some the produce

Averaging their scores per province per month (Figure 18), shows that in the beginning of the year (January/February) farmers from Muyinga are more food secure than in the other provinces (especially Gitega being lower), from April to June the average is almost the same for all provinces, and from July till the end of December farmers from Gitega are the most food secure. Overall, this is most likely influenced by the different agro-ecological zones and climate/rainfall patterns in each province. Observations made in the region confirm that with the PIP approach, people adopted different crops and more vegetables and can grow them in the dry season by means of innovations in irrigation, so they can have a source of income and food during the critical food insecure period at the end of the year.

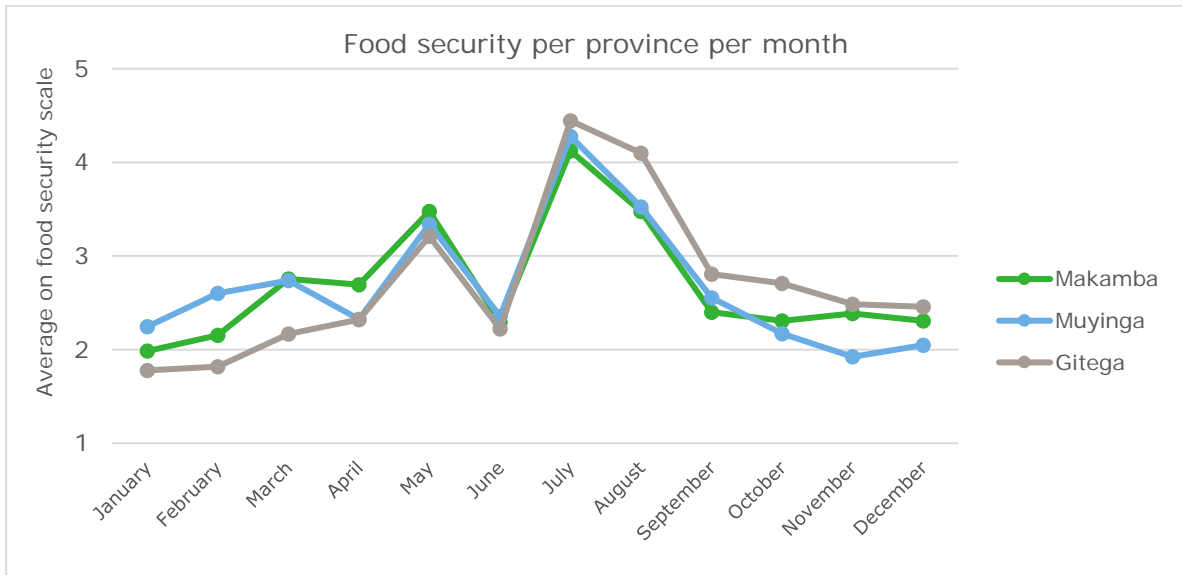


Figure 18. Average food security per province per month (on a scale running from 1=hunger to 5=plenty and we can sell)

From July to September, food security decreases because farmers are investing in school materials and in farm inputs. From September to December food security levels for Gitega and Makamba remain more or less the same because they are still provisioning the family with crops from the harvesting season C. Muyinga in the same period continues to decline in food security because of less season-C opportunities and more drought. This is a handicap for the less resilient crops, although PIP farmers are already starting to invest in irrigation and water conservation material and tools.

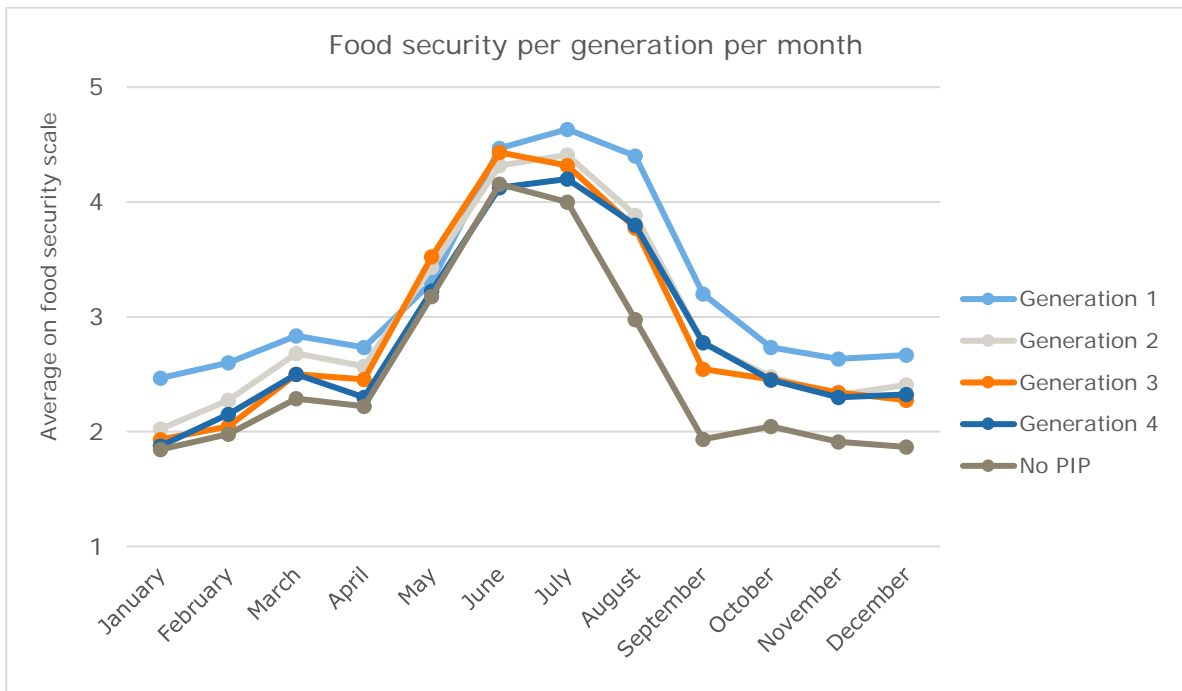


Figure 19. Average food security per generation per month (on a scale running from 1=hunger to 5=plenty and we can sell)

When averaging the food security scores per generation (Figure 19, Table 5), the scores show that the 1st generation PIP farmers (the PIs) have significantly more food security during seven months of the year (from July to January) compared to farmers with no-PIP. This evidences that these farmers are more resilient than the others, by having a bigger stock and more diversity after the B-season harvest, which is also true for the other PIP generations compared to the no-PIP farmers. In the other five months (February to June) no significant differences are observed in food security levels between the PIP generations and no-PIP farmers.

The biggest difference between farmers with a PIP and farmers without a PIP is thus from August till December, and this is particularly big for the PIs (Table 5). In general, June and July are the months with the highest food security, and January with the lowest. Overall we can easily observe that the no-PIP farmers are always scoring lower than any of the PIP generations, even compared to the 4th generation. This is once again a positive sign about the impact of PIP and the quick wins that can be obtained when farmers start to work with the PIP approach and invest in their farm and land. Food security is an indicator by excellence of farm resilience, because several issues play a role at the same time in defining food security: crop diversity, good practices, more awareness, and the generation of extra income. Hence, Figure 19 more or less summarizes the impact of PIP on farm resilience in one graph: food security. This was also the main goal of the SCAD project, and with this single graph we show that indeed the project is well on track in achieving this goal.

Table 5. Averages of food security per month, with significant differences

	Generation 1	Generation 2	Generation 3	Generation 4	No-PIP
January*	2.47 ^a	2.02 ^{ab}	1.93 ^{ab}	1.88 ^{ab}	1.84 ^b
February	2.60 ^a	2.27 ^a	2.05 ^a	2.15 ^a	1.98 ^a
March	2.83 ^a	2.68 ^a	2.50 ^a	2.50 ^a	2.29 ^a
April	2.73 ^a	2.57 ^a	2.45 ^a	2.30 ^a	2.22 ^a
May	3.30 ^a	3.43 ^a	3.52 ^a	3.23 ^a	3.18 ^a
June	4.47 ^a	4.32 ^a	4.43 ^a	4.13 ^a	4.16 ^a
July*	4.63 ^a	4.41 ^{ab}	4.32 ^{ab}	4.20 ^{ab}	4.00 ^b
August*	4.40 ^a	3.89 ^{ab}	3.77 ^b	3.80 ^b	2.98 ^c
September*	3.20 ^a	2.77 ^a	2.55 ^a	2.78 ^a	1.93 ^b
October*	2.73 ^a	2.48 ^{ab}	2.45 ^{ab}	2.45 ^{ab}	2.04 ^b
November*	2.63 ^a	2.32 ^{ab}	2.34 ^{ab}	2.30 ^{ab}	1.9 ^b
December*	2.67 ^a	2.41 ^a	2.27 ^a	2.33 ^{ab}	1.87 ^b

*Lower case letters show significant differences per month ($p=0.05$)

Investments

In order to make investments, farmers primarily need income. In the previous chapter we have already seen that cash crops play a crucial role in generating more income among the PIP farmers. Farmers with small farms try to maximize the output from the small land they have in order to increase profitability, e.g. they can invest a lot in the technical package of their farm to increase profitability. Next to this, especially PIP farmers are more actively diversifying their income by having other (also off-farm) sources of income than what crop production generates for them, also through collective entrepreneurial activities. It is therefore a kind of cycle of investments and outputs, and the PIP is an important factor to create sustainable impact and leverage for farmers, independent of their land size.

Testimonies by PIP farmers furthermore explain that they are also able to access extra money (credits) more easily, and that with their new spirit to develop and invest in their future, they are anyhow better able to get money if the need it. These farmers have a plan, a vision, and are determined (intrinsic motivation!) to get to their goal: with such a spirit and mind-set farmers becomes less risk-averse because they know that they will succeed. They have experienced the change, they know they can do it, and they go for it. As such, these farmers enter in a new upward spiral, a positive one in which their future improves because they take the initiative themselves, they are self-confident, and determined to improve.

The survey explored and calculated the following three main groups of investments:

- Investments in the household, in the homestead, education, equipment, and in means of transport;
- Investments in infrastructure, such as land, stables, irrigation, storage facilities and machinery;
- Investments in livestock, related to what was presented in the previous section.

Figure 20 presents the overall results of these investments over the last 3 years for all PIP farmers and the no-PIP farmers. It shows that compared to the no-PIP farmers, overall investments of the 4th generation PIP farmers are similar. What mostly calls the attention is the enormous difference between the PIs and the other PIP farmers, who double investments in all three categories. From testimonies and observations in the field we know that also in the group of PIs there are big

differences, with some PIs having invested in the purchase of land and motorbikes. However, even if not counting these outliers in, differences in investments between PIs and the others remain big, showing once more that PIs are indeed the more innovative and dynamic farmers in the village, who have rapidly benefitted from the newly acquired knowledge and skills, giving them an increased advantage over the other farmers in the village.

The high investment score for no-PIP farmers is mainly due to the contribution of investments in the household. Analysis of the specific data shows that considering the average shown (210 €) about 80% of the no-PIP farmers have lower household investments than this average; hence, it is mainly determined by some outliers. Comparing the third and fourth generation PIP farmers there is quite a big difference still, and the 4th generation scores lower because they have started with PIP only recently, still concentrating on the quick wins (as we have explained before), while not yet having the means to start investing overall more in their farm resilience. However, as observed in the field, we can see that investments in land management activities are even higher in the later generations, because the PIP farmers learn that agriculture cannot be durable if it is not founded on land which is managed sustainably.

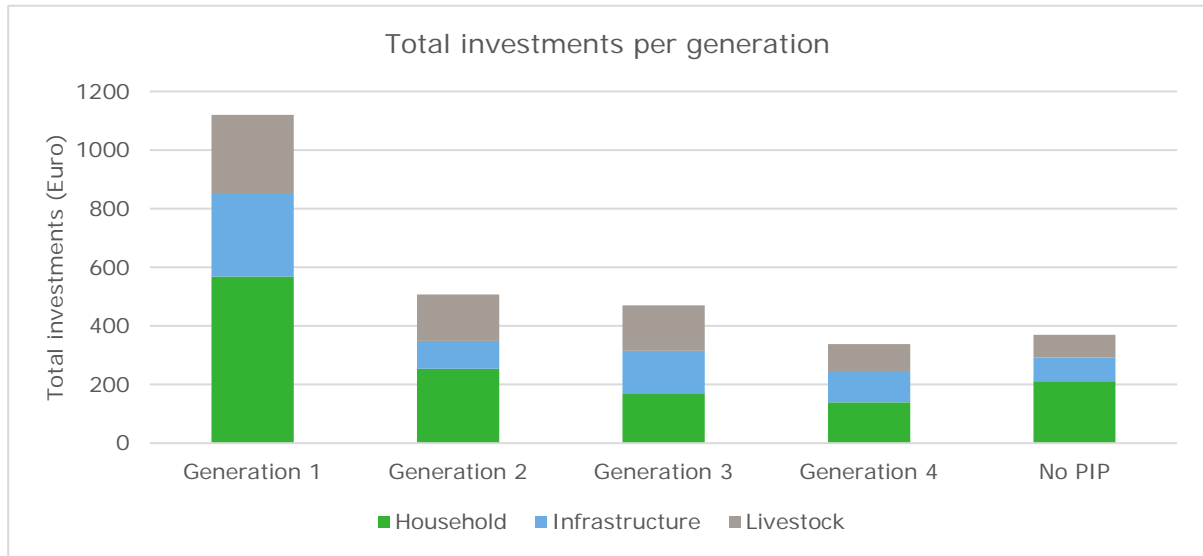


Figure 20. Average investment per generation over the last 3 years, divided over the sub-investment groups

If we look at the average investments made by household per province, one would expect to see higher investments in Gitega, than Muyinga and finally Makamba, given the years of PIP experience. However, there is no big difference in overall average investments in the provinces (Figure 21), which are all around the 500 € over the past 3 years. Makamba scores slightly higher on investments in the household, while Gitega scores a bit higher on investments in infrastructure and Muyinga in livestock. When not taking into account the PIs, investments average around the 400 € over the past 3 years, so just above 100 € per year.

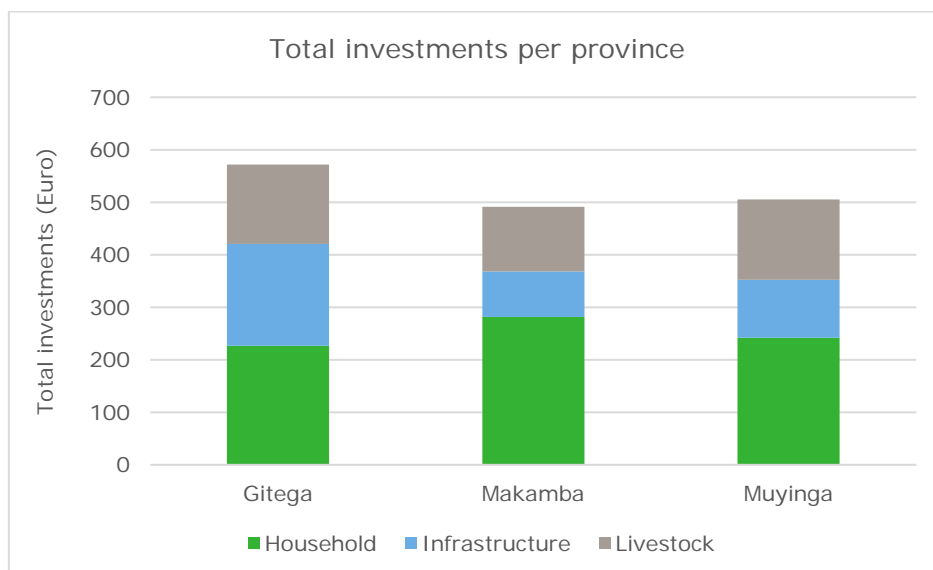


Figure 21. Average investment per province, including all farmers surveyed

7. Discussion and analysis

This chapter brings together the results from previous chapters about motivated people, healthy land and resilient farms, and will go one step further in analysing the linkages (correlations) between these three PIP key-elements. This will provide further deepen our insights about PIP impact in the SCAD villages, and result in concrete conclusions in the final chapter of this report.

Calculating overall scores

In order to compare the different generations of PIP farmers and provinces concerning the three PIP key-elements, first of all an overall score was calculated for each of them.

For a score on "Motivated people" (the first pillar of the solid foundation for PIP) we considered an average of the motivation related responses on "changes over the past three years" questions (as explained in Chapter 4). Other questions that focused more on the future were not taken into account, because these do not reflect the real change that is perceived by the farmers, but rather reflects "only" their hope towards the future. The questions considered to come to an average overall score for motivation – which was indexed between 0 and 10 – were therefore:

- 'My life is better than 3 years ago';
- 'My farm is in better condition than 3 years ago';
- 'My land is in better condition than 3 years ago';
- 'I have more money than 3 years ago';
- 'This village is in a better condition than 3 years ago';
- 'There is more trust among the people in the village than 3 years ago';
- 'There is more collaboration in the village than 3 years ago';
- 'I am more willing to stay and live here than 3 years ago'.

For the score on "Healthy land" (the second pillar of the PIP foundation) we used the sum of all Natural Resource Management practices and Crop & Land management practices implemented by a farmer (as explained in Chapter 5). Since no soil testing was done on the fields of these farmers, their investments in good practices reflect best if the land is in a good condition; hence, and in line with the philosophy of this study to focus more on outcomes than on real impact, we do not consider the effect of the implemented practices, but only *if* a farmer implements the measure or not. This follows the reasoning that once farmers know and see that a practice works (enhanced knowledge) they will continue using and implementing the measure when they are able to. This is not necessarily *now* and/or on a wide scale, but each farmer will do it once s/he is able to do so. The sum of practices was also indexed between 0 and 10 in order to get a final score for "land health".

Finally, for the score on "Farm resilience" we have only considered the Food security situation of the household, averaged over one year (Chapter 6). Farm resilience – as explained in the introduction chapter of this report – is in fact the final outcome of the PIP approach: based on the solid foundation (Motivated people and Healthy land) farm households will implement PIP activities and gradually work towards more farm resilience. The food security situation best reflects this change and the progress towards resilience: with better farming practices and more motivated farmers, our assumption is that production will increase, farmers will sell some/more crops and have more income (also to buy food), crop and livestock diversity goes up, farmers start to invest also in other activities (generating off-farm income), and in general are better able to manage their farm and make it more resilient. Scores for food security are therefore averaged over the whole year, based on the level of food security given for each month, and then indexed within the range of 0 to 10.

When we look at the average score for these three PIP pillars, we see that all the PIP generations have a significantly higher score than the farmers with no PIP (Table 6, where no-PIP farmers scores are marked with a superscript "C" (c) to indicate that these scores are significantly different – lower – compared to all other farmers considered). Furthermore we see that:

- Motivation is strongest in the first three generations, and significantly higher than in the 4th generation of PIP farmers;
- Healthy land is significantly higher for generations 1&2 as compared to generations 3&4;
- Farm resilience shows a similar pattern, but now the PIs score visibly higher than all other PIP farmers.

This suggests that motivation changes first in the PIP approach, followed by investments in healthy land, and eventually farm resilience. The correlations between the three are further investigated in the following sections.

Table 6. Average score per factor (motivated people, healthy land, farm resilience) per generation with small letters indicating their significant differences.

	Generation 1	Generation 2	Generation 3	Generation 4	No PIP
Motivated people	9.07 ^a	8.89 ^a	8.40 ^a	7.33 ^b	3.98 ^c
Healthy land	7.35 ^a	7.05 ^a	6.19 ^b	5.87 ^b	2.57 ^c
Farm resilience	6.03 ^a	5.35 ^{ab}	5.12 ^b	4.94 ^b	3.84 ^c

Motivated people vs Healthy land

The first analysis concerns the relation between the two pillars of the solid foundation of PIP: motivation and healthy land. As these two key-elements are mostly emphasized within the PIP approach, we would expect that people who are more motivated for (sustainable) farming also invest more in their land with best practices. Figure 22 shows the results for the different generations of PIP farmers and for the different provinces, confirming our expectation.

Looking first at the overall picture, we clearly see the high coefficient of determination (R^2) for this relation. An R^2 of 1 would mean that the percentage variation on the Y-axis is explained by all x-variables together. An R^2 of 0 would mean there is no relation at all between the two variables. The R^2 here is higher than 0.55 and therefore is showing a relatively high correlation between the two variables.

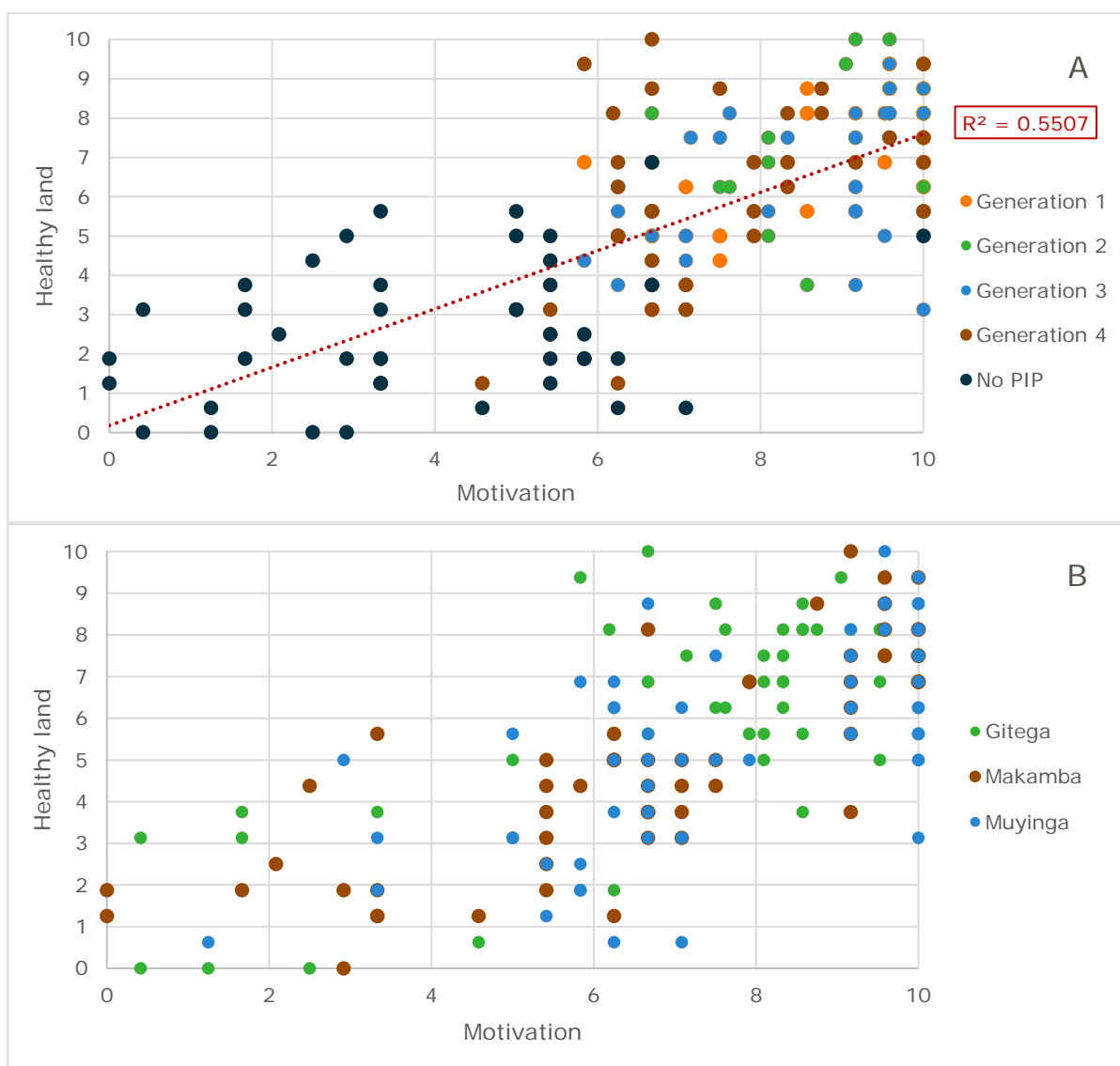


Figure 22. Motivation versus Healthy land for the different PIP generations (A) and provinces (B).

The relation between healthy land and motivation can go however in two directions: investments in land health increase when motivation of farmers increases, and when farmers invest in better practices (quick wins, more income) they will become more motivated to continue implementing other practices in their farm, which they are trained in during the PIP workshops. In that sense Figure 22 confirms what we have explained in earlier chapters: that the PIP approach actually works very well to build this solid foundation of motivated people and healthy land.

A closer look on Figure 22 and the differences between the PIP generations, shows that most of the no-PIP farmers are – as expected – in the lower-left corner, while the PIP farmers are further up on the right (please note: in Figure 22 not all cases are visible, given that some farmers have equal scores on both key-elements). When looking at the provinces in detail, a Kruskal-Wallis test confirms what we also see in Figure 22, namely that there are not any significant differences between the provinces. However, it is interesting to see that Makamba scores just a bit higher (not significantly) than the other two provinces, although the SCAD project has started later in Makamba. Apparently the PIP approach works even better here than elsewhere, maybe because the project had more experience and did a more efficient job in Makamba, but another explanation could be that investments in land health were simply more needed in Makamba where land degradation is visibly more serious than in Musinga and Gitega. Hence, effects of better practices resort faster impact and motivation of farmers will increase at a same pace. More in-depth studies would be needed to draw conclusions in this respect.

Table 7 presents the results of the correlation analysis (Pearson, two-tailed) between all three PIP key-element. This shows how much the two factors are explained by the other for each specific combination. When looking at the correlations between Motivated people and Healthy land it shows that these are significant for all the analysed cases, so also for each PIP generation separately, and for the no-PIP farmers. Hence, for each generation – even if the number of sampled farmers is relatively low – motivation and land health are significantly correlated, and in all PIP generations cases at a 0.01 level, meaning a very high correlation. Only for the no-PIP farmers this correlation is a bit lower, but still significant at a 0.05 level. Hence, even for the no-PIP farmers motivation and land health mutually reinforce each other, and this result is crucial for sustainable agriculture: it means that investing in motivation really works, and directly contributes to healthier land with more NRM measures and better land management.

Table 7. Correlation between the three PIP key-elements (Pearson, two-tailed)

	Motivation – Healthy Land	Motivation – Farm resilience	Healthy land – Farm resilience
All farmers	0,742**	0,419**	0,247**
Gen. 3, 4 & no-PIP	0,682**	0,425**	0,264**
Generation 1	0,607**		
Generation 2	0,629**		
Generation 3	0,442**		
Generation 4	0,473**		
No-PIP farmers	0,318*	0,471**	0,311*

** means correlation is significant at the 0.01 level (2-tailed)

* correlation is significant at the 0.05 level (2-tailed)

Motivated people vs Farm resilience

With more resilient farming systems being the ultimate goal towards which the PIP approach is working, Figure 23 shows that the overall picture gives indeed a tendency in which more motivation of farmers results in more resilient farms (i.e. higher food security in this case, as this is taken as main indicator for farm resilience). The R^2 is however much lower than for the previous correlation between motivation and land health, which would suggest that not for all PIP farmers a higher motivation is directly translated into higher farm resilience. Apparently other factors than motivation are at play that influence farmers to reach a higher score on resilient farming / food security.

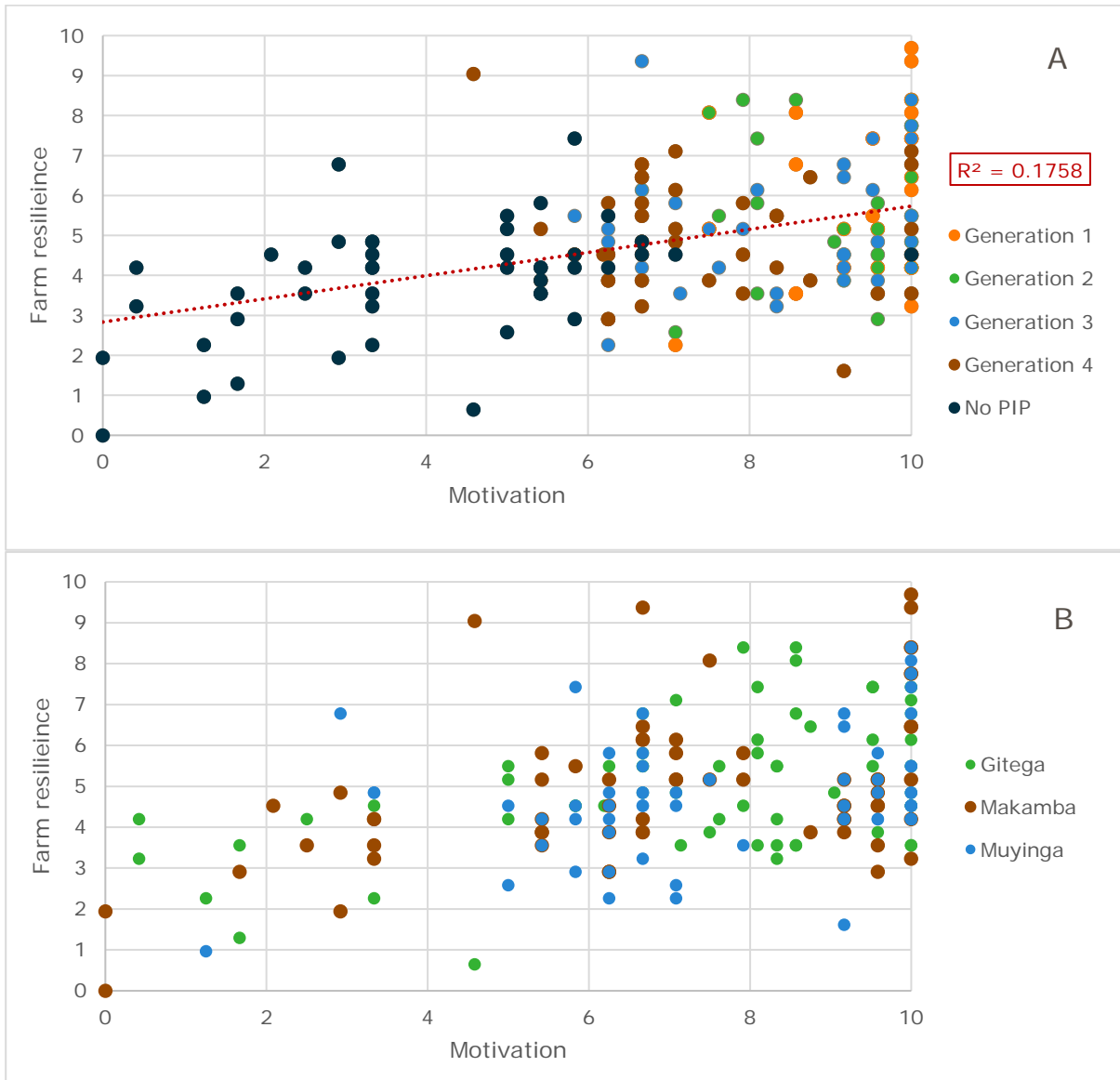


Figure 23. Motivation versus Farm resilience for the different PIP generations, No PIP farmers (A) and provinces (B).

In order to gain more insight, Figure 23 already showed that most of these no-PIP farmers are in the lower-left corner, with low motivation and low farm resilience. However, Table 7 shows that for the no-PIP farmers motivation is correlated to farm resilience, which means that within this sample of no-PIP farmers we observe that those who are motivated (without having participated in the PIP approach) already are more food secure (i.e. more resilient). This same correlation is not observed for the PIP farmers in our study, because most of them are already high on the motivation score, but it is too early to see the effect of a higher motivation reflected in a higher score on farm resilience (Table 7). There is of course a tendency, but for these PIP farmers it is not a significant correlation and conclusions can therefore not be drawn. However, coming back to the no-PIP farmers, it is in fact a very positive sign and a prove of the importance of motivation, that more motivated no-PIP farmers have more resilient farms. It justifies once more that investing in motivation and a change in behaviour and mind-set is essential for establishing more resilient farming systems; as does the PIP approach.

Land health vs Farm resilience

The final relation that we will discuss is between Land health and Farm resilience, hence, do investments in land also result in more resilient farms? Similarly to the discussion in the previous section, we see in Figure 24 an even weaker R^2 . In fact, we should conclude here that there is hardly any correlation between land health and farm resilience. It shows once more that achieving farm resilience is determined by more than one factor (than only land health in this case), e.g. market opportunities and agroecological conditions.

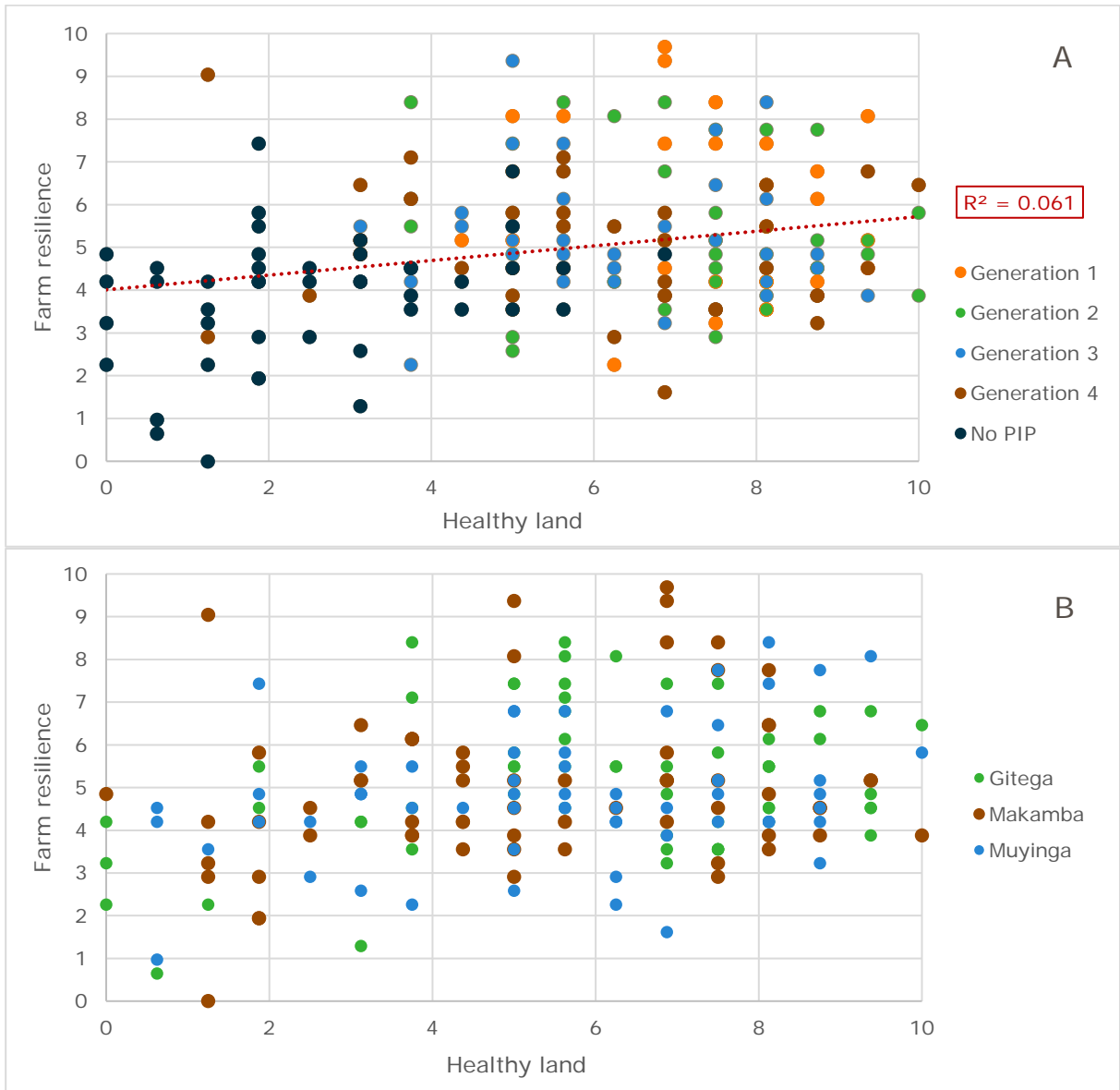


Figure 24. Healthy land versus Farm resilience for the different PIP generations, No PIP farmers (A) and provinces (B)

Table 7 shows the details for the different generations, and it shows again the same pattern (but a bit weaker) as for the previous correlation between motivation and land health: farm resilience and healthy land are correlated when we take all sampled farmers together, hence, the more land practices they implement the more resilient farms become. Interesting to see that again this counts strongest for the no-PIP farmers as compared to each of the PIP generations considered separately.

8. Conclusions and recommendations

In this impact assessment study of the PIP approach in Burundi, it has become evident that the PIP approach has led to both profound and relative quick changes in the SCAD villages. Profound changes, because the PIP approach really changes people: their behaviour, their mind-set and the concrete actions they undertake, this being the foundation for long-term and truly sustainable impact. And quick changes, because even the 4th generation of PIP farmers - those in the adjacent villages who have started recently with PIP - already state that their farm, their life and their village are now in better conditions and that knowledge among them has increased. Although the knowledge transfer takes time, the overall picture is that the PIP triggers a change process in these villages which allows all farmers, male and female alike, rich and poor, to join and benefit. The PIP therefore can be seen as a 'flywheel for sustainable development'.

This flywheel is driven firstly by the intrinsic motivation of farmers who work with PIP. Of course it starts with the PIP itself, the drawing that empowers farmers to plan and have a vision, and to take concrete steps to realize that vision. But there is more than only empowerment that makes the flywheel turn faster: the spirit of collaboration in the villages (exemplified in the competitions, the village vision development plan, and the new groups that emerge), the confidence within people that the farm and life in general can improve (with farmers becoming more forward-driven and seeing more future possibilities to invest), and the practices promoted in PIP that are mostly based on local knowledge, easy to implement, and compatible with other aspirations of the family members as expressed in their PIP. This results in more resilience, where farmers with a plan are planning to implement also more off-farm activities, that allow them to not solely have an income from farming, but also to diversify their income and to become less dependent on their farm. This integration of activities creates ownership and a greater sense of stewardship, which is evidenced by the passion of the PIP trainers, their motivation to share knowledge with others, to teach, to experiment and to learn on a voluntary basis.

One of the best outcomes of this study is that this knowledge transfer from farmer to farmer works in the PIP approach. Knowledge concerns not only "how to create a PIP" (in the PIP competitions), but also best practices: the ones promoted by the project, but also many others, often based on tacit knowledge of farmers, who are proud of what they know and like to share this with others. Reaching and training all these farmers is only possible by the community itself. In this study we have seen that even farmers in the adjacent villages have rapidly taken-over knowledge about better practices, and these farmers make the biggest group of farmers trained so far. This result is an important indicator that also in these non-project villages, PIP can drive sustainable change and that PIP can function as an important tool for knowledge dissemination. However, from this study we cannot conclude if this knowledge development also contributed to more sustainable impact, but we do emphasize that this attitude, this intrinsic motivation to learn, experiment and do better is one of the pillars of sustainable change, rooted in the mind-set of the people. How to further enhance this knowledge transfer and keep the process going to next generations is something that merits further study. Furthermore, creating easier access to knowledge from research, and showing local governments how to better disseminate this to farmers, is an essential issue for the near future.

Next to widespread dissemination of knowledge, this study also shows that PIP triggers a new dynamic in each village, and that the social cohesion (trust, collaboration, and leadership) has improved in the SCAD villages. Farmers also experience that things have changed in their village, and this has enormous consequences for the willingness of people to stay and put effort in village development. Village visions are now being developed in all SCAD villages, and we see that the organization within the villages has improved, with better leadership and with the commune administration supporting the process. This is a huge gain, because it will open doors to possible donors and organizations who can financially support the more costly activities.

Another strong aspect of the PIP is the focus on the whole family. Male and female farmers bring home the gained knowledge and work together with their family on a realistic plan for future change. Testimonies tell that within households gender relations have improved while working with PIP, as husband and wife now have common objectives and start collaborating. However, in the SCAD project there was not a strong focus on gender issues, although within the groups of PIs (first generation PIP farmers) about 40% were female. It is evident that female farmers will see results from PIP different than male farmers, who have by default more authority in the household. In the PAPAB project more gender related activities were included in the PIP approach,

especially the work with the Family Tree, which has brought a lot of additional benefits. In this study, we have not specifically asked for different viewpoints of male and female farmers, and our pre-analysis revealed that for the questions in our survey there were indeed no significant differences between male and female respondents. However, future studies should look at the effect of PIP on gender equality, to see if there are differences in actions or plans between female and male farmers, and how these differences can be addressed better for further impact.

This study furthermore proves that the investments in the solid foundation (motivated people, healthy land) work: both have been strengthened by the PIP approach and mutually reinforce each other, and their correlation is highly significant for all generations. More motivation triggers investments in healthy land, and healthier land triggers farmers' motivation to continue and invest even more in their land and farm. This is a positive upward spiral, with more and diverse (cash) crops, more investments in the farm (crops and livestock), and eventually more resilience.

If more PIP activities are implemented, more investments are done in the farm and the household, but this study did not investigate where this money comes from. Although some of it is generated by more profitable farm activities, this cannot be the only source. The total additional income that the PIP has generated, or the income that comes from on or off-farm activities is so far unknown. In future reflections and studies, this is definitely something that can be focused on, since collaboration and trust increased in the areas where the PIP was introduced and we expect that these changes also give farmers benefits in terms of income diversification and food security by having access to other income sources than farming.

Next to this, despite the intention of the study to measure yield levels for the main crops, we were not able to obtain reliable data. As yield and plot size were not measured but given by the farmers themselves, these often did not reflect reality. A separate study is therefore required to measure this more accurately, and draw conclusions about the influence of healthier land on agricultural production. Furthermore, since PIP focuses on the whole farm, it is also needed to look at yields of other crops, as well as take integration on the farm into account. Case studies on single farms could reveal to what extent higher and more diverse agricultural production contributes to the observed higher food security of PIP farmers in this study. This has everything to do with farm resilience, and increased production on the farm can be a flywheel for faster and more sustainable development, especially when soil fertility can be maintained. Nonetheless, this study showed that there is a direct correlation between both categories of the solid foundation and enhanced farm resilience. However, these correlations were lower for both *motivated people* and *healthy land* versus *farm resilience* (compared to motivated people vs healthy land), showing that also other factors play a role in achieving farm resilience and more food security.

If we look at the results of the 4th generation PIP farmers, there are already many changes. In this 4th generation we see the effect of the scaling-up phase in the adjacent villages. Project involvement was much lower there than in the original SCAD villages, with the 3rd generation PIP farmers training the 4th generation, and the extension workers of the DPAE having an important role. In these adjacent villages we see the 4th generation PIP farmers participating in the PIP competitions on their own initiative – driven only by their intrinsic motivation. The whole PIP process has been much more spontaneous here, and even so, often within a year, changes have occurred. These farmers affirm that in this short period of time, both farm and living conditions have already improved, and that they are more willing to stay in the village than before. We also see a high uptake of the less labour demanding practices (such as compost pits and mulching) in these adjacent villages, even already with some extra cash crops that generate income. The message is thus very quickly understood, thanks to the exchange visits with the SCAD villages, the trainings by the 3rd generation PIP farmers, but foremost thanks to the “tambour du village”: the promotion from farmer to farmer of the PIP approach, and the “voice” running through the villages that PIP really works.

Finally, this study evidences that the longer farmers work with PIP, the higher they score in motivation, land health and farm resilience. Hence, the more time farmers spend on implementing their PIP, the more motivated they become, with more and better practices, and strengthening their natural resource base for a sustainable future. Being a better steward of the land has a direct visible impact on farm resilience. The final conclusion of this study is therefore a crucial message for all rural developments programmes: investing in motivation and land health - by means of the three PIP principles “empowerment-integration-collaboration” - actually works, and will lead to more resilient farming systems and sustainable local development.

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