Beyond Farmer Field Schools in Indonesia:
Understanding adoption, adaptation and rejection of agricultural practices with context-specific features

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Executive Summary

Farmer Field Schools (FFS) have been primarily designed and implemented by the UN Food and Agriculture Organization in 1989 to promote Integrated Pest Management (IPM) to farmers in Indonesia (Bartlett, 2005). Since farmers were exposed to highly toxic pesticides in the Green Revolution era, they experienced negative side effects of it. For instance, pests started to become resistant against the pesticides being used thus leading to severe outbreaks and harvest losses (Braun and Duveskog, 2011). The IPM FFS was in that way a contradictive approach towards reaching more sustainability in agriculture (Veisi, 2012). IPM FFS are often implemented by governments, NGO’s and international organizations and can be described as a group-based, experimental learning approach where knowledge generation among farmers is enhanced (Bartlett, 2005 and Scoones and Thompson, 1994). The aim is to trigger farmers’ understanding of how agro-ecosystems function including the interrelations of soil, water and weather conditions, natural enemies, pest and crops (Thorburn, 2013). On the basis of this understanding, farmers are expected to choose for more agro-ecological farming practices. Besides of choosing for more agro-ecological farming practices, the IPM FFS also stresses the importance to include collectivism in farming (van de Fliert, 2003). Collective action, meaning that farmers work together for a common aim is equally important and a crucial component of reaching sustainability in agriculture.

Although there were many changes on agricultural practices after IPM FFS reported in the last years, the construction of these changes was not often questioned. For instance, it was reported that alumni IPM FFS participants might flip back to their old practices although they are supposed to experience positive side effects of the IPM FFS practices. (Resuduarmo and Yamazaki, 2007). The understanding for farmers choosing not to adopt IPM FFS practices might have crucial reasons but these reasons have not been often investigated.

For this study, alumni IPM FFS participants originating from three different sub-villages on Java have been interviewed to understand why farmers choose to adopt, adapt or reject IPM FFS practices. Their reasons and justifications but also their embedded environment has been studied to attain an understanding on their actions.

This study investigated that IPM FFS practices have been adopted for instance where a system of social togetherness and collectivism played a fundamental role. Collectivism helped to consolidate certain IPM FFS practices. Besides that, farmers would adopt IPM FFS practices when they also see and experience related benefits. These benefits often referred to an increased productivity. Other findings showed that practice adaptations were often executed on individual level where farmers were exposed to certain environmental circumstances. For instance, depending on pest severity in the field or weather conditions, farmers would adjust their farming practices in such a way that they suit to their personal circumstances, abilities and sense-making. On the other hand, IPM FFS practices were often rejected where farmers did not have the necessary inputs for implementing these into their farming systems. Also, often more practical and easier to use methods were preferred over the IPM FFS practices by farmers. As notified in this study, land ownership proved to be a constraining factor for adopting IPM FFS practices. Farmers who rented land and were willing to adopt IPM FFS practices were often restricted in doing so since the owner would not agree with such deviations.

All in all, it can be concluded that IPM FFS considerably influenced agricultural practices of farmers however the way they tuned out in the reality of farmers always depended on context-specific features as explained further in this study.
Acknowledgements

With this piece of work, I wished to gain a better understanding of the choices farmers make with regards to their agricultural practices. To make this happen, many people supported me for several months to whom I wish to express my gratitude.

First of all, I would like to thank my supervisor Dr. Conny Almekinders. Her critical mindset helped me to think outside the box, gain new insights into the social sciences and to think twice about the sentences I put down on paper.

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BHP: Brown planthopper
BIMAS: Bimbingan Masal, Mass guidance programme for rice intensification
FAO: Food and Agriculture Organization
FFS: Farmer Field School
IPM: Integrated Pest Management
MOA: Ministry of Food and Agriculture Organization
OPEC: Organization of the Petroleum Exporting Countries

List of Acronyms

Desa: Village
Dukuh: Head of the sub-village
Dusun: Sub-village
Garitan: Wodden tool to draw square patterns into the soil
Ghaba: Rice including the husk
Gorengan: Fried vegetables, tofu etc.
Ibu: Miss
Inpres desa: Village subsidy
Kecamatan: Sub-district
Pak: Mister
Pemandu Lapang: Field leader
Petani: Pure farmer
Petani Pemandu: Farm leader
Posyandu: Monthly clinic for children and pregnant women providing health care
Warung: Small shop
CHAPTER 1: Introduction

1.1 Introduction to the study

Farmer Field Schools (FFS) were primarily designed and introduced by the UN Food and Agriculture Organisation (FAO) in 1989 to promote Integrated Pest Management (IPM) to farmers in Indonesia (Bartlett, 2005). The idea to address pest issues from an agro-ecological point of view came especially into being since farmers were exposed to highly toxic pesticides in the Green Revolution era. One of the biggest drawbacks of this era was the overuse of pesticides being promoted by the government which caused pests to become resistant. Therefore, they could not be controlled anymore (Braun and Duveskog, 2011). Severe crop infestations with the brown planthopper (*Nilaparvata lugens*) in 1986 were the outcome of such incidences. Besides, farmers placed their environment as well as their health at vast risk by the intensive use of toxic pesticides.

In these days, food production was meant to be increased through external inputs via top-down approaches (Veisi, 2012). According to Veisi (2012), whereas the Green Revolution promoted the intensive utilization of pesticides, inorganic fertilizer etc., the IPM FFS has been considered as a central technology to achieve sustainability in agriculture. Also Resuduarimo and Yamazaki (2007) state that the IPM FFS was introduced as an alternative approach towards overcoming the negative side effects of the Green Revolution era. Whereas in the Green Revolution, farmers were controlled uniformly with the same input packages, the IPM FFS had the tactic to introduce more agro ecological farming practices to farmers and let them make choices themselves on farm arrangements suiting best their circumstances (Resuduarimo and Yamazaki, 2007). By enabling farmers to take their own decisions on crop management, the IPM approach avoids the top-down transfer of pre-designed input packages to farmers (Winarto, 1994). Thus, it can be seen as an alternative approach compared towards the earlier extension programmes.

IPM FFS- Schools without walls

The IPM Farmer Field School is a group-based learning approach used by governments, NGO’s and international organisations focusing on the enhancement of knowledge generation on agricultural ecology especially among small scale rice farmers. The fundamental concept of a FFS is to provide farmers with skills and theories so they are able to use such inputs for discovering and creating knowledge (Bartlett, 2005). These skills and theories follow a four principle scheme according to Palis (2006), centring on the cultivation of crops in an agro-ecological and socially sound system. First of all, crops should be grown healthy meaning to use pest-resistant crop varieties, selecting suitable seeds and by considering effective water and nutrient management. Secondly, natural enemies such as beneficial predators, playing an important role in an agro ecosystem, should be well maintained. Thirdly, FFS stress the importance of conducting observations in the fields. This is especially needed to decide on further managerial actions with regards of producing healthy crops. And last, farmers should support each other to becoming experts in the domain of IPM. The goals are embedded in the IPM FFS practices which are introduced to farmers in a discovery, experimental, group learning process. This means that 25 to 30 FFS members come together on a weekly basis over one cropping season to solve local farming issues (Najjar, 2013). The FFS, a ‘school without walls’ became named as such since farmers are educated in the rice fields, representing their primarily learning material (Bartlett, 2005). Here, they discover together in a group the ‘how and why’ of farming and take decisions for solving problems collectively (Duveskog et al., 2011 and van der Fliert et al., 2007) The aim is to trigger farmers’ understanding of how agro-ecosystems function including the interrelations
of soil, water and weather conditions, natural enemies, pest and crops (Thorburn, 2013). On the basis of this understanding, farmers are expected to choose for more agro-ecological farming practices. FFS represent a farmer first approach, it draws attention to on-farm conditions as well as to the farmers who should be actively involved in agricultural experimentation (Scoones and Thompson, 1994). With the involvement of farmers into on-farm experimentations, it is believed that farmers further apply and develop technologies which suit to local conditions and urgencies. Since FFS always works on issues and challenges being noticeable at a certain moment in time and space, a continuous cycle of reflecting and doing is created for farmers. It is about realizing why certain things are as they are and how they can be optimised in an agro-ecological manner. The innovative mind is thus stimulated among farmers and a critical outlook is developed towards the pursued actions (Fliert et al, 2007).

To reach sustainable management of the land, the IPM FFS also stresses the importance to address issues beyond the crop field. For instance, equally important to managing the field sustainably, is to take social issues into consideration. This was also indicated by Maumbe (2003) stressing that IPM is a technical as well as a social approach. As van de Fliert et al. (2007) point out, farmers’ cultivation practices will influence the ecological conditions of the neighbouring fields. An example is for instance, that farmers decide together to eliminate pesticides out of their farming system so that natural enemies can be preserved on all fields. The importance for acting on a collective basis becomes of high relevance to achieve the common goal of an applied natural pest control (Maumbe, 2003). Collective action is thus an important component for reaching sustainable agriculture and can be described as an “organisational form that brings people together and generates and redistributes benefits associated with improved farming livelihoods” (Olsen, 1965). The IPM FFS realized the importance of combining technical and social domains within an educational programme. Therefore, next to the agro-ecological farming practices being promoted, there was also attention for social issues such as group coherence, collaboration and group dynamics (van de Fliert et al., 2007).

Like the IPM FFS combing technical and social features, farming can be regarded in general as a technical as well as a social process in itself since farmers are actively using the technique including tools for instance (Rogers, 1995). So a practice application is not just technical but also encounters social features in the way how the practice is carried out.

IPM FFS have been widely implemented in many countries in Asia and since 1989, over two million farmers have been involved in such education programmes (Bartlett, 2005). Also, the IPM FFS approach spread since then to over 70 countries, reaching a number of over 4 million graduates (Thorburn, 2012).

**IPM FFS approach and change of agricultural practices**

IPM FFS have influenced agricultural practices of small scale farmers in Asia. For instance, several case studies In Indonesia showed that IPM FFS contributed to yield increases of about 10% as well as reduced pesticide application of about 50% (Resosudarmo, 2014). Additionally, other investigations showed that in many developing countries, the pesticide use reduced by 50-100%. Here, yields did not decline under IPM practices and proved to be economically efficient (Bajwa and Kogan, 2003). A reduction of costs was indicated as the main benefit of IPM for farmers in Vietnam, Cambodia and Indonesia. Costs were either saved on synthetic fertilizers in Vietnam and Indonesia and on synthetic fertilizers and on seeds in the countries of Cambodia and Vietnam (Winarto, 2004). Besides the decline of pesticide application, the majority of farmers also adopted the practice of row planting. This practice brings farmers the advantage of facilitating field observations, weeding activities, fertilizer application etc. (Van de Fliert, 1993). An interesting example where IPM FFS shows that technical change is associated with social change is provided by Palis (2006). Her article stresses that the IPM FFS introduced the practice of synchronized planting to farmers in the Philippines. The
practice of synchronized planting means that paddy is planted at the same time. It was adopted by all farmers and helped them to reduce the risk of extreme harvest loses. When farmers grow paddy at the same time, harvest losses are diminished as such that pests feed on a generally larger field of paddy cultivation. In this case, only when all farmers are exposed to “social pressures to encourage cooperation and participation”, social organisation to regulate pest management can be successfully achieved (Palis, 2006).

1.2 Problem statement

As seen above, IPM FFS influenced agricultural practices as well as social changes as reported over the last years. However, at the same time, Resuduarmo and Yamazaki (2007) state that there is evidence that graduated IPM FFS farmers flip back to the old practices and do not stick anymore to the new practices they have become familiar with in the IPM FFS process. The notion of farmers flipping back to the old practices is difficult to understand since presumably farmers experimented and experienced accomplishments within the IPM FFS set up, such as applying natural pest control, improving cropping skills, addressing health issues etc. This implies that there might be underlying and important reasons that need to be further investigated to understand how the IPM FFS approach can be constructed in a more optimal manner. When looking at the diffusion of innovation theory by Rogers (1995), it becomes relevant to consider the time-factor in the adoption of new practices. Whereas some people pick up the innovations immediately, others might pick them up at a later stage. However besides only paying attention to the adoption of innovations meaning in this case the changes IPM FFS triggered, not often was the construction of these changes questioned. Farmers are surrounded by complex conditions and these have often not been considered or linked to the changes being reached or not reached. The investigation of the context is often overlooked and thereby an insight into why and how IPM FFS practices have been not only adopted for instance but also adapted or even rejected has not been attained.

1.3 Research objective

This study aims to investigate how the IPM FFS in combination with context-specific features changed agricultural practices of small scale farmers on Java. This study should help to make agricultural development more efficient and successful in such a way that incentives for understanding farmers’ position is provided to practitioners.

1.4 Research questions

Main Research Question
How does the IPM FFS in interaction with context-specific features change agricultural practices of small scale farmers in three sub-villages on Java?

Sub-research questions
1.1 What were the main practices farmers have been introduced to in the IPM FFS?
1.2 Which practices have been adopted, adapted and/or rejected on the farm after IPM FFS participation?
1.3 What were the main incentives and benefits for adopting, adapting and rejecting the IPM FFS practices on the farm?
1.4 How were changes of agricultural practices triggered or inhibited through interaction with context-specific features?
1.5 Methodology

This sub-chapter describes the methodology applied for this study including the research design, data collection and data analyses. Together, all should provide understanding on the set-up of the data collection and the applicable processing stages pursued.

1.5.1 Research design

First of all, desk research was conducted on the topic of IPM FFS in relation to implementation targets, namely the farmers and the impacts being reached on the farm. Desk research was first of all conducted to get a basic understanding on the topic for further research. Mainly articles, books and journals provided the necessary equipment for the desk research.

For this research project, three case studies were chosen as a research method offering a detailed examination of specific cases at a certain time and space. A qualitative research design was chosen including semi-structured interviews. The collection of semi-structured interviews was especially seen as applicable to attain a rich set of data which is necessary for understanding the issue and its contextual framework. Open ended questions within the interviews were used to let farmers express their personal opinions and experiences for instance.

Target groups

The target groups of the interviews were alumni IPM FFS participants from 2002, 2007 and 2009 and came from three different sub-villages on Java (Table 1). All farmers were trained in the IPM FFS by the Ministry of Agriculture (MOA). In each sub-village, at least eight semi-structured interviews were conducted with IPM FFS participants from the respective years (Table 1).

Table 1: Interviewing scheme

<table>
<thead>
<tr>
<th>Year of IPM FFS participation</th>
<th>Name of sub-village</th>
<th>Number of interviewees</th>
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</thead>
<tbody>
<tr>
<td>2002</td>
<td>Wareng IV</td>
<td>8</td>
</tr>
<tr>
<td>2007</td>
<td>Mutihan</td>
<td>9</td>
</tr>
<tr>
<td>2009</td>
<td>Gedongsari</td>
<td>8</td>
</tr>
</tbody>
</table>

Next to interviewing IPM FFS participants from the respective years, I also interviewed extension officers and dukuh (head of the sub-village) of the particular sub-villages. This was of importance to get a general viewpoint on the external support farmers are receiving from governmental institutions and village leaders. Also, the dukuh provided relevant information on sub-village specifications (such as on the number of inhabitants, religious features etc.) which were of importance for capturing the context. Conversations were held with other alumni IPM FFS participants who participated in former IPM FFS such as from 1992 and originated from the same sub-village. These people especially recalled the historical background on IPM FFS in the sub-villages. Besides the interviewing, I attended events such as FFS evaluation days and farmer days in case they took place at suitable days for participation.

A detailed list of interviewees is provided in this report and can be found in Annex 1. Something to note with regards to gender is that I interviewed male as well as female alumni IPM FFS participants. There was no specific number agreed upon on how many male and female farmers to interview. Of course, I tried to interview an equal amount of men and women within each sub-village but often this...
depended on the availability of alumni IPM FFS participants. In most cases, more men than women were present in an IPM FFS group thus providing a larger amount of male farmers to choose from. However, a few female alumni IPM FFS participants were always present and these were then interviewed to attain more gender-balanced outcomes.

**Access to and selection of the target groups**

Access to the target group was possible through Arief, a contact person from the NGO Field Alliance. Since Arief works already for many years with Field Alliance in the domain of IPM FFS in Indonesia, he was able to provide further information and contact persons. The study area Yogyakarta was especially chosen since this area was famous for many IPM FFS activities over the past years as well as because there were relevant contact persons located. Alumni IPM FFS participants from the particular years of 2002, 2007 and 2009 were selected since databases from these years were most easily accessible. The databases were of importance to ensure that interviewees were originating from the same IPM FFS. People who provided access to the wide-ranging population of interest were in the first place the extension officers and the dukuh. Extension officers provided databases on alumni IPM FFS participants and dukuhs agreed to the interviewing of individuals in a respective sub-village. Selected alumni IPM FFS participants were trained by extension officers working for MOA. I selected the sub-villages while keeping in mind to pick at least one sub-village from a rural area and others from an urban site. The reason for especially keeping rural as well as urban locations in mind was because they might be differently connected to the access of information and in general different settings might occur. Also, it was important for me to also experience the paddy season which was only possible in the urban sites due to irrigation accessibility.

**1.5.2 Data Collection**

**Location and interview timing**

The interviews were all carried out in a natural setting meaning in the naturally appearing environment of the farmers. This was either their home or the field. The interviews were in most cases carried out just with the individual farmer, their partners or children if present, by my female translator Wulan and me. The interviews took approximately 1,5 to 3 hours and were all recorded after having received consent from the interviewees. The translator was of great support since she was familiar with the Indonesian culture and ethical matters from what I could learn and experience from. She studied agriculture before what made the topic also interesting for her.

**Drawing visioning**

Besides the interviews, I handed over white paper and coloured pencils to farmers so that they could draw a picture. These pictures often presented their learned and still applied IPM FFS practices or just their future wishes with regards to their farming occupation. This was a nice activity where farmers were triggered to think about visualizing their practices, fields etc. I especially decided for drawings since IPM FFS also stimulate this ability.
1.5.3 Data processing

Data processing started already in Indonesia besides conducting the interviews. Due to a rich set of data arriving from semi-structured interviews, I decided to transcribe the recorded interviews. This was very helpful for organizing outcomes, discussing progress with my translator and to process and think about the data collection step by step. Meetings with my translator were regularly scheduled to get a smooth data collection process but also on receiving feedback from her on my interviewing skills. To organize all the transcriptions into useful pieces, a thematic content analysis was applied. First of all, common features were analysed among the transcriptions. Afterwards, the common features became umbrella terms allocated resulting in the codes and themes. Identifying and applying codes facilitated the finding of regularities and the organization of my outcomes. In total, 21 codes were recognized among all the transcriptions ranging from IPM FFS practices learned, applied to collective action, additional earnings and so on (Annex 2). After having finalized the coding, a better overview on the findings was achieved and the writing part of the results could start.

1.5.4 Limitations of the study

During my study, I also came across certain limitations. First of all, I experienced difficulties with the communication in Indonesia. The official language in Indonesia is Bahasa Indonesia and is usually spoken throughout the country. I also took private lessons in Bahasa Indonesia during my stay so that at least a small talk with farmers could be arranged. However, where I conducted my interviews, some farmers only spoke Javanese, the very traditional language on Java. Even my translator, originating from Jakarta, whose primarily language is Bahasa Indonesia had difficulties to understand and speak Javanese. Therefore, we faced communication issues with certain farmers. Another issue was that in Bahasa Indonesia, tenses are not well expressed language wise. For instance, they cannot necessarily express the past. Therefore, it was always a bit tricky to note whether they are still applying certain practices or if they did that many years ago. Hence, more questions for further clarifying the exact outcome had to be encouraged.

Much more, I faced the issue of validating if what people say reflects what they do. Since Indonesia constitutes of a very polite culture, it is very important to be kind to each other. This is very important in Indonesian society and often comes along with a different way of being honest as we are used to be. As I personally experienced in some cases, people express very modest their opinion and feelings. Therefore, I found it difficult to trace what people think, feel or act like. What helped to get a bit closer towards solving this dilemma was to build trustful relations to the farmers by visiting regularly the sub-villages. For instance, I visited their field sites, joined them for lunch hours or during times where they prepared ceremonies. The aspect of building trust was very important, not just with farmers themselves but also with extension officers who often acted as the gatekeepers to the communities. Extension officers often introduced me to the responding farmers and liked to know what kind of questions I was going to ask. Especially in the beginning, they preferred to participate at the interviews and thus tended to act as the respondents. This was sometimes a critical situation since the interview outcomes might have differed without the present of the extension officers. However, as soon as a certain degree of trust was built with extension, they did not join the field visits anymore. A last important limitation was that farmers had often difficulties to recall the year of IPM FFS participation. Therefore, I rather asked who the other participants of the IPM FFS were.
1.6 Theoretical framework

1.6.1 Farmers’ position and its embedded context

In this section, I highlight the position of farmers and their multiple and constantly exposed circumstances. This is important to understand how and why farmers respond towards newly introduced technologies and knowledge paradigms. According to a quote by Richards, a farm is never finished (Richards, 1989). This statement is explained by creating an image of a farm which is in this respect a dwelling being established step by step with certain investments being made. Investments are of significance to receive future outcomes such as the final house construction or the harvest. The dwelling or the farm so to say delivers material and symbolic features to farmers such as satisfaction, basic needs, status and appearance. To keep up both, it is a matter of coping and struggling in social and environmental surroundings facing multiple constrains and undertaking regular adjustments. For instance, “a family wishing to build a home, let us say in an African city, must make many hard decisions about its location, its cost, its dimensions and its design. Many possible variables, from personal preferences to financial constraints and difficulties encountered over land rights and access, may influence the final outcome of such endeavour” (Batterbury, 1996). Similar features must be considered when running a farm, such as on the choice on farmland crops, agricultural techniques applied, with regards to labour constrains, financial and social matters, etc. All these constrains have to be considered by farmers and come into play when they are introduced to new technologies and have to weigh the effect of possibly changing their own practices. For instance, if a new technological tool is introduced to farmers, this toll will always be outweighed with various considerations farmers keep in mind such as livelihood goals. Here, there is an interplay between technical and social features. Technical arrangements such as the pursuing of certain farming practices come along with certain motivations or incentives which often relate to social domains. The study by Crane et al. (2011) shows that incentives stated by farmers often lie in the realm of achieving a good crop and good profits. However, when taking it a step further, “the pursuit of agronomic and economic goals is always contextualized within the pursuit of wider social goals” (Crane et al., 2011). This basically means that not necessarily objective goals make up the incentives but rather the subjective goals which relate to social features and are the outcome of the former one. Social goals can relate for instance to a meaningful live, offering food to the family, caring for each other etc. For this study, it is important to highlight the position of farmers to identify how IPM FFS influence agricultural practices. To understand the position of farmers in their embedded context plays a crucial role for attaining insight into the aspects affecting farmers for further changes on agricultural practices.
1.6.2 Realist evaluation

An additional theoretical perspective chosen for this investigation is based on the realist evaluation. Realist evaluation is a theory-driven evaluation focusing on social programmes and its implications in a certain context providing the supportive embedding for further changes and outcomes (Pawson and Tilley, 2008). The context, seen as a fundamental surrounding for understanding the interlinkages among variables is considered. Whereas other evaluations often focus on the cause-effect relationship, not incorporating the context in general, realist evaluation especially incorporates the context as a fundamental surrounding for understanding the interlinkages among variables. Whereas conventional evaluations focus on “What works?”, realist evaluation rather aims to address the major question such as “What works for whom in what circumstances and in what respect and how?” (Pawson and Tilley, 1997). It is not just based on identifying the changes triggered by a respective programme but rather on how these changes were fostered by interventions within a particular context. Realistic evaluation is based on critical realism which takes a certain philosophical standpoint as outlined by Bhaskar and Danermark (2006). Here, critical realism is explained with regards to ontology, epistemology and methodology. Ontologically, it can be stated that critical realism suggests that there are several layers of reality. From the epistemology standpoint, critical realism incorporates the existence and interplay of mechanisms and context specific arrangements, leading to certain outcomes and phenomena. These mechanisms can be found internally within the objects of investigation which are real and manipulable, producing further precise outcomes (Mesjasz, 2008). So the objects and their actions evolving from it cannot be regarded as separate entities but rather as a whole system incorporating external context specific features. So basically, there is a philosophy stressing the incorporation of a holistic, open system being constantly about to change depending on the various variables. Therefore, as noted by Sayer (1997), realism is not about predicting certain outcomes since they cannot be forecasted due to the open nature of systems in which mechanisms and their effect depend on the context specific environment. Last, critical realism in relation to methodology, is meant to be able to “move beyond reductionism” (Bhaskar and Danermark, 2006). Instead of looking how certain things function and collaborate with each other in a closed system, critical realism looks beyond that in such a way that it incorporates other, outlying existing features. Linking it to the before mentioned ontology, there are more layers of reality to look at and incorporate. Pawson and Tilley (2008) developed an approach to apply realist evaluation in which the four fundamental aspects are explained and further elaborated. These aspects are outlined and linked to the conceptual framework of this study.

Programmes

According to realist evaluation, programmes are considered to be embedded into social systems to “cure” problems and to look after the betterment of target subjects. It is about the introduction of new inputs into a social system which might trigger disturbances or any other kind of effects, making it visible in the changing behaviour of social subjects. The meaning of “programmes are embedded” stresses the point of realizing that they are surrounded by multiple realities, forming the context (Pawson and Tilley, 1997). Since realist evaluation stresses the notion of open systems, the programmes delivery can be easily influenced by externalities. This could be for instance political instability, financial crises, unemployment and so on, depending on the location of programme execution.

With regards to this study, the IPM FFS can be considered as the “programme” being introduced by practitioners (extension officers from MOA) into the social system of rice farmers in three sub-villages on Java. The rice farmers are in this respect the target subjects, i.e. the individuals trying to be reached
by the programme, the IPM FFS. The programme provides new knowledge and technical options to farmers which they should together explore and further evaluate by conducting experiments upon. The experiments should help them to further validate the choices to make with regards to their agricultural practices.

**Mechanisms**

Mechanisms are extremely crucial components in the realist evaluation since they are supposed to bring changes and effects in a given context and circumstances. Mechanisms are not always seen or obvious and thus often hidden. According to Pawson and Tilley (1997), mechanisms can “explain how things work by going beneath the surface (observable) appearance and delving into the inner (hidden) workings”. It is therefore not so easy to identify mechanisms since someone has to dig into the understanding of individuals’ justifications for conducting certain actions. In realist evaluation, it is then about digging and identifying mechanisms which might be activated by a programme especially in a specific context. For instance Pawson and Tilley (1997) point out an example where they talk about the individual choice of conducting suicide. However, the suicide although individually decided and enacted, might be related to socially constructed features such as the exclusion or marginalization of family membership, friend groups or communities for instance. That’s where the social mechanisms come into play, being about the decisions people take which arise from socially constructed characteristics such as collectivism. Although the sadness and the loneliness of the individual person committing suicide might be seen as the triggering activator for committing suicide, the understanding rather lies in the hidden mechanisms of understanding why this person has been sad or lonely. For this study, I consider the mechanism as the process of change.

**Context and outcome patterns**

A particular mechanism can be only activated or triggered under a specific given context. For instance, a certain context can be supportive to foster certain mechanisms to be activated. With regards to the before mentioned example, it could be assumed that the individual committing suicide, has experienced a denied access to a friend’s group since he is a foreigner, making it more difficult in certain countries to be accepted. Being a foreigner can bring along certain constrains such as not being able to speak the language, making communication more difficult etc.

In this study, the rural setting on Java, be it the culture, the geographical location, political structures, social relations etc. form the context.

Outcomes can be then described as the consequences programme interventions brought along such as “changes in the behaviour” of the target subjects (Pawson and Tilley, 2008). To state an example again, this would be for instance the actual enactment of the suicide of the individual mentioned beforehand.

In the case of this study, the outcomes are reflected in the agricultural practices of farmers after they participated in an IPM FFS. It is about realizing the changes which can be regarded in the enacted action of rice farmers. The outcomes are the enacted actions where farmers either adopted, adapted or rejected the IPM FFS practices. ‘Adopted’ refers in this case to practices which have been implemented as they were supposed to be implemented by practitioners. ‘Adapted’ on the other hand means that new practices were modified, thus creating hybrid practices. And last, ‘rejected’ draws on practices which either have been immediately or over time not incorporated by farmers.

So basically, the following equation can be noted as presented in Figure 1 (Pawson and Tilley, 1997):
The context-mechanism-outcome pattern configuration provides then the basis for understanding when (meaning to what moments in time and space) a programme works for whom and in which circumstances. As stated by Mark et al. (2000) “Good evaluation is that it is able to explain the complex signature of outcomes.”

As already exemplified under each aspect, the programme relates to the IPM FFS intervention which is introduced in a specific context of the rice farmers, the target group. The introduced programme together with context-specific features affect the target group in the kind of choices being made with regards to agricultural practices. The changes on agricultural practices can be thus described as the outcomes.

1.7 Thesis outline

The first Chapter presents an overview of this study including an introduction to the study, the problem statement, research objective, research questions, methodology and the theoretical framework. In the theoretical framework, the four fundamental concepts of this study are presented but also a general standpoint is provided on how these concepts are interlinked. Chapter two provides then a more detailed description of the case studies including its geographical location, climate, traditional aspects but also historical background on agricultural development programmes in Indonesia. Chapter two should especially provide profound background information for this study whereas Chapter one rather focuses on the study itself. Chapter three, four and five focus on the empirical data of the field work in Indonesia and therefore on the answers to the research questions. Chapter six presents the discussion and conclusion of the empirical findings.
CHAPTER 2: Contextual description of the case studies

2.1 Geographical location

The research site was arranged in the Yogyakarta region, in the south of Central Java (Figure 2). Yogyakarta is also the name of the capital city of the Yogyakarta region and has thereby two meanings. The Yogyakarta region is divided into four districts such as Sleman, Gunung Kidul, Bantul and Kulon Progo and one municipality called Yogyakarta. Each district consists of sub-districts (Kecamatan), which are furthermore divided into villages (Desa) and these in turn are further divided into sub-villages also known as hamlets (Dusun). Hamlets are the smallest unit and have been considered for further investigation. The three respective sub-villages named Wareng IV, Mutihan and Gedongsari are either located in the district of Gunung Kidul, Sleman or Bantul (Figure 2). The districts of Sleman and Bantul share similarities: both are located in rather semi-urban areas, in the proximity of the municipality of Yogyakarta, accounting for a higher population density and a more developed infrastructure. Also, there is a more extended network of irrigated land compared to the district of Gunung Kidul, being rather located in a remote setting as well as on a higher altitude.

![Figure 2: Yogyakarta region including its four respective districts (Kim, 2006)](image)

All three sub-villages are surrounded by agricultural land on which paddy cultivation is the major economic activity (Kim, 2006). Due to the geographical locations, farmers in Mutihan and Gedongsari practice irrigated lowland paddy cultivation. However, in Wareng IV which is located on a higher altitude, farmers depend on upland paddy cultivation systems. Upland paddy cultivation means that
paddy is grown on rainfed fields. Whereas paddy presents the major crop in lowland areas due to the low altitude and access to irrigation facilities, paddy in combination with secondary crops such as maize, cassava, peanuts etc. has become more common on highland areas. In Yogyakarta, paddy presents the staple food for the majority of people, as it is being consumed two to three times in a day. It is an important food diet among indigenous people and often eaten in combination with vegetables, meat or fish. Indonesia accounts for the country being the largest rice consumer in the world, consuming “140 kilogramme of rice per person per year” (Indonesia Investments, 2015).

2.2 Climate

The climate in Yogyakarta can be described as a tropical with an annual rainfall of 2157mm per year and an average temperature of 26.4 °C (Climate-Data, 2015). The given values are averaged and can of course vary according to the geographical location. There is one long rainy season from November until May and one dry season from approximately June towards October (Figure 3). In the long rainy season, two agricultural paddy seasons can be grown. One paddy season takes approximately 100 days. In the dry season, usually other crops are grown depending on the location and access to irrigation facilities. Figure 3 indicates the temperature on the left side of the climate diagram and on the right side the rainfall in mm per m².

![Figure 3: Climate diagram indicating temperature and rainfall (per m²) in Yogyakarta (Climate-Data, 2015)](image-url)
2.3 ‘Gotong Royong’ tradition

One very important cultural aspect in Indonesian society which I came across during the field work is Gotong Royong, “a traditional form of mutual assistance” (Kartodirjo, 1980). The term Gotong Royong is deeply rooted within Indonesian society. It basically has the meaning of collectivism, of belonging together and helping each other mutually in need for support and assistance. As described by Bowen (1986), the term generates an “image of social relations in a traditional, smoothly working, harmonious, self –enclosed village on Java” in which labour exchange takes place as well as the motivation for accomplishing work with the idea to reach a common welfare. With regards to the studied sub-villages, Gotong Royong was encountered in the domains of planting, harvesting, organizing feasts, building houses, cleaning the irrigation canal etc. Gotong Royong does not involve any payment for the physical work and rather focuses on the tightening of social relations. However, to understand social relations on the ground, it becomes apparent to look into the political background since it strongly interferes with the behaviour and culture within a country. The same counts for the term Gotong Royong which became a slogan in Indonesian politics for expressing “national unity” (Bowen, 1986). As noted by Bowen (1986), presidents of Indonesia often referred to Gotong Royong or at least the meaning of the term in various speeches. For instance Muhammad Hatta claimed during the Japanese occupation that farmers in Indonesia should rely on reciprocal assistance. This is important since a farmer is not able to execute all the agricultural activities himself. Hatta used the term Gotong Royong as the basis for revitalizing the folk of Indonesia. Also, the notion of Gotong Royong found prominence in society due to the speech of President Sukarno in 1945. There, he used the term as an expression of uniting the people within society, no matter of origin, religion or status belonging. The fact that the term Gotong Royong was used within politics had also a wider meaning with regards to Beard (2005). He claims that the Indonesian state also wanted to stimulate the development within Indonesia. For creating development, the active participation of citizens is of importance and therefore, the relationships among individuals, the social capital (what Gotong Royong embodies) has found prominence among policymakers (Beard, 2004). Gotong Royong became also part within development programmes in which the participation of citizens was crucial. For instance, the governmental BIMAS programme, focusing on the mass guidance for rice intensification within the country, also included Gotong Royong linguistically as a strategic method for trust and cooperation building. Bowen (1986) stresses here that foreign chemical enterprises started to spray pesticides over wide field blocks. Farmers were in this case compelled to grow hybrid crop varieties as well as paying back the surcharges for the inputs to the company. Here, the Gotong Royong notion became misused by practitioners who tried to promote their ideology by persuading farmers. But instead of reaching mutual assistance and equality, farmers did not turn out any better by stepping into such misleading networks. Another state-based project called “Inpres Desa”, also known as the “village subsidy”, focused on the annual grant for villages. The grant is provided to the village head to invest in Gotong Royong activities. These Gotong Royong activities concentrate on infrastructural means such as the cleaning of the irrigation canal, roads, houses etc. Here, the state tries to promote Gotong Royong within villages as such that “labour is to be donated and not purchased” (Bowen, 1986).

When being in Indonesia, villagers often talked about Gotong Royong in a very positive manner, stating that everybody profits from it. It is all “Sama sama”, “equal for everybody”. One interesting aspect to mention here is still the gender relation within Gotong Royong. As experienced during a Gotong Royong of a housing construction, men usually take over the physical work. Women and especially the woman who is about to live in this house, prepares food and beverages for the entire assisting community. So also sharing breaks, a time besides work can be realized where the community comes together, thus creating a place for exchanging thoughts and ideas.
Whereas Gotong Royong plays an important role with regards to agricultural practices such as planting the paddy seeds and harvesting the paddy in Wareng IV, other forms of Gotong Royong relating to rather the cleaning of the irrigation canal and the village in general has found prominence in the sub-villages of Mutihan and Gedongsari. In Mutihan, Gotong Royong is not practiced for agricultural activities such as planting and harvesting since farmers have to plant and harvest at the same time. Therefore mutual assistance is more difficult to incorporate. However, in all three sub-villages, Gotong Royong represents an important tradition which creates stronger ties among sub-village inhabitants.

2.4 Historical perspective on agricultural “development“ programmes in Indonesia

Chapter two provides a historical perspective on agricultural “development“ programmes in Indonesia, reaching from 1960's until now. It clarifies how certain development programmes came into existence through political powers and context-specific events as well as the achievements and drawbacks being encountered. Also, the development of the IPM FFS will be described and how it further settled and developed in times where political power was strong and influential.

2.4.1 Five Efforts in Agriculture Pilot Project

From the Japanese occupation until the 1960's, Indonesia was confronted with the severe issue of food shortage due to an increasing population and a low domestic rice supply (Resosudarmo and Yamazaki, 2007). Rice, being the staple food in Indonesian society, had to be thus imported. With the food shortage issue and its associated imports being relatively expensive for “this young republic”, it became indispensable for the government to prioritize an agricultural development programme focusing on improving rice production with a rural modernization approach (Resosudarmo and Yamazaki, 2007; Hansen, 1972).

In 1963, the Institute of Agriculture in Bogor, the best agricultural faculty in Indonesia at these days, conducted a pilot project in the Karawang District, East of Jakarta. This pilot project was meant to enhance rice cultivation by following the “Five efforts in Agriculture” programme (Rieffel, 1969; Murai, 1980). This project was also common under the Indonesian name “Complete Pantja Usaha Pilot Project”, called into existence by MOA and exclusively sponsored by the Ministry of Education. For the pilot project, twelve selective students from the faculty were sent over the wet season to three respective villages (Rieffel, 1969). These students conducted experiments with small scale farmers and facilitated the implementation process of new farming technologies encompassing the “Five Efforts in Agriculture” which focuses on the “intensive use of high yielding varieties, appropriate and timely use of fertilizer, pest and disease management, improvement in cultivation methods and improvement in irrigation and drainage system” (Resosudarmo and Yamazaki, 2007).

This project proved to be successful since farmers accepted the new technologies and thereupon higher productivity could be reached. However, there were also incidences showing that farmers modified the instructed technologies and thereby rather applied a mix of the old and the new practices. Therefore, doubts on whether farmers might flip back to the old practices became apparent (Hansen, 1972). However, although there were some farmers not applying the recommended technologies, a general increase in rice production was identified. Thereupon, the small scale “action research” turned into a large scale national programme, also known as the BIMAS (Roekasah and Penny, 1967). The “Complete Pantja Usaha Pilot project” became thus the ‘springboard’ or the ‘embryo’ of the national instructed BIMAS programme (Resosudarmo and Yamazaki, 2007; Rieffel, 1969). With regards to the upscaling of the programme, first of all 440 senior students coming from
various agricultural faculties from Indonesia were sent to 220 villages which later on increased to 1200 students. These students were used to live in big cities. However, with the expanded BIMAS programme, a vast amount of students were supposed to build the bridge between agricultural science and real life situations experienced on village level. Students, especially coming from the elite, had the chance to explore the lives of rural farmers in Indonesia (Roekasah and Penny, 1967).

2.4.2 BIMAS

In 1965, the Mass Guidance (BIMAS for Bimbingan Masal) rice intensification programme was introduced as part of the New Order government by Suharto with the main goal of achieving rice self-sufficiency in Indonesia (Thorburn, 2013). Oil companies being part of the Petroleum Exporting Countries (OPEC) as well as the World Bank supported this massive governmental initiative. Besides improving rural infrastructure and facilitating agricultural extension, the main idea of the BIMAS consisted of delivering uniform input packages of “high-yielding rice varieties, pesticides, fertilizers and credit” (Welker, 2012). These uniform input packages were set up by the government in collaboration with the World Bank, Asian Development Bank, International Rice Research Institute etc. and consisted of a certain "kind and amount of fertilizer and pesticides" which had to be furthermore delivered to the customers, the farmers (Welker, 2012; Hansen, 1972). As criticized by Welker (2012), these input packages did not consider the broad context of the target groups such as the geographical or ecological disparities among farmers within Indonesia. This statement has been also supported by Hansen (1972) who claims that the government did never maintain any data on soil composition characteristics or agricultural conditions which is of importance when applying fertilizers or pesticides at a certain location in time and space. Also, the input packages aimed to bring farmers in a position where a broad spectrum of choices on agricultural practices is strictly diminished. Farmers should be basically forced into certain practices. However, what happened was that farmers often sold inputs to local agricultural shops since the given quantity exceeded the personal needs or the quality of the given products was not satisfactory for the farmers. Another issue being encountered with the BIMAS was that farmers could not repay the credits to the government and that agricultural inputs arrived too late meaning after the paddy season. According to the latter, farmers rather sold the inputs to the local markets since there was no current need anymore.

2.4.3 BIMAS Gotong Royong

In 1968, Suharto was re-elected in 1967/68 and continued his office, providing special attention to the BIMAS programme still with the aim to finally turn Indonesia into a self-sufficient country. Therefore, he went a step further and slightly modified BIMAS into BIMAS Gotong Royong (Resosudarmo and Yamazaki, 2007). With this new approach, the government agreed to an offer of the Swiss chemical firm CIBA to provide high-yielding seeds and fertilizers to farmers on village level as well as the aerial application of the insecticide Dimecron (Hansen, 1972; Joyce et al., 1970). According to Settle et al. 1996, large scale insecticide applications were especially executed to control the current pest of the yellow stem borers (Scirpophaga incertulas) in rice fields. The first aerial application was thus conducted over the wet season starting from October 1968 until April 1969 and was considered as an effective way since farmers could be better controlled. Also, with the application of aerial spraying, the decision making was no longer in the hands of farmers themselves but rather passed on to the government bureaucracy (Hansen, 1972). Farmers had no choice for escaping this application and therefore they were forced into this terrific situation. But not just the aerial spraying turned farmers into non self-decisive actors. Alike, there were also the “new miracle rice seeds”, also known as IR5
and IR8 which required a larger amount of inputs to optimise productivity (Murai, 1980; Hansen, 1972). Providing these seeds, should have prevented farmers from selling inputs. Thereby, a better control over farmers and creating uniform agricultural practices among farmers should have been created. Through the application of Green Revolution technologies, rice productivity increased in late 1969. However this goal was only achieved on a high price of ecological and economical distraction as further elaborated on by Hansen (1972).

For instance, the high yielding variety IR8 became susceptible to certain pests. Other related issues with IR8 can be attributed to the different taste this variety encountered. Consumers did not like this taste and thereby the demand decreased and farmers started to move back to their old, conventional seeds. Since conventional seeds require less inputs, the surplus of the nitrogen and phosphate fertilizers were sold again to the local market at a generally smaller price. Consequently, farmers started to rather secure their inputs by sourcing them from the local market instead from the government. With regards to the ecological side effects of the BIMAS Gotong Royong, fish in nearby paddy ponds were poisoned thus disturbing the agro-ecosystem. This phenomena was especially triggered by the aerial spraying and thus the distribution of chemical pesticides.

BIMAS Gotong Royong undertook many efforts for reaching rice self-sufficiency. However, little achievements could be recalled. As noted by Djurfeldt and Jirström (2005), Indonesia still faced severe deficiencies with regards to adequate domestic rice supply in early 1970s. The average rice supply only reached 80% and thereby, Indonesia “continued to rank among the poorest countries in Asia.”

2.4.4 BIMAS Improved

BIMAS Improved (BIMAS yang Disempurnakan) was called into existence in late 1970 and was part of the “second phase of Indonesia’s Green Revolution” (Hansen, 1978). This programme was meant to address issues encountered with BIMAS Gotong Royong. In scale, BIMAS Improved was still similar to BIMAS Gotong Royong by approaching a similar area of farmers. However, the content of the programme came along with fundamental changes initiated by the government.

First of all, the government terminated any collaboration with foreign firms resulting in the increased financial and administrative burden governments had to face from now on. Secondly, whereas the power was truly in the hands of the government in the previous programme, it slightly shifted back to the farmers. This can be explained as such that farmers had more freedom in the choice and utilization of inputs. The input packages became more flexible and more adapted towards farmers’ personal needs. However, the government still identified ranges where the freedom was accordingly restricted. Last, aerial spraying was abolished and substituted by hand spraying. This made farmers more flexible towards their pesticide application techniques. Resosudarmo and Yamazaki (2007) also highlighted the important role of the BRI bank being involved in the set-up of village retailers and village warehouses to overcome late delivery issues of fertilizers and insecticides and to store the rice as “a warranty for further credits.” Furthermore, the appointment of extension workers increased and thus entirely replaced the BIMAS students from the agricultural faculties. BIMAS Improved continued until the 1980’s and can be in general regarded as successful for certain matters. For instance, the achievements relate to the large area of rice farmers being covered by this programme. Farmers adopted the recommended technologies and over the first 10 years, “45 per cent of rice areas in the country were under an intensification programme” (Resosudarmo and Yamazaki, 2007). Also, rice yields increased over the period of the 1970’s. This outcome is also supported by Hansen (1978) who claims that the rice yields were generally satisfactory with the BIMAS programme although some yields had to suffer in respective years but this was especially attributed to unpredicted weather conditions instead of the programme itself. As noted by Thorburn (2013), Indonesia could finally reach
self-sufficiency in rice in the year of 1984. Reaching self-sufficiency in rice has been regarded as one of the greatest achievements as considered by Suharto himself (Djurfeldt and Jirström, 2005). In spite the success factors of the BIMAS programme, also drawbacks could be identified. For instance, Welker (2012) points out that medical diseases were notified by farmers being exposed to large amounts of insecticides. The symptoms of these diseases were especially related to nausea and headache. Additionally, as stated by Bottrell and Schoenly (2011), the Green Revolution, what the BIMAS incorporates, changed the landscape of rice cultivation as such that pest incidences such as of the Brown Planthopper (BHP, *Nilaparvata lugens*) were encouraged. Heavy pest outbreaks could be especially verified in irrigation sites where two to three rice cropping seasons were induced. Several factors facilitating a favourable environment for BHP's to multiply could be acknowledged. These can be briefly described as a widely applied monoculture, heavy use of nitrogen fertilizer, the massive application of the insecticide as well as the pests being resistance against the insecticides. Especially through the intensive use of insecticides, the agro-ecosystem was disturbed as such that natural enemies were directly killed and thereby the food chain was interrupted. The disappearance of natural enemies, usually controlling pests such as the BHP, contributed to the fact that the target pests of BHP was thus able to increase in a steady amount. Basically, the killing of a non-target “pest”, being supressed through the intensive use of insecticides gives the target pest the chance to survive. This phenomena is also referred to “pest resurgence” and is regarded as an effect of the Green Revolution technologies. BHP caused severe pest outbreaks on the rice fields in the years of 1976/1977 and 1985/1986 damaging 450,000 hectares in the first and 275,000 hectares in the second epidemic (Thorburn, 2013, Resosudarmo and Yamazaki, 2007). Thereupon, yields were enormously affected by these incidences.

2.4.5 National IPM Programme

As further elaborated by Thorburn (2013), the BHP outbreak created the importance of a new agricultural development programme which was firstly initiated by FAO and agricultural scientists from the agricultural faculty in Bogor. What happened was that these two organizations introduced natural enemies and pests in “matchboxes” to President Suharto in October 1986 to explain the fundamental idea of Integrated Pest Management (IPM). Suharto favoured the idea of IPM and abolished straightaway “28 broad-spectrum pesticides”, backspaced pesticide subsidies and instructed to implement IPM as a national policy (Thorburn, 2013). The IPM approach was nationally disseminated via the FFS model and was first of all implemented in 1989 as a two year pilot project. This pilot project was at first hand financially supported by the U.S Agency for International Development (USAID) and later on handed over to the Indonesian Ministry of Finance and the National Planning Agency (BAPPENAS). FAO provided especially technical assistance and implemented the first IPM FFS in Indonesia in 1989 (Welker, 2012; Thorburn, 2013). The IPM FFS was at that time depicting a unique approach in agricultural development discourses since experimental learning was placed as a fundamental idea to solve underlying problems in the field (Bartlett, 2005). Also, the issues should not be simply solved by providing knowledge on agro-ecological features to farmers, alike, it should stimulate skills of reflecting on and modifying this knowledge within a group based education system. The weakness as Bartlett (2005) points out often lies in the non-existence of these skills and is in itself a crucial issue. The IPM FFS therefore tries to trigger knowledge generation in farmers themselves instead of providing clear instructions and messages.

The IPM FFS approach was strongly supported at that time by BAPPENAS, a governmental agency searching support from scientists and other governmental organizations to facilitate the IPM implementation on a national level. Through the IPM promotion by BAPPENAS, the IPM by Farmers
Program established with a special focus on the dissemination of the IPM FFS nationwide. The IPM Farmer Program consisted of three fundamental steps such as the “training for trainers, for farmers by these trainers, and training for farmers by farmers” (Resosudarmo and Yamazaki, 2007). As Jelantik and Nyoman (2003) explain, this training programme focused on the dissemination of accurate IPM principles and the replication of it on each level, reaching from the government to the respective farmers. In the first year, 22 Senior Field Pest Observers, being selected from the major provinces, participated in an IPM training mainly executed in Yogyakarta. As stated by Jelantik and Nyoman (2003) and van der Fliert (1993), laboratories and experimental fields were provided to intensively study the principles of IPM for 3,5 months, incorporating soil preparation, transplanting, natural enemies and pest interactions. Afterwards, the participants were trained for another 3,5 months on how to conduct IPM FFS training to farmers. Besides the training on IPM FFS on rice, they became also equipped with IPM FFS on soybeans which took another 3,5 months of education. Last, a diploma course at the university had to be completed which took another 4,5 months. After they have completed the 15 months training programme, they were called Pemandu Lapang 1 (PL1), also known as Field leader 1. Field leaders 1 were responsible to further train IPM principles to trainers in the provinces.

While participants were trained to become Field Leaders 1, also 90 Senior Field Pest observers from different provinces were trained in the IPM principles for just 2 weeks. These graduates were called later on Pemandu Lapang 2 (PL2), Field leader 2. Field leaders 2 were responsible in assisting Field leaders 1 in the compiling stage of the IPM training programme in the respective provinces. So in each province, one Field leader 1 has been assisted by two Field leaders 2 to conduct IPM training to pest observers who would later on carry out the 12-week IPM FFS to farmers. The pest observer became the main facilitator of the IPM FFS to farmers and was assisted by extension officers from MOA when necessary. When extension officers joined, they could immediately see and learn how to conduct IPM FFS trainings (Van der Fliert, 1993). Farmers who were trained in the IPM FFS were members of a Farmer Community and as noted by Welker (2012) selected by the village head. Also, the trainers of IPM principles were referred to as “facilitators” for indicating that the knowledge generation of participants was rather facilitated instead of disseminated by a top-down approach. As noted by Resosudarmo and Yamazaki (2007) and Resodudarmo (2014), 200.000 farmers, especially rice farmers, participated in IPM FFS by 1992 of which ten percent have been selected again to follow an IPM training of trainee programme (TOT). With the finalization of this programme, certain farmers became further facilitators for IPM FFS, also known as ‘Farmer Leaders’ (Petani Pemandu) and supervised by Pest observers and extension agents (Resodudarmo, 2014).

At that point, it became clear the IPM FFS started to be disseminated on a national level, reaching from province to village domains. After 1992, Indonesia applied for another loan at the World Bank which should assure the financial drawbacks for the Indonesian National IPM programme running from 1993 until 1999. The loan got accepted and the IPM national programme was to 75% financially supported by the World Bank and to 25% covered by the Indonesian Government itself. From 1992 onwards, BAPPENAS shifted the Management of the IPM FFS implementation to the Ministry of Agriculture (MOA), still being technically supported by FAO (Thorburn, 2013). The shifting of the IPM FFS to MOA has been often criticized since MOA has been the implementation body for Green Revolution technologies and now entered a phase in empowering farmers with the IPM FFS approach (Winarto, 2007). Until 1999, the IPM national programme experienced many drawbacks with regards to the up scaling. For instance, as Thorburn (2013) points out, one issue can be related to the “top-down” delivery which often occurred when ministry officials tried to make the programme fit into existing bureaucratic structures. Likewise, MOA still tended to support farmers with pesticides, making them still depending on governmental support. The FAO had thereupon little trust in MOA and its commitment to the implementation of IPM FFS.
The issue triggering the end of the IPM National Programme can be attributed to the crises in 1997. Indonesia faced a huge drop in the national GDP what furthermore triggered the non-consideration of the IPM FFS as a national priority. Governmental support became less and thereupon the programme ended in 1999. In spite the National IPM programme terminated in 1999, it came along with many accomplishments such as that “1 million farmers had been trained in the IPM FFS” (Resosudarmo and Yamazaki, 2007). These farmers became equipped with the knowledge of producing healthy crops as well as being more confident in taking their own decisions on pest control in the field. Also, pesticide use diminished among farmers showing a positive effect on their health (Resosudarmo and Yamazaki, 2007). With the end of the National IPM programme, FAO stopped its technical support.

2.4.6 ‘Reformasi’ and the construction of IPM FFS

Indonesia entered a new political phase with the resignation of Suharto in 1998. B.J. Habibie became the new president of Indonesia and thereupon, the ‘new order’ regime got displaced by political changes highlighting the era of ‘Reformasi’. As described by Hainsworth et al. (2007), the new Reformasi era aimed for regional autonomy in the country meaning that resources should be no longer controlled anymore by administrative national authorities. Thorburn (2013) adds that besides the assignation of more power to regional authorities, further reforms on “freedom of the press”, the agreement to free elections on East Timor and free trade mechanisms were called into existence. These discourses had also significant effects on the IPM context as such that governmental functions moved from central to district government (Resosudarmo, 2014). MOA being part of the central government had thereby less control over regional activities. Thus, it became more of a hassle to control and guide the IPM programme by MOA itself on a national level. This argument has been also supported by Thorburn (2013) stating that “national ministries lost considerable control over sectorial budgets and programs.” Alike, with the diminishing support from international agencies, priorities shifted away from agricultural extension towards more “important projects” focusing on road construction and irrigation at these days.

As Thorburn (2013) criticizes, in the era of regional autonomy, MOA tended to promote inputs packages (including credits, seed, fertilizer, and chemicals) to Farmer Communities what carries similarities to the previous agricultural development programme of the BIMAS. Next to it, they carry out IPM FFS in which the real essence is not correctly represented. Also he adds that “the delivery of inputs and instructions to farmers is called a field school”, however, it takes a very contradictory standpoint and attitude towards the former IPM FFS within the National Programme. This depicts a caustic paradox since both programmes carry on different values and standpoints to agricultural development schemes. For instance, whereas the IPM FFS in the National programme took 12 weeks in total, the MOA conducted IPM FFS, also known as ICM (Integrated Crop Management) FFS, only compromised four short meetings in which farmers are made familiar with particular techniques in combination with inputs.

The fact that the IPM FFS manifests differences compared to the IPM National programme has been also supported during an Interview with Arief, one of my contact persons during my field work. He stated that the “FFS conducted by MOA looks similar but is certainly different.” Whereas the MOA takes rather an exclusive standpoint on technology transfer, IPM FFS in the FAO era focused on the empowerment of farmers. MOA concentrates slightly more on the content on how to control pests instead of moving “people” into the light of importance. The reason for conducting the IPM FFS in a relatively shorter period (as stated above) has been often attributed to the fact that financial support was lacking. Van den Berg and Jiggins (2007) also support this argument by saying that FFS being
implemented by extension departments have been “restricted to small budget allocations and narrowly defined objectives related to crop protection”.

Figure 4 presents the development programmes in Indonesia from 1963 until now.

Figure 4: Historical perspective of agricultural development programmes in Indonesia (1963-2015)

2.4.7 Interrelations of MOA and Farmer Communities nowadays

As already mentioned, MOA, being involved in the Green Revolution technology implementation, executes IPM FFS which built on the fundamental aim of making farmers more independent with regards to their choices on agricultural practices. Besides implementing IPM FFS, MOA still provides subsidies, especially for seeds as well as for macro- and micro fertilizers. The subsidized inputs are either provided straight to the Farmer Community or to agricultural supply stores which are located close to the farmers’ houses. The fact that inputs are provided straight to the Farmer Community depends on their financial situation meaning if they have financial means to afford inputs. These Farmer Communities have the freedom to decide which seeds they prefer and which should be subsidized by the government. However, there are limits to this freedom as such that farmers can only choose between two rice varieties of *Ciherang* and *Situbagendit*. With regards to the fertilizers, usually urea (CH₄N₂O), phonska (NPK) and if specially requested Petroganik (organic fertilizer) is subsidized and provided to the farmers. There are strict regulations set up by MOA on how much fertilizer will be subsidized. Usually, 200kg urea, 300kg phonska and 500kg Petroganik per ha are the recommended amounts which are handed over in relation to the land size of the farmer. In case farmers need subsidies for special input requirements, the Farmer Community can write a proposal to MOA and hope that it will be accepted. As mentioned frequently, the amount of input subsidies already diminished over the past years and as extension officers stated will even continue in the future.

For each sub-village, there is an extension officer employed by MOA, executing IPM FFS and ensuring that farmers receive their requested inputs. Also, in case farmers have serious issues and complains with regards to pest issues for instance, extension officers can be contacted. Extension officers also stand in close contact with research centres. Therefore, in case there are any new technologies at hand, extension officers are requested to furthermore introduce these to the respective farmers. Farmer Communities usually exist in each sub-village. Farmer Communities can be found throughout Indonesia and have been especially established to create a bridge between the government and the farmers. A smooth flow of intangible and tangible goods such as information as well as seeds,
fertilizers etc. should be facilitated. The Farmer Community is usually guided by a Farmer Community leader. This leader has been elected by the farmers. It was noticeable that the Farmer Communities consist of approximately 50-150 members and are to a large extent represented by men. This argument is also supported by van der Fliert (1993) who says that men dominate the number within Farmer Communities although women execute farming activities as well. This could be also realized in the three respective sub-villages. However, women usually join their own "women communities" in which also further activities besides the farming are discussed.

In general, it can be stated that there is a close relationship between MOA extension officers and Farmer Communities, being often the entry points for further input distributions and technology transfer. Extension officers know their Farmer Communities very well and are open to listen to their wishes. However, MOA is often restricted in the implementation of these wishes since they do not have control and authority on what is happening on the grassroots level. So extension officers at the district level can only forward requests but the decision whether wishes are further pursued often lies in the hands of higher national authorities.
CHAPTER 3: Wareng IV

The first sub-village I visited for my field work was Wareng IV, a small place located in the Gunung Kidul district about 1.5 hours bus drive from Yogyakarta. To reach the sub-village, the first challenge coming across for my translator and me was to conquer the mountain with a nearly broken bus. Additionally, it was hard to find Wareng IV since there are four additional sub-villages resulting together in the village Wareng. My first impressions when finally arriving in Wareng IV were that the air turned out much fresher and the biodiversity of trees and all kinds of crops such as corn, cassava and tobacco increased. Tall cotton and bamboo trees surrounded the houses in the sub-village.

When visiting Wareng IV for the first time in September, there was unfortunately no paddy cultivation since the rainy season and thereby the paddy planting did not start yet (Picture 1). But luckily, I visited Wareng IV again in December when the paddy has already reached a certain growing stage (Picture 2).

3.1 Village specifications

Agricultural activities

Wareng IV has 338 inhabitants who are mostly small scale farmers. Farmers apply the practice of a multiple cropping system meaning that various kinds of crops are grown together in the same field at a certain season. One big field is divided into several ones where soil dikes serve as a borderline (Picture 1). Usually, farmers grow paddy intercropped with corn in the first rainy season (November - February) as illustrated in Picture 2. Other crops such as tobacco, sorghum, vegetables, chili and/or corn are planted in the second rainy season (March - May) and in the dry season (June to October). There is no irrigation available throughout the year and therefore farmers depend strongly on the rain. Paddy is a crop which needs generally larger amounts of water compared to the other crops such as tobacco, corn etc. Therefore, paddy can only be grown in the first rainy season when there is enough water supply available. In the dry season, farmers make use of the groundwater from the wells for watering the crops. The wells can be also seen in Picture 2. In Wareng IV, farmers keep cows which provide cow dung. Unfermented cow dung is used as a natural fertilizer on the fields. In addition to the unfermented cow dung, farmers apply little urea (CH4N2O), phonska (NPK) and sometimes Triple Superphosphate (TSP). Chemical fertilizers are subsidised by the government and easily accessible for farmers in nearby agricultural supply stores or by the Farmer Community.
Income generating activities

Paddy is considered as the staple food for the people in the sub-village which is grown for their own consumption. Only in cases where there is a surplus of paddy and the need for certain investments such as schools fees, inputs for farming activities etc., farmers sell it to nearby markets. Besides paddy, corn is another important crop in Wareng IV which is especially used for cattle and chicken fodder (the residues for cattle and the corn seeds for chicken fodder). Tobacco and vegetables are sold to the market and present another source of income generation for farmers in Wareng IV.

There is a lower work load during the dry season and thus off-farm activities become especially common among men. They usually leave the sub-village for other economic activities as a constructor or jeweller in bigger cities such as Jakarta or Yogyakarta. Women however stay in the sub-village to look after the farm. They are therefore intensively engaged in farming activities. Other additional income sources for all farmers consist of cattle raising being especially practiced for savings. In case farmers require additional money for certain matters, cows are usually sold.

Land ownership

With regards to land ownership, all interviewed farmers are the owners of their land which consists of approximately 2000-5000m². However, there is one farmer in the sub-village who owns a surprisingly larger extent of land compared to the rest of the farmers. He holds a major position in the sub-village and is also referred to as the dukuh, the leader or head so to say of the sub-village. He has several responsibilities as further described in Box 1.

Position of women

What became immediately obvious in Wareng IV is, that women have strong personalities. Women in Wareng IV take in a very crucial position since they are intensively engaged in farming activities due to the absence of men in the dry season. While men leave the sub-village for off-farm activities, women become the major planners, organizers and activists with regards to farm arrangements. Women are much keener on bringing change and very brave when it comes to arguing with the husbands. This was mentioned for example throughout the interviews with female farmers. As a female farmer stated:

"Women are cleverer than men. Women are very good in arguing. In my opinion, women have a good memorize and when they argument with the men, the men normally loses. In this village, women also take decisions on what is happening on the field. The men becomes an actor. They do what the women say. After the IPM FFS, women became braver to argument with the men.” (Ibu Sarniati)
Another women also made a surprising comment on the relations among husband and wife. Such as: “In my opinion men are very slow and weak here. They are not such hard workers. I think that happened already a long time ago. Men are always waiting. For example, they are always waiting for the rainy season to plant the one variety they know. They do not try others. They are not creative and are slow thinkers. And also women often take over the job to get the income. For example, men eat when there is food available. They don’t think about the next day. If there is no food available, they don’t eat. Women think more in advance. Men always accept the conditions. For example, if men sell tobacco to the market and the market rejects it, they do not try further to find other markets. They just accept the conditions. Women however sell the tobacco then to other markets.” (Ibu Parjiyem)

3.2 IPM FFS in Wareng IV

FFS with various themes have been frequently introduced by MOA in Wareng IV. In most cases, farmers participated several times in a FFS before, for instance in FFS for corn, soybean, climate change etc. The alumni IPM FFS participants who were part of this study all joined the IPM FFS in 2002. Specifically for Wareng IV, a women dominated group participated in the IPM FFS in 2002, counting twenty women and only five men. With regards to the procedure women came to participate in the IPM FFS in 2002, a few alumni IPM FFS participants claimed that they were selected and motivated by Ibu Parjiyem. Ibu Parjiyem is a very enthusiastic and committed women in the sub-village and she participated in the IPM FFS in 1992. She is very much involved in women community programmes in the sub-village and always tries to strengthen the ties among women. Her position within the sub-village is of great importance and further described in Box 2. One alumni IPM FFS participant also noted that there were so many women participating in the IPM FFS probably to make a crowd and to support each other. Another two alumni IPM FFS participants stressed:

“I wanted to participate in order to know about the technique and the agriculture and the others participated so I also wanted to get the same knowledge.” (Ibu Wagiyem)

And,

“Everybody joined the IPM FFS. I thought if everybody gets new knowledge, why should I not get the knowledge. I want to be smart.” (Ibu Wartinem).

Both statements illustrate that both women were afraid of not belonging to the group or of being excluded from the group and the knowledge which can be acquired there. Both women wanted to meet on the same level of "smartness" with their friends. Another female alumni IPM FFS participants mentioned:

“I like to study everything. You don’t know about the future maybe I become a widow so it is important that I do something from now on." (Ibu Wagini)

That alumni IPM FFS participants wanted to acquire new knowledge was mentioned frequently. They mentioned that they were willing to join the IPM FFS to know more about agriculture and how to manage the field properly. In Wagini’s statement however, it became also clear that she wants to
become independent since she is concerned about the future. However another male alumni IPM FFS participants said:

"Actually no reason. At that time I didn’t have any side job yet so when my friend asked me to join, I just said yes." (Pak Samiran)

What these quotes generally express is that different reasons for IPM FFS participations were encountered. Whereas one woman participated due to peer pressure and meeting on the same level of smartness with her friends, others claimed to participate for reaching independency or just because there was nothing else to do in the meantime. When the IPM FFS finally started, the participants had to introduce each other to the extension officer (trainer of the IPM FFS). They formed small groups of about five people and conducted field visits together in which they had to observe the crops, pests and diseases etc. Afterwards they discussed in their group the field observations and presented the outcomes to the larger group. All together, they discussed the outcome and tried to find solutions to the problems they have encountered within their fields.

3.3 Reactions to IPM FFS practices

Several farmers said during the interview that they learned many things in the IPM FFS. However, they could only recall a few. The practices they mostly remembered and thereby came most often into play during the conversation are the ones listened below. Also, the reactions to IPM FFS practices from alumni IPM FFS participants are elaborated under each practice.

3.3.1 Soil dike construction

Farmers told that water management has been always a constraining factor in Wareng IV. Since water is rather scarce, farmers had difficulties to manage it suitably for their needs. Within the IPM FFS, alumni IPM FFS participants learned how to construct small soil dikes of about 20cm height around their paddy fields. Water can be captured in this respect on the plots and absorbed by the plants. When asking alumni IPM FFS participants whether and why they adopted the practice of ‘soil dike construction’, they said for instance:

"I learned how to make dikes so that I can save more water. I could see that if the rain did not come for one week, it was not a big problem anymore.\" (Pak Kampto).

That farmers can finally handle some days without water was also supported by a comment from a female farmer stating that "Before, when the rain stopped, the paddy could not grow well and they died. But now, when there is no rain maybe for 2-3 days, it is okay for the paddy."

The benefit of saving water was also stressed by a female farmer by saying that "I can save some water with the dikes and also the soil seems to be more fertile.\". Besides of saving water she also realized that there can be a positive effect on the soil.

Generally, all interviewed alumni IPM FFS participants were speaking positively about this "water saving" strategy. They knew the constraining factor very well in the beginning and saw benefits with regards to this new practice. ‘Soil dike construction’ was a well-integrated practice into the farming system which was also noticeable when seeing the paddy fields (Picture 2). By adopting this practice, farmers were able to adjust themselves to their natural environment.
3.3.2 Line sowing

IPM FFS participants were introduced to the practice of ‘line sowing’. The meaning of this practice is to plant the seeds in a certain distance of about 25cm*~15cm which is generally a wider and more consistent distance to what farmers used before. Before the IPM FFS, farmers broadcasted the seeds meaning that they got unequally and randomly distributed. The new practice of ‘line sowing’ allows the paddy to establish more roots and to form wider canopies to increase light and nutrient absorption. Plants are supposed to grow better and thereby reach a higher amount of tillers per plant. Additionally, field observations and the application of natural pesticides should be facilitated. Also, less seeds are supposed to be used when applying this method.

When asking alumni IPM FFS participants what they learned during the IPM FFS and why or why not they were adopting the practice, they replied for instance:

“Before the IPM FFS, I was spreading the seeds. But in the IPM FFS, I learned how to plant seeds correctly with a distance of about 25*15cm and by putting 2-4 seeds within one hole. I can see that the productivity is higher. Because if the distance is too close, the paddy cannot grow properly. So if there is a distance, the paddy can grow better. And also, the paddy can develop stronger roots.” (Ibu Wagiyem).

That the productivity increased with regards to this practice was also realized by a male farmer who mentioned that “the advantage of applying the distance between the seeds is the increase of productivity. When I spread the seeds, the plant was smaller and also before from 1000m², I only got 6 bags of ghaba (rice with husk) and after I applied the distance, I got 13 bags.”. He also adopted the ‘line sowing’ practice and recognized the increase in productivity as such that there was a relatively larger amount of ghaba bags afterwards. During the interviews, farmers often mentioned a higher productivity as the benefit when applying the ‘line sowing’ practice. Besides the productivity, also other benefits were mentioned by farmers as illustrated in the following reaction:

“Before the IPM FFS, I spread the seeds before the rain came but now I can wait until the first rain. I plant the seeds one by one and keep a distance. I am using much lesser seeds now and the observation of the paddy field became also easier.” (Ibu Sarniati)

Although farmers did not mention any difficulties in adopting the ‘line sowing’ practice, there was one female farmer who faced relatively more challenges by stressing:

“So last season, it is because my husband got sick so there is nobody who can help me. So the productivity is not good. Usually from 560m², I get 8 bags but for last season I only got less than 8 bags. One bag is between 50-60kg of ghaba (rice with husk). So maybe just because my husband didn’t help me, I did not make a good distance between the crops. I made a hole but not on a good distance. So maybe for the next season, I have trust that productivity increases again because my husband is well again.” (Ibu Wagiyem).

In this case, it becomes obvious that personal obstacles such as a sick husband hamper her to apply a good meaning a consistent distance. A consistent distance asks for a higher work load and she was in her situation not able to comply with it.

What these quotes from interviews represent is that the practice of applying a consistent distance between the seeds got generally well adopted by alumni FFS participants. Also, the benefits of this practice, especially a higher productivity became apparent to the farmers. Also, farmers showed understanding in the logic of this practice by realizing certain changes on the plant growth itself. No one was mentioning any disadvantages of this practice although it must be more labour intensive compared to the ‘broadcasting’ practice which they learned from their ancestors. Generally speaking, the ‘line sowing’ practice was well adopted except in once case due to personal obstacles.
3.3.3 Pest management

Alumni IPM FFS participants became familiar with the preparation of natural pesticides, an alternative to the chemical pesticides which they exclusively used in large amounts before. The preparation of natural pesticides included the collection and preparation of the following ingredients: leaves of chinaberry tree (Melia azedarach), lesser galangal (Aloinia officinarum), lemon grass (Cymbopogon citratus) and ginger (Zingiber officinale). These ingredients are mixed with water, filtered and poured into a bottle where it stays for approximately one month. Also, extension officers from MOA executing IPM FFS promoted the idea to farmers to only use chemicals as a last resort.

The production of natural pesticides was after the IPM FFS introduced in the women community MENUR and represented a practice exclusively delivered by women. However, the activity of producing natural pesticides together in the women community stopped since “the pests are not too many anymore”. When the term “pest” was mentioned, farmers often referred to either the rice bug (Leptocorisa oratorius) or the brown planthopper (Nilaparvata lugens). However, they still meet regularly and discuss what they have found in their fields. If only one member encounters pests, she has to make a decision on her own on how to control them but if a larger group experiences the same problem, they will come together and prepare the natural pesticides again.

When asking women how they would control their pests, they would for instance reply:

“For me it depends on the pest. If it is a green planthopper, I will leave it in the field because it is not so dangerous but if it is brown planthopper, I would use chemicals.” (Ibu Wagiyem)

This woman takes her decision on pest management according to the kind of pest she is facing in her field. She can distinguish well if the pest is threatening her field or not. Based on this knowledge, she acts accordingly. The same intention but differently formulated is also mentioned by another woman. She said that “Before the IPM FFS, the field was sprayed with chemicals even when there were no pests, just for prevention. But now it is very rare to use chemicals on the field. I hardly use them. Only when it is really necessary.”

In both cases, women use chemicals only if it is really necessary. By this, they both refer to the severity of the pest outbreak by certain pests. Women often supported their more “natural pest management strategies” by emphasizing on the health benefits such as the following woman who said “I am not buying chemical pesticides from the company because I do not have money and because I hardly use chemicals. Chemicals are poison for our body.” In her statement, it becomes also apparent that she is restricted by personal obstacles or by default so to say to buy chemical pesticides.

In case natural pesticides were produced, there was also a woman facing the challenge of applying it on her field. She stressed the following:

“The problem are the parents from my husband. We share a field and they want the traditional technique, so chemicals. So we just follow what the parents want but the chemicals are already used in a smaller amount. But on the other field which belongs to us I try to use natural pesticides. The productivity on both fields is the same.” (Ibu Wagini)

In her case, she is willing to avoid chemical pesticides but restricted in doing so. Land ownership and the associated norms and values people keep illustrate a constraining factor for realizing the adoption of applying natural pesticides. She and her husband accept the conditions and follow the traditional practices. Next to the answers women provided with regards to their pest management strategies, this man would take an opposed standpoint as illustrated in the following quote:
"I do not have the confidence to use natural pesticides. I am afraid of the productivity because I could see on my neighbour’s field when they do not use chemicals, the yield is getting lower. When I see pests in a small amount, I directly spray but for the women here, they tolerate more pests in the field. They do not spray directly.” (Pak Samirin)

This quote illustrates very well the anxiety for encountering the risk of harvest losses. He is rather shy in experimenting and thereby prefers to avoid any unexpected conditions. He does not trust the new technique of applying no or little chemical pesticides since he does not see any related benefits with regards to the yield. On the other hand, there was a male farmer having a unique pest management strategy and explaining it as followed:

"They prepare natural pesticides in the women community but it takes time. The fermentation process takes one month and therefore I chose an easier way. There are so many vendors coming to the community selling Supermax (a natural pesticide and fertilizer). So I rather apply this. And applying Supermax which is a natural pesticide and fertilizer also provides healthier rice which is for the family. I only apply chemicals when the outbreak is very serious because I am afraid that the productivity will drop." (Pak Kampto)

Here, the work load of producing natural pesticides is emphasised. Due to the work load, he chooses a more convenient option by just buying a natural pesticide product. However, he still sticks to the natural way of treating pests and thereby shows awareness for the importance of a healthy diet as stated already in the previous comments by female farmers. Interestingly he also expressed to becoming afraid when the productivity drops as well as his male counterpart.

Generally, data showed that women provided more coherent answers with regards to their pest management strategies. Especially women consider to avoid chemical pesticides as long as possible. With regards to the practice of producing natural pesticides, women rather reject this practice when there are few pest incidences reported. Men however rather reject this practice because of other reasons such as anxiety for harvest losses and practicality issues.

Something last to mention here is that a common feature can be detected as such that the careful and responsible use of chemicals exist in farmers minds after the IPM FFS participation. The fact that chemicals are used as a last resort can be thereby regarded as a well-established standpoint among alumni IPM FFS participants. However, the point of justifying that a severe pest outbreak is reached depends on the personal perceptions. Especially women showed more confidence in avoiding chemicals compared to men (as also mentioned by Pak Samirin).
3.4 Experiments on IPM FFS practices

After the IPM FFS, it was also mentioned that women conducted experiments on ‘soil dike construction’, ‘line sowing’ and on testing different varieties together on a small piece of a commonly shared land. Additionally, in community meetings after the IPM FFS, Pak Kampto, the duku of Wareng IV, together with Ibu Parjiyem tried to convince farmers to apply certain practices by providing explanations to the farmers why they could be useful. The practices being promoted by Pak Kampto and Ibu Parjiyem were primarily the ‘soil dike construction’ and ‘line sowing’. Pak Kampto mentioned once:

"We tried to convince the farmers in community meetings about the line sowing by showing them that the productivity of the harvest can increase. It took about 2-3 years to convince the farmers. " (Pak Kampto)

Ibu Sarniati was one of the first farmers who adopted the ‘soil dike construction’ and ‘line sowing’ practices. She remembered the following:

"After the IPM FFS, I changed my habits from the traditional to the ones I have learned. But honestly at the first time, I was a bit confused if it is a success. But I had courage to try it. I first tried it on a small field and after the harvest was successful I applied it on the whole field one year later." (Ibu Sarniati).

Especially two persons, namely Ibu Parjiyem and Pak Kampto were still actively involved in further promoting the practices to alumni IPM FFS participants. They were providing support over a longer period of time which is necessary to make farmers believe that the practices are useful to them. As seen in the outcomes, the promoted practices (‘soil dike construction’ and ‘line sowing’) by Ibu Parjiyem and Pak Kampto were also the ones being well adopted by farmers. In the other IPM FFS practice of ‘preparing natural pesticides’ more variations in the reactions were notified. As also Ibu Parjiyem and Pak Kampto stressed, it is important that practices are promoted as such that farmers can see related benefits. Then, farmers are more willing to go about changes on agricultural practices. Through the experimentation on IPM FFS practices, being executed together in a group, alumni IPM FFS participants also mentioned frequently that they think that social relations improved thereupon. For instance, farmers claimed that they come together and exchange a lot of information and knowledge on IPM FFS practices. Alumni IPM FFS participants stated that the exchange of information established stronger ties among themselves.
CHAPTER 4: Mutihan

The second village I studied was Mutihan, a sub-village of Madurejo, just twenty minutes from Yogjakarta East, near the hindu temple Prambanan. Driving on the scooter from Yogjakarta to Mutihan on an early morning in October, I noticed numerous farmers working in the paddy fields executing several activities such as weeding, transplanting seedlings into the soil and harvesting paddy. It showed that farmers were occupied at that time of the late dry season. This is explained to the Opak, a small river that runs along the fields and supplies the neighbourhood with certain amounts of water throughout the year. Due to the irrigation canal that draws water from the Opak, farmers can grow paddy not only in the rainy seasons (first rainy season from November to February; second rainy season from March to May) but also in the dry season (from June to October). Mutihan differs therefore from Wareng IV where there is no irrigation available and paddy cultivation only takes place once a year. In the dry season, there are also some farmers planting mainly corn, followed by chili or soybean. The reason why farmers apply such a cropping system relates to the block system which is further described in the following sub-chapter.

4.1 Village specifications

Block system

The fields in Mutihan consist of 21ha in total which were arranged into a block system a long time ago to cope and manage the small amounts of water. Irrigation is available to farmers in Mutihan however to a limited extent. Irrigation is controlled via dams and therefore wise management is needed with regards to the cropping system and farm arrangements. There are two blocks: West (consisting of 9ha) and East (consisting of 12ha) blocks, which are both relatively close located to the sub-village. Although water is available in the dry season, it is not sufficient for allowing paddy cultivation on both blocks. Therefore, the water supply needs to be regulated accordingly and on one block, other crops such as chili, corn and soybean are cultivated. These crops need a generally fewer amount of water supply compared to paddy. To make farmers stick to the cultivation schedule of what to plant in which blocks, certain rules on farming activities are implemented. These rules are set up and enforced by the Farmer Community. The rules enforce the following and should also bring certain benefits to the farmers as explained below:

1. Swapping crops or crop varieties every season/year among the blocks

Figure 5, 6 and 7 present the two blocks of West (9ha) and East (12ha) in the dry and two rainy seasons. Within the blocks, thin lines can be seen which present the different field plots of the farmers. The blocks including the diagonal lines indicate the fields with paddy cultivation whereas the blocks without diagonal lines illustrate the field with other crops such as corn, chili and soybean cultivation. In the first and second rainy season, paddy is grown on both blocks respectively with different varieties which also swap for the coming season as presented in Figure 6 and 7. For instance, if in the first rainy season, the paddy variety *Ciherang* is grown on the West block and *Situbagendit* on the East block (see Figure 6), for the second rainy season it will be the other way around, meaning to plant the rice variety *Ciherang* on the East block and *Situbagendit* on the West block (see Figure 7). In the dry season, the cultivation of crops switches every year among the East and the West since there is only one dry season within one year.
That farmers use different varieties on both blocks and swap them for the next season is specifically referred to the pest management. Farmers stated that pest outbreaks such as with the rice bug (*Leptocorisa oratorius*) can be reduced when diversifying the cropping system so that pest cycles can be interrupted and controlled. The farming activity (when commonly implemented by all farmers) of swapping crop varieties every season/year among the blocks brings thus the advantage to reduce pests in the fields.

**Figure 5**: Block system in Mutihan during the dry season (June-October)

**Figure 6**: Block system in Mutihan during the first rainy seasons (November-February)

**Figure 7**: Block system in Mutihan during the second rainy season (March-May)
2. Planting the same paddy variety within one block

Also, farmers grow the same paddy variety within one block to facilitate pest control. For instance, if there is a severe pest outbreak on one block, mass spraying can be more easily implemented and also farmers can buy the pesticides all together in the Farmer Community.

3. Square planting

Farmers implement the practice of ‘square planting’. When planting the paddy seedlings in squares, an accessible alley in the field is created which facilitates observations of the crops, weeding and the spraying of pesticides.

4. Synchronous planting

Synchronous planting, meaning to plant the paddy at the same time, is of high importance in the block system since the water regulation (the amount of water regulated to the blocks) corresponds with the growing stages of the crops. For instance, paddy needs smaller amounts of water when being at a younger stage compared to the older growing stages. Water is then regulated accordingly. Therefore, it would not be attractive for farmers to plant paddy outside the planting schedule, meaning for instance to have paddy at its harvest stage when water is not sufficiently supplied. Synchronous planting is equally important for reducing harvest losses with regards to pest occurrence. For instance, a big challenge are the birds who like to feed on the paddy. In case all farmers comply with synchronous planting, birds can feed on a larger area of crop cultivation. The suffering of harvest loss by birds is therefore equalized among the farmers. In case one farmer grows paddy asynchronously, he/she might realize more severe harvest losses. Synchronous planting can be thus regarded as a risk management strategy to avoid severe harvest losses for farmers in Mutihan. To enforce synchronous planting in Mutihan, a planting schedule was set up by the Farmer Community to which farmers have to comply with (see Box 3).

Box 3: Planting schedule in Mutihan (set up accordingly after FFS participation)

5th-15th Nov.: Seedling East
20th-30th Nov.: Seedling West
20th Nov: Transplanting East
5th December: Transplanting West

Farmer Community

The reason for pointing out the Farmer Community in Mutihan in a separate sub-chapter is because its contribution to the strong ties being created among farmers. The Farmer Community in Mutihan consists of 108 members of which only 30 ones are active meaning to participate in meetings. The active members as stated by the duku in Mutihan are usually those who are passionate about farming so basically the pure farmers. Also it was mentioned that rather the younger farmers like to become energetic about agriculture. The block system with its associated rules was implemented, designed, enforced and regulated by the active members of the Farmer Community in Mutihan. Strict rules such as planting different varieties within both blocks, planting the same paddy variety within one block, planting the seedlings in squares and synchronous planting must be obeyed by all farmers no matter if active or passive members. In case farmers do not obey the rule and become a ‘free rider’ without telling, they need to pay 50.000 Rupiah (~3,50€) per 1000m² to the Farmer Community. When farmers do not pay the money, they will be warned at first hand. After being warned and still not pay, social exclusion will enter into force. Social exclusion refers in this case to the verbal communication within the sub-village of someone not following the rules. This brings the person who did not follow the rules in an uncomfortable position where he/she will feel ashamed. The Farmer Community possess over
the power of the collectivism which keeps the system on punishment and the enforcement of rules running and thus also the block system. The collectivism can be in this case regarded as the instrument for keeping the functionality of the block system in control. For further understanding of the relationship between the Farmer Community and the block system, see Figure 8.

**Figure 8: Farmer Community and the enforcement of rules for the functioning of the block system**

When asking Pak Sukiman, the head of the Farmer Community what the advantage is of these punishments and the rule implementation, he would stress "*When we do everything together, it shows good togetherness. Farmers always work together. This rule exists since many years ago.*" He holds a very positive standpoint towards this Farmer Community by emphasizing on the togetherness of people in the community. However, although not all farmers in Mutihan are active members, they also must obey the rules of the block system. There is still the question on how non-active members feel part of this togetherness he is talking about.

Next to the regulations within the Farmer Community, farmers can also experience many benefits (also stated by the farmers) such as by receiving subsidized seeds and synthetic fertilizers, renting tractors and collaborating with the corn seed company Branita. With regards to the tractors, it is important that farmers share this equipment since only three act as an operator. Certain skills and also physical strength is needed for operating it. Therefore farmers usually pay for an operator when field preparations are needed.
**Land ownership**

Most farmers in Mutihan rent approximately 2000-4000m² of land and can be thereby considered as small scale farmers. On the basis of an agreement between the land owner and the farmer who rents the land, the harvest is equally shared (50% for the owner and 50% for the farmer who rents the land). It is not the rice which is shared with the owner but the ghaba (rice including the husk). Besides farmers who exclusively rent the land, there are also some who own and rent land at the same time. Owned and rented land can be located on different blocks. The duku in Mutihan, elected by the community inhabitants, owns a relatively larger property of land compared to the rest of the villagers. This land is provided by the government as a payment for the work he executes. Since dukuhs own respectively larger amounts of land, workers are usually hired for executing the agricultural practices. It is mentioned by farmers who rent the land that the owners who pay workers are usually less motivated and interested in farming activities. Farmers who are actively involved in farming activities (those who usually rent and own small plots of land) are also called petani, the pure or real farmers by themselves. They primarily use the rice for their own consumption.

**4.2 IPM FFS in Mutihan**

IPM FFS participants from 2007 were in this case selected out of the Farmer Community. Someone who played a strong role in the selection process of IPM FFS participants in 2007 was Pak Lanjar who was at these days the duku of the sub-village. FFS usually take place at the duku’s house and therefore he also decides on who participates or not. For the IPM FFS of 2007, twenty men and five women were selected. One limitation which needs to be stated at this point, before introducing the practices is related to the time confusion farmers were facing throughout the interviews. Since farmers in Mutihan also followed the SRI (System Rice Intensification) FFS programme, also being executed by MOA, their answers towards IPM FFS practices might also incorporate some from the SRI FFS.
4.3 Reactions to IPM FFS practices

This sub-chapter introduces the different practices farmers became familiar with in the IPM FFS of 2007. The practices farmers learned differed slightly from the ones introduced in Wareng IV due to the different location and moment in time of IPM FFS execution. The practices introduced here are again referred to the most occurring answers farmers provided.

4.3.1 Square planting with garitan

The meaning of this practice is to plant the paddy seedlings in squares at a wider and uniform distance as used before. This practice got introduced in combination with a new tool called garitan. Garitan is a wooden tool that helps farmers to draw continuous lines from both sides into the soil (Picture 3 and Figure 9). Thereby a square planting pattern of usually 23cm*23cm is created. The seedlings are then planted on the “crossing of the lines” (see Figure 9). The tool is also available in other distances such as 25cm and can be either borrowed from neighbours or purchased in an agricultural supply store.

Garitan provides guidelines to the farmers to plant in a wider and uniform distance. This should furthermore facilitate the conducting of field observations, weeding and the controlling of pests. During the IPM FFS in Mutihan, it was the first time farmers got confronted with such a tool. When asking farmers if and how they still apply this tool they responded to the question in a similar manner. One female farmer for instance stated that she applies two different distances depending on the location. In case the soil is too hard and not too fertile, she uses 23cm*23cm but if the soil is more fertile, she uses 25cm*25cm. For the distance of 25cm*25cm, she also applies the tool which has a wider distance in common. Although this farmer adapts the distance according to soil conditions, another male farmer argued the following:

"In the dry season I use 22*22cm but in the wet season 23*23cm. In the dry season, the water is not so much, so it is better to use 22cm*22cm. When there is the rainy season, the distance becomes higher because the rain also contains fertilizer. So in the rainy season, the plant grows very good so that’s why I give 1 cm more.” (Pak Tukimin)

He adapts the distance rather according to the seasons instead of the soil conditions and experiences good results. Although both take a different standpoint for choosing the distance, it is realized that in
both cases, there is the similarity of being able to adapt the practice in such a way that it suits to exposed circumstances. They manifest a flexible performance which comes along with the understanding of agricultural practices in combination with external factors. The two examples presented beforehand were more related to the “how” they execute the latest practice. When moving further to “why” people consider to execute the latest practice with the garitan tool, they especially pointed out the following for instance:

“When I used the rope, for 2500m², I needed 20kg of seeds but if I use the garitan, I only need 5 kg of seeds and the productivity is better than before.” (Ibu Suharti)

Before the tool garitan got implemented, farmers already applied the square planting but rather used a rope instead. The distance was in this case about 18cm*18cm and rather estimated by the farmers. The fact that farmers use less seed inputs when transplanting the seedlings within the holes determined by the garitan tool was supported by several farmers. Another example is provided by a male farmer who also stressed that he usually spend 20kg of seeds but after the IPM FFS, he applied the tool and saw that he only needs to use 5kg for the same area. When asking him further if the productivity is the same when transplanting the seedlings into the holes determined by the latest tool he replied: “Yes, it is actually the same. I mean it also depends on the soil and water. For every 1000m², I will get 375 kilo of rice but excluding the amount I need to pay for the helpers. For 1000m²m, four people help to harvest. 70kg will be given to 4 people.” (Pak Welasono)

What these quotes present is that farmers generally adopted the practice of ‘square planting with garitan’ very well into their farming system. When looking at the broader picture of why this practice was implemented so well, it becomes clear that this practice suits very well into the scheme of the block system. Since the ‘square planting with a rope’ was already before the IPM FFS a well-integrated practice partly for the functioning of the block system, the ‘square planting with garitan’ basically only asked for the application of a different tool. So the Farmer Community and the fact that they already enforced rules on similar practices beforehand , helped in such manner to commonly adopt the ‘square planting with garitan’ practice. Also, it was important that farmers experienced benefits with the new practice such as the saving of seed inputs. Besides the practice adoption, also some adaptations were identified. As farmers stated, they usually change the distance of the square planting with garitan due to soil characteristics and weather conditions.
4.3.2 Transplanting

Already for many years, farmers in Mutihan are used to work with nurseries meaning to grow paddy in a separate small plot until they have reached a certain growing stage and are thereby ready to be transplanted. As a common practice, farmers were always used to transplant the paddy seedlings after 21 days. However in the IPM FFS, farmers were introduced to the practice of ‘transplanting at an earlier stage’ of 7 to 14 days. The advantage should be that the seedling is much younger and thereby disposing over thin roots which facilitates the tolerance of stress. Also, the seedling is supposed to adapt more smoothly to the newest conditions. Additionally, instead of transplanting four seedlings into one hole, farmers became familiar with only transplanting one seedling per hole. ‘Transplanting less seedlings into one hole’ should facilitate a higher nutrient absorption as well as the access to solar radiation by plants due to less competition which is leading to the establishment of more tillers per plant. Farmers responded to the question of whether and why they apply an earlier transplanting scheme rather uniformly. One female farmer answered for instance:

“When I transplanted after 21 days, I had to cut the leaves because the plant was much bigger. So it was more work for me. And also the productivity is higher when I transplants on 7-14 days.” (Ibu Instiningsih)

By listening to her statement, it became apparent that she points out the benefits namely the increase of productivity as well as the lower labour intensity. The ‘higher productivity’ was mentioned several times as a benefit by farmers and represents thereby the overall feedback to the transplanting practice quite well. However, the fact that the practice comes along with a lower labour intensity was mentioned only once in this case. To transplant the paddy seedlings after 7 to 14 days was generally well adopted by farmers. However, with regards to the ‘transplanting one seedling per hole’ practice, certain variations in answers became noticeable. For example, one women said that she uses sometimes two seedlings instead of one in case the seed is not good. So she basically adapts the practice according to the quality of the seed for instance. Another female farmer stated that she plants two seedlings per hole just in case one plant will not grow well. She also stressed the increase in productivity when applying both transplanting practices (‘transplanting the seedlings at an earlier stage’ and ‘transplanting one seedling per hole’).

To sum up the findings with regards to the transplanting practice, it was identified that there is a strong agreement in adopting the ‘transplanting at an earlier stage’ practice. Farmers experienced the benefits of an increased productivity when transplanting the paddy at an earlier stage. Besides, it was noticed that this practice was commonly applied which can be attributed to the embedded context where the block system played a fundamental role. Since the Farmer Community decided to plant the paddy at an earlier stage and enforces rules on synchronous planting, all farmers had to comply with this rule. The ‘transplanting one seedling per hole’ practice was not set up as a rule to comply with. Here, it was noticed that this practice was not as well adopted as the ‘transplanting at an earlier stage’ practice. For the ‘one seedlings per hole’ practice, there were generally more adaptations carried out according to external circumstances.
4.3.3 Pest Management

When interviewing farmers on what they learned with regards to natural pest control, meaning to avoid any kind of chemical substances for controlling pests as much as possible, the answers by farmers were extremely diverse in Mutihan. Different kinds of practices were stated by farmers which are furthermore elaborated.

Yuni for instance, a woman working partly as an administrator next to being a farmer, would prepare natural pesticides from the leaves of the chinaberry tree (Melia azedarach) and tobacco. This is a practice she learned in the IPM FFS. Luckily she has leaves from the chinaberry tree in her garden what is rather exclusive. She mixes the ingredients, adds water and applies them onto the paddy leaves to avoid the rice bug (Leptocorisa oratorius). However, if there is a very big outbreak of rice bug (Leptocorisa oratorius), she applies chemical pesticides. But she emphasized the fact that she only uses small amounts of chemical pesticides since it will be absorbed by the plants and later on by the rice which goes into her body. When listening to her answers she proved to have a very critical mind set and thereby deciding wisely on her actions. The fact that farmers had a critical mind set towards using chemical pesticides was noted in several interviews. Farmers often make up their pest management strategy based on the severity of the pest outbreak. Severe pest incidences were generally not often experienced lately in Mutihan. This was stated frequently in interviews. The only pests which were mentioned as a more constraining factor were the birds lately. Another example which supports the finding of trying to control pests, in this case snails, with the avoidance of chemical pesticides comes from a female farmer who stated that:

"When I would find snails in my field, I need to put papaya leaves on the field so snails go to the papaya leave and become one. That is something I learned in the FFS. Because maybe the snails want to eat the papaya leaves. You know snail is pest for the young paddy. But when I see snails, I take them one by one because there are not too many. It is very easy." (Ibu Instiningsih)

When asking her further why she does not use the papaya leaves since that might be less labour intensive, she stressed the fact that it is difficult for her to find papaya leaves. So basically she does not have access to the ingredients what hampers her to conduct the ‘snail management’ practice learned by the IPM FFS. The same problem she faces when controlling the rice bug (Leptocorisa oratorius) with leaves from the chinaberry tree (Melia azedarach). She does not produce any natural pesticides with this ingredient since it is very hard to find these specific leaves and also because she does not find any rice bug (Leptocorisa oratorius) in her field. Besides from the non-availability of inputs for controlling pests, another constraining factor for producing natural pesticides was stated by a female farmer claiming that "I am not too enthusiastic to make my own natural pesticides. The ingredients are so many and it takes time and I have to boil everything first." So besides the non-availability of inputs, some farmers also emphasized on the fact that it is just too time consuming to prepare natural pesticides. In this case, farmers would not apply any kind of pesticides and only spray when severe pest outbreak occur. On the other side, there were also farmers stressing that they like to produce natural pesticides especially for health reasons. One female farmer explicitly explained her recipe to us and proudly presented her own natural pesticides in a plastic bottle, smelling terribly as I remember. She stressed that:

"I spray with my own pesticides for pest prevention and treatment. It is made from my own leaves, yam (Dioscorea hispida), sugar extract, yeast, fermented shrimp (terasi), and rumen from the cow. I take the rumen and mix it with the other ingredients. But I did not make it this year since I do not have enough time. Chemicals are not good for myself. First I would use natural pesticides but if it is not effective then I would use chemicals." (Ibu Suginem)
She became familiar with this practice in the IPM FFS of 2003. The practice is also specifically described in Box 4 and should illustrate the effort behind such an activity. I was also very curious if preparing own natural pesticides seems to be economically favourable for her. She replied that the ingredients are very cheap and some she even receives for free. Although the enthusiasm of producing natural pesticides has been already proven in this case, there are still time constrains encountered hampering her from continuing this practice.

The above outlined stories of farmers provide an understanding of how farmers go about their pest management strategies which they often make up according to the severity of the pest incidences. What was commonly noticed is that farmers apply chemicals as a last resort. Also, farmers rather reject the practice (either from the beginning or at some point) of natural pesticide production due to the non-availability of inputs and/or the heavy workload.

**Box 4: Recipe for natural pesticides with yam, sugar etc.**

1. She mixes the following ingredients:
   - Yam
   - Sugar extract
   - Yeast
   - Fermented shrimp
   - Liquid of rumen
2. She takes two cups of the mixture and mingles it with 14 litres of water plus a detergent (soap)
3. She boils all ingredients for two hours
4. She ferments the solution for one month

She filters it and applies it to the leaves
4.3.4 Cow dung fermentation

The initial principle of IPM FFS has always supported the idea of reducing chemical pesticides as well as chemical fertilizers and acting as agro-ecological friendly as possible. Therefore, it was inescapably to introduce a practice to farmers fostering soil fertility in a long run. The practice which is going to be introduced in this sub-chapter refers to the ‘cow dung fermentation’. Before the IPM FFS took place in Mutihan, the fertilization technique consisted mainly of the application of urea (CH$_4$N$_2$O) and phonska (NPK), two common synthetic fertilizers which were and still are subsidized by the government. Some farmers also applied unfermented cow dung in combination with phonska and urea if the respective input (cow dung) was available.

With regards to the practice of ‘cow dung fermentation’, cow dung is supposed to be collected and regularly turned so that a fermentation process is initiated. To speed up the fermentation process, cow dung is placed under a plastic bag and a bio activator called EM$_4$ is added. Fermented cow dung is supposed to provide nutrients more rapidly to the soil in comparison to unfermented cow dung. When investigating whether farmers are keen to ferment their cow dung after IPM FFS participation, especially two aspects became obvious. First of all, farmers claimed that they do not possess any cows and therefore they do not even have further inputs for cow dung fermentation. This was supported in various statements. One farmer said for instance:

"I do not apply cow dung because I do not have cows. But still, I buy cow dung once in a year to fertilize the soil." (Pak Lanjar)

Although he does not have any cows and cannot apply any cow dung at all, he still knows the advantage of applying cow dung and therefore buys it once in a year. A similar statement was provided by a female farmer who stressed that she only uses urea and phonska because she does not have any animals. But sometimes if she has more money, she buys cow dung. Cow dung as realized during the interviews, is never applied exclusively as the only fertilizer. Cow dung is often applied in a combination with urea and phonska. Here, we can see that farmers are restricted in adopting the practice by not having any access to inputs and that’s where companies come into play. In Mutihan, there is a company offering ‘Petroganik’, an organic fertilizer, which finds high encouragements among farmers especially who are lacking inputs.

Besides the constraining factor of lacking inputs, there was a second one pointed out frequently by farmers especially who possess cows. These farmers were especially complaining about the associated work load with regards to the fermentation process. Another farmer argued that “It depends on my condition if I ferment the cow dung. If my condition is well I ferment the cow dung.” (Pak Tukimin)

Generally, the ‘cow dung fermentation’ practice did not find a lot of reception among farmers and was thus rejected either because of the non-availability of inputs or the labour intensity the practice entails.

When walking through the village, I realized that there was an abandoned house standing in the middle of the village. Inside, old machines, plastic bags and organic matter on the floor. It was once a house which was used for organic fertilizer production but as I found out later could not sustain itself since the operational costs were higher than the return. So basically it was not economically favourable. Companies producing and promoting the organic fertilizer ‘Petroganik’ could thereby find high interest rates for this product among farmers in Mutihan.
4.4 Experimentation on IPM FFS practices

In this sub-chapter, the aspect of experimentation in relation to changing agricultural practices is furthermore investigated. Experiments as stated by farmers were executed in IPM FFS especially on 'square planting' using different distance parameters. As a farmer remembered, they tried different distances such as 20cm, 23cm and 24cm on a common plot. With regards to experiments, I was especially interested to what extend farmers were still encouraged to conduct experiments on their own after IPM FFS participation. Thereupon, farmers generally stated that they do not perform any experiments on their rented land. Some referred to the reason of being restricted in carrying out further experiments on their rented land as explained in one example:

"If I would have the chance to make an experiment, I would make a wider distance because I visited Kodong Prongo before and the distance is 50cm*50cm and the paddy grows very good. The roots and branches are very big. I want to try such an experiment." I intervened and said that he could propose it in the FC. Thereafter he replied "yes it is possible but most of the members of the FC are not the owner and if they apply it, it would be very strange. Because it is not their own field." (Pak Sumardi)

The fact that farmers were restricted to carry out further experiments was also supported by another female farmer who claimed that she does not make any experiments since she does not own land. The land belongs to the “others” as she said so if she would make experiments there, she would not feel good. With the term the “others” she referred to the owners of the land from whom she rents it.

What I wish to express with these statements is that agricultural practices aiming for an improved rice cultivation is often restricted by the domain of land ownership. In case owners agree with changing agricultural practices, associated benefits such as an increased rice productivity etc. could be attained. Since the harvest of the paddy cultivation is equally shared among land owner and tenant, both could benefit from the improved agricultural practices. The relationship between the owner and the tenant can have therefore an effect on how farmers perform their agricultural practices. Motivation to conduct experiments was present but not further pursued due to the constraining factor of land ownership. Although farmers rent land, they are not immediately the ones who can decide on the agricultural practices being executed. Owners still need to agree with changes on agricultural practices. Land owners as described by one male farmer are often the passive farmers, those who are old and not so active. In his opinion, they do not care so much about improving the agricultural practices and rather stick to what they are used to. First, I thought that the Farmer Community might hamper farmers to fulfil creative ideas and actions but in this case it was rather a matter of land ownership. Also, farmers did not claim any disadvantages of being a member of the Farmer Community. Instead, they either stressed on the advantages of receiving support be it on the access to subsidised inputs such as seeds and fertilizer.
CHAPTER 5: Gedongsari

In this Chapter, I present my findings on Gedongsari, a small sub-village counting about 1400 inhabitants and located approximately forty kilometres south of Yogyakarta city. At that time of my visit, it was already December and thereby I found myself in the middle of the first rainy season. Since the heavy rain was never an excuse for staying home, I remember ending up frequently with wet clothes and a hot cup of tea offered by farmers. I do remember very well my first impressions when entering Gedongsari. There were neat, colourful houses everywhere and the environment was surprisingly clean. I saw garbage bins arranged throughout the sub-village which is something rather rare to observe in Indonesia. Everything seemed to be much better organized and cleaner compared to the other sub-villages. There was in a way a very comfortable and cosy atmosphere within this sub-village. Houses were surrounded by bright green paddy fields, water canals, palm-, mango- and banana trees.

5.1 Village specifications

Educational programmes

When meeting farmers, I was immediately triggered to find out why this sub-village seems to appear so clean. The explanation relates to a family empowerment programme which has been introduced in Gedongsari by the government. Especially female farmers are addressed by this programme who regularly meet in the dukuh’s house for being instructed about health and hygienic features. As the dukuh, the head of the sub-village, stated: "during the meetings, women do not only learn, they also get together to sing and conduct Arisan". Arisan is especially a women activity which takes place every month. During Arisan, small amounts of money are collected in a jar from every woman and later on one woman wins all the money which has been collected. Arisan brings women closer and fosters the mutual support. The idea to set up garbage bins was initiated exclusively by women. Next to the family empowerment programme, there were also plenty of other programmes launched, be it on a healthy nutrition, child raising (Posyandu) or smoking regulations for instance. Someone could also immediately see that these programmes were not just launched but also the content was continuously promoted by posters in the entire sub-village as illustrated in Picture 4.

Picture 4: Educational promotion in Gedongsari

Picture 5: Displaced newspapers in Gedongsari
Next to educational posters, also newspapers were openly presented in the centre creating a meeting point for further exchange among inhabitants (Picture 5). The reason for especially emplacing these two images is to provide a better understanding on the already existing arrangements within the sub-village. Besides all these awareness programmes, which already turned Gedongsari to a very clean and organized place, there is also the "Organic" Farmer Community. The "Organic" Farmer Community counts exclusively members who produce "organic" rice and is part of the regular, larger Farmer Community. However, there are also farmers who produce still conventional rice and these are then only members of the Farmer Community in Gedongsari. Since the "Organic" Farmer Community plays an important role in this Chapter, I would like to present its development over the last years.

**"Organic" Farmer Community**

Pak Sumarjana is an alumni IPM FFS participant of 1992 and can be seen as the initiator of the "Organic" Farmer Community which was established in 2009. He lives in Gedongsari with his family and has been a farmer for already many years. In the year of 2000, his friend working for an "organic" fertilizer company visited the sub-village to introduce the advantages of guano fertilizer, a highly nutritious manure originating from bat dung. The interest to try out bat guano fertilizer while omitting any kind of chemical compounds was especially advocated by four farmers. Although the productivity dropped at the first time when completely changing to "organic" fertilizer, farmers could see advantages of the soil structure and texture over the seasons through the experiment. They became motivated in continuing the application of "organic" fertilizer and also thought to switch to natural pest management by either leaving small amounts of pests in the field or by using *Beauveria bassiana*, a fungus which is utilized for pest control on an agro-ecological basis. Farmers were able to receive *Beauveria bassiana* for free from nearby laboratories which especially focused on the experiments with such fungus. At that time, *Beauveria bassiana* was not so common yet and the research on it still in practice. In Gedongsari, four farmers started to produce "organic" rice starting in 2000. Since not all the "organic" rice could be consumed by the farmers, Pak Sumarjana started to explore the marketing opportunities. Between 2001 and 2003, he started to promote "organic" rice at government offices since extension officers usually have more money to afford such exclusive diets. His strategy was based on handing out "organic" rice for free and in case they like it, they could make further orders. Also, he tried to introduce "organic" rice by door to door selling and to small supermarkets. The "organic" rice offers a unique and delicious taste to the consumers as experienced by the farmers in Gedongsari. And therefore, he tried to make people eat "organic" rice to taste the difference. His marketing strategy proved successful and demand grew. Since the demand became even higher than the supply, Pak Sumarjana thought about how he could convince other farmers to produce "organic" rice. He decided to write a proposal to the Ministry of Food and Agriculture (MOA), asking for an IPM FFS in Gedongsari with a special attention to solely "organic" practices. The proposal got approved and thereby, an IPM FFS with a focus on "organic" production took place in 2009. As Pak Sumarjana remembers, the loan for this IPM FFS was provided by the World Bank at these days. The participants for this IPM FFS executed by MOA were selected by Pak Sumarjana. He chose especially farmers who particularly showed interest and effort in "organic" farming practices. As he stated "I would only choose participants who are interested in "organic" agriculture". For the IPM FFS, twenty men and five women were selected for the IPM FFS participation. When asking Pak Sumarjana who he believes could be convinced to change to "organic" cultivation practices, he claimed that it always depends on the personality of the farmer and the values which tag along. Once the IPM FFS was executed in the sub-village, Pak Sumarjana established the "Organic" Farmer Community counting until now fifty members. So over the time, more farmers were convinced to switch to "organic" farming practices also in other sub-villages. So the supply of “organic” rice grew especially since the rice became certified by the government as hygienic rice.
There is something important to mention with regards to the hygienic rice certification. Actually the rice is produced “organic” as so far that no chemical fertilizers and pesticides are used for rice cultivation. However, the rice cannot be sold and certified as fully “organic” since the water which is used for irrigation, coming from the Bedog river, is not 100% pure and free of chemical contamination. Since conventional farmers and “organic” farmers use the same canal, small amounts of chemical substances might enter the “organic” system. Also a sugarcane factory is located nearby throwing waste material from their production into the canal which is shared with the farmers of Gedongsari. Therefore, the rice is not fully “organic” and is rather sold under the hygienic label, what should at least present that it is a more healthy and distinctive product compared to the conventional rice.

However, I wish to apply the term “organic” (using quotation marks) throughout the Chapter to distinguish it from the fully organically produced rice. This is just for the reader to keep this small obstacle in mind. I was also wondering if it is not possible to incorporate water filters into their rice cultivation system especially for the “organic” rice cultivation but “organic” farmers stated that it is rather difficult. The only method they know is to introduce the water hyacinth （Eichhornia crassipes），carrying the feature of absorbing chemical compounds and dirt, into the pond. But so far, they still consider it as a challenge to build up small ponds around the fields.

Since 2009, the “Organic” Farmer Community turned into an active organisation with packaging, labelling and selling “organic” rice not to just individual people but also to larger supermarkets. I also used immediately the opportunity of buying two kilos of black and red rice before heading back to Germany. The nice thing about this “Organic” Farmer Community is that they are selling different varieties of rice such as Pandan wangi and Mentik wangi, both well-known for their distinctive fragrance and ordinary taste. Farmers who are members of the “Organic” Farmer Community are not restricted in growing these two varieties. They can also grow red-, black rice or Ciherang as “organic” for the niche market. However most farmers decide to grow Pandan Wangi and Mentik Wangi since these are the most favourable rice varieties purchased by consumers. The seeds for these varieties are also provided through the “Organic” Farmer Community and are not subsidized by the government. Regarding the seeds, the government only provides subsidies for seeds of Ciherang and Situbagendit which is grown by the majority of conventional farmers. Therefore, there is also a higher independency reached by the “Organic” Farmer Community compared to the regular Farmer Community which is still receiving their subsidies for Ciherang seeds. However, subsidies by the government for Petroganik, an organic fertilizer, are provided for both the “Organic” Farmer Community as well as for the Farmer Community. Here, a special request had to be stated by the farmers to receive subsidised organic fertilizer.
5.2 Reaction to IPM FFS practices

Something important to note here (compared to the IPM FFS presented in the previous sub-villages) is that in this IPM FFS, farmers were exclusively introduced to “organic” practices meaning to eradicate any kind of chemical fertilizers and pesticides.

5.2.1 Transplanting

In Gedongsari, farmers work with nurseries which are located near to their paddy fields. Nurseries are also used in Mutihan but not in Wareng IV. Farmers in Gedongsari were used to transplant the paddy at a growing stage of 25-30 days. In the IPM FFS, they became introduced to the practice of ‘transplanting at an earlier stage’ of 15-18 days. The supposed advantages of the ‘transplanting at an earlier stage’ practice have been already outlined (Chapter 4.3.2). This practice was remembered by all farmers and thereby pointed out in each interview. When asking farmers if they consider the ‘earlier transplanting’ as a suitable practice, Suparti, a female farmer said that she transplants the paddy seedlings after 15-18 days because “the productivity is better when transplanting the paddy at a younger stage.” The fact that the productivity is higher when transplanting at an earlier stage was mentioned several times just differently formulated. Farmers for instance referred to the point that “there are more leaves, the leaves grow better” or “paddy grows more and the colour of the leaves is green”. Although this practice was generally well adopted, there was one farmer, named Sukijo who insisted that he likes to transplant his paddy at a stage of about 20 days because when he transplants on 15 days, he has the feeling that the weeds grow faster than the paddy. According to his experience, he feels saver to transplant at a later stage of 20 days. So basically, he decided to apply an intermediate transplanting stage of the traditional – and the IPM FFS practice. He did not switch completely back to the old practice but rather adapted the old and new practice according to his understanding and sense making.

Next to the earlier transplanting stage, farmers were also introduced to the practice of ‘transplanting one seedling per hole’. Before this practice got introduced, farmers were used to transplant 5 to even 8 seedlings per hole. With regards to this practice of ‘transplanting one seedling per hole’, quite some variations in the implementation process were apprehended.

As one female farmer said ‘Since the IPM FFS, I plant one seedling into one hole because I experienced that the plant receives more tillers and I can use less seeds than before.’ So here, it becomes obvious that she made good experiences with one seedling per hole and thereby she continued. She also can see the advantage of using less inputs when applying the recommended IPM FFS practice. However, on the contrary, there are also farmers who consider it as too risky to use only one seedling per hole. As Sukijo and Giyono stated, there are snails in the fields which might eat the seedlings and therefore they prefer to use rather three to four seedlings instead of only one. So farmers also look for harvest security in their fields. Therefore, farmers were not willing to adopt the practice since they showed worries towards their paddy production and chose rather for an adaptation of the practice, adjusted to their personal circumstances. Some farmers had more problems with snails than others which often influenced the seedling practice to adopt or adapt. As a farmer stated, it is possible to also dry the field a bit to avoid snails but this depends on the location of the field.

When asking Badawi, another male farmer and head of the Farmer Community how many seedlings he plants into one hole, he said:
“It depends on the availability of the workers. In case workers are available, I tell them to plant 2-3 seedlings because for workers it is too difficult to plant one seedling per hole and also it is too time consuming. But in case no workers are available, I plant one seedling per hole.”

In the interview with Badawi, it was the first time and only once mentioned that the practice of planting one seedling per hole is more labour intensive but also asks for the possession of certain skills. So for him, he does not necessarily stick to one practice or the other but rather changes them according to labour availability. In case there is no labour available, he chooses for the more labour intensive practice and plants one seedling per hole.

Generally, the practice of ‘transplanting at an earlier stage’ was adopted by all farmers except one who did not make good experiences. He slightly adapted the practice according to his personal circumstances. With regards to the ‘planting one seedling per hole’ practice, there were generally more variations stated by farmers based on their personal limitations such as pest incidence and labour availability.

5.2.2 Pest Management

The use of natural pesticides becomes highly relevant in “organic” production systems since chemical ones are strictly prohibited. Before the IPM FFS, most farmers applied solely chemical pesticides on their paddy fields. However, the IPM FFS introduced farmers to several pest management strategies, all based on agro-ecological features which will be further explained here.

When asking farmers which pest management strategy they still remember from the IPM FFS in 2009, they often referred to the natural pesticides produced out of crushed chili, detergent and sugar (Box 5). A very easy to produce and to apply solution for avoiding the rice bug (*Leptocorisa oratorius*).

This is still produced as found out later in the “Organic” Farmer Community by a few farmers. The chilies of secondary choice are provided for free by the women community (Box 6). Therefore, no ingredients need to be purchased. Although this pest controlling method seems generally handy, the frequency of it decreased over time since first of all another natural pest management solution became even more attractive, namely *Beauveria bassiana*, a fungus acting as a parasite on pest species such as the rice bug (*Leptocorisa oratorius*) or brown planthopper (*Nilaparvata lugens*) and secondly there are less pests identified in the fields. With regards to *Beauveria bassiana*, although it is known for many years already, the way of applying it changed. Since extension officers managed to produce it in a powdery formula in laboratories, it became “more practical and handy to apply for farmers” as Badawi stated. For the pest control of the rice bug for instance, two to three grams of *Beauveria bassiana* which comes in a powdery form is dissolved in one litre of water and mixed with three tablespoons of sugar. Usually 500 litres of this respective solution is applied on one ha of paddy cultivation. Besides the easier application technique, the practicality of this method became also expressed by Suroyo stating “I take Beauveria bassiana from the laboratory which is close by and it is even for free.” So *Beauveria bassiana* as expressed by farmers has the advantage that they do not have to produce it themselves and they can take it for free from the laboratory which is close by.
So basically the fact that farmers rather prefer to apply *Beauveria bassiana* instead of natural pesticides out of chili can be regarded as a sign that the natural pesticide became outdated. *Beauveria bassiana* as it is now offered in a powdery formula is a more modern technique which appears to be a more suitable pest management strategy for farmers in case they face actually pests.

I am saying that “in case they face actually pests” because it was noticeable that farmers were confronting generally little problems with pests in their fields. The last severe pest incidence happened in the rainy season of 2013. At that time, the rice bug (*Leptocorisa oratorius*), feeding on the foliage of the rice plant, caused severe damage to the harvest. A mass spraying event was organized by MOA, but executed by farmers from Gedongsari who were paid by the community. On the conventional fields, the chemical pesticide *Neptune* was applied whereas on the “organic” rice fields, *Beauveria bassiana* was sprayed.

Since 2013, farmers only complained about very small pest outbreaks in the rainy season of the rice bug as well as of the brown plant hopper (*Nilaparvata lugens*). In case there are only a few pests being observed in the field, “I would rather leave them in the field. There are not many anyway since the plants are very healthy” as a farmer stated. Also for Yatrumini, a woman living together with her mother, she also did not face any problems with the rice bug (*Leptocorisa oratorius*) for a long time. The last time she found them was in 2013, and then it was a serious pest outbreak so the extension officers came and appointed a few farmers for mass spraying with *Beauveria bassiana*.

In case many farmers experience severe pest outbreaks, the extension officers usually come into play and ensure that fields are treated with biological agents for controlling the pests. As the extension officer also stated one day “we only provide natural pesticides to this community when they face serious pest outbreaks for instance with the rice bug (*Leptocorisa oratorius*) or the brown plant hopper (*Nilaparvata lugens*).”

One female farmer also remembered that she learned in the IPM FFS to collect dead rice bugs (*Leptocorisa oratorius*), crush and mix it with water and afterwards apply it onto the paddy leaves. However when asking her, if she still pursues this method she claimed: “I do not use this technique any longer because I do not find any rice bugs (*Leptocorisa oratorius*) in my field anymore.” When letting her further explain, it came to light that she does not use any kind of natural pesticides at the moment and that the last time something was sprayed was the mass spraying in 2013.

So to summarize, the practice of producing natural pesticides out of chili did at a certain point not find much adoption among farmers. This is attributed to the fact that farmers find their plants generally healthy and do not encounter many pests anymore. In case they find pests, farmers rather accept a newly adjusted technique namely *Beauveria bassiana* which is more suitable for farmers to apply due to practicality characteristics. Something important to note here is that all farmers (at least the ones I interviewed) eradicated the chemical pesticides completely at least on these plots where they decided to adopt the “organic” cultivation practices.

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**Box 6: Women community MELATI**

The woman community MELATI specializing on sheep and vegetable cultivation was established in 2011 in Gedongsari. It actually started first with the vegetable production of chili, sesame, ginger, onion, celery etc. However, the vegetable production did not provide enough income for satisfying personal needs. The vegetable harvest was not sufficient since they were only planted in limited amounts. Since women were not satisfied with only the vegetable production for income generation, they decided to reach out to an additional income generating activity, the goat rearing. Especially the male goats provide good income since they are preferred for slaughtering according to Muslim culture. At the moment, there are in total 35 members in MELATI. The members count especially poor women who do not have another source of income. The leader of MELATI is Endah, the wife of Pak Sumarjana.

Nowadays, MELATI is currently involved in in both business directions, the vegetable production as well as the goat rearing. The vegetables are usually sold on the market. However, chilies of secondary choice, those which cannot be sold anymore on the market due to insufficient quality standards, are used as an ingredient for natural pesticides, produced by the “Organic” Farmer Community.
5.2.3 Fertilization

When applying “organic” agricultural practices, the utilization of chemical fertilizers is strictly forbidden. Therefore, there must be other practices promoted fostering soil fertility but on an agro-ecological basis such as the fermentation of cow dung or the preparation of natural fertilizers (with cow pie and water). ‘Cow dung fermentation’ and the ‘preparation of natural fertilizers’ are these two practices which were most often referred to when asking farmers about the fertilization practices learned in the IPM FFS in 2009. Besides, other unique practices such as the fermentation of leaves or the soaking of coconut husk were highlighted by individual farmers.

Something interesting to mention here is that when being in Gedongsari, someone immediately realizes a relatively large storage house for cow dung which already established before the IPM FFS. Farmers can bring their cow dung to this place and some people from the sub-village are appointed to turn it regularly to initiate the fermentation process. Although there is a storage house for fermented cow dung, farmers do not always like to make use of it. The fermented cow dung is provided for free to all “organic” farmers in the sub-village. The free provision of cow dung should stimulate farmers to apply it on their fields and not having to encounter the fermentation process anymore. Curiously not many farmers make use of it. Farmers only have to pay the transportation of the fermented cow dung to the field which is done by Pak Sumarjana for 500 Rupiah (~0.04 €) /km. The cow dung storage was already established before the IPM FFS but only very few farmers make use of it.

When asking Yatrumini, a female farmer who lives alone with her mother if and how she uses fermented cow dung she stated “I do not have any cows and therefore I cannot apply any fermented cow dung.” When listening to her statement, I was wondering why she does not take any free fermented cow dung from the community storage. I remember her saying “I do not feel comfortable when I take cow dung from the community because I do not have any cows.” In her argument, it became apparent that she feels really uncomfortable to take something for which she did not provide a contribution. When asking others if they take any cow dung from the community storage, they replied for instance “I have a cage next to my house where I can ferment the cow dung myself. I can produce enough on my own and therefore I do not take any cow dung from the community” (Pak Sukijo). That farmers were rather not making use of the cow dung storage was stimulating since it was free for all farmers and thereby assumingly attractive. But also Badawi claimed that he does not use fermented cow dung because he does not have any cows. He also does not want to take any cow dung from the community and rather applies Petroganik, an organic fertilizer. Petroganik is in his opinion easier to apply and less heavy. Farmers are very interested in the Petroganik product offered by a company and subsidised by the government for especially the “Organic” Farmer Community. Especially those farmers who do not have any cows or other inputs for natural fertilizer like to buy Petroganik. This finding was confirmed also in Mutihan.

Coming back to Yatrumini, I was curious what she uses instead of cow dung and how she fertilizes her field. She said that she uses Petroganik in combination with leaves. Actually she learned in the IPM FFS how to ferment leaves by collecting them, adding EM4 (a biological activator) and placing them for some time under a plastic bag. She knows that fermented leaves provide much faster the nutrients to the plants compared to the unfermented leaves. However, she does not ferment the leaves and rather applies them like this because she needs too many leaves and does not have enough time for the fermentation process.

Here, it was especially the labour intense process which hampered her from applying fermented leaves onto her field. So the fact that a practice be it the fermentation of the cow dung or leaves was not accepted referred to either the non-availability of inputs or the labour intensity.
Another practice which was mentioned with regards to the IPM FFS in 2009, was the preparation of natural fertilizer from cow pie and sugar. Cow pie is rich in minerals and thereby able to provide nutrients to the crop. Sugar however is the basic food for bacteria and fungi, the primarily decomposers in ecosystem services fostering the microbiological activity within the soil. The production of this specific natural fertilizer is produced nowadays in the “Organic” Farmer Community. Usually before the paddy season starts, they gather and prepare the natural fertilizers together. Sugar, one of the main ingredients is taken from the market whereas the cow pie is collected from the cows farmers keep in the sub-village. Afterwards, they give it for free to the “organic” farmers. So what farmers often use in addition to either cow dung, Petroganik or leaves, is the natural fertilizer from cow pie and sugar. The practice of applying “natural fertilizer out of cow pie and sugar” was generally common among farmers. They learned to apply it once a week on the leaves before the paddy is forty days old. The preparation of this natural fertilizer is relatively easy since all ingredients can be effortlessly provided. In Gedongsari, some farmers keep cows from which the urine is collected for further needs.

One unique practice which was only mentioned by just one farmer was the natural fertilizer production out of coconut husks. Qomarudin, a male farmer, stated that he learned to soak the coconut husk in water for one night. Afterwards, it can be applied as a natural fertilizer. When asking him if he likes to apply this technique he said “No, I do not apply it because it takes time and I am too lazy and also because I need to buy all the coconut husk which costs 10.000 Rupiah (~0.60 Euro) for 100 pieces.”

What I wish to express here is that farmers show different features towards their fertilization practices after the IPM FFS which introduced several practices. Farmers often rejected the practice of ‘cow dung fermentation’ since necessary inputs are missing or the work load is merely too heavy. Since also an easier option is provided to farmers through the subsidization of Petroganik, farmers like to rely on such a product. When listening to the responses of farmers, it became also apparent that farmers combine very different practices on their fertilization strategies. For instance, some combine Petroganik with natural fertilizer (cow pie and sugar) whereas others use leaves with Petroganik and natural fertilizer etc. The mix of how farmers decide on their fertilization practices often depends on the individual positions of farmers and thereby bounded circumstances. However, for sure it can be stated that these farmers I interviewed all apply agro-ecological fertilizers at least on these fields where “organic” paddy is grown. At a later stage, it became apparent that farmers still decide differently on their fertilization strategies depending on the land ownership. But this is further explained in the following Sub-chapter 6.4.
5.3 Land ownership

Something significant to mention here with regards to the agricultural practices farmers pursue is the aspect of land ownership. Land ownership often proved to be a limiting factor for farmers who cannot pursue agricultural practices of their preference, be it in this case the “organic” cultivation. Farmers I interviewed either rent land, are the owners of their land or even both. These were the only three land-use options I came across in Gedongsari. It was noticeable that farmers only applied “organic” practices on their own land or rented land. The rented land where “organic” practices were pursued mainly belongs to Pak Sumarjana as investigated later. He provides land to farmers who are willing to apply exclusively “organic” practices. Conventional practices were then applied in addition to “organic” practices but most often on rented land. For instance, Suroyo grows conventional rice on his parents land since they do not want him to change to “organic” cultivation practices. The reason for this can be attributed to the fragrance of “organic” rice which they do not like. In their opinion “the “organic” rice is too aromatic”. In most cases, farmers consider to cover their own needs of rice consumption before selling it further. Therefore, it plays for farmers quite an important role which rice to grow and under which circumstances. When also asking Qomarudin why he grows conventional rice on the rented land he stated that “the owner is worried that the production drops. He does not allow it to apply the “organic” cultivation.” The rice harvest from the rented land is usually distributed equally, meaning that 50% of the harvest goes to the tenant and 50% goes to the owner of the plot. The sharing of the harvest is in this case considered as the payment from the tenant to the owner for the land usage. The fact, that owners are afraid or thereby not willing to change to “organic” cultivation practices can be attributed to the harvest drop which usually occurs in the first year of the conversion period from conventional to “organic” cultivation. However, as soon as the conversion time is bridged, the harvest as confirmed by the “organic” farmers is equal to the conventional harvest or even higher. The same reason for not agreeing to change to the “organic” cultivation practices was also supported by another male farmer.

On the contrary, there was one exemption with a male farmer called Sukijo. He was able to adopt the “organic” cultivation practices on the rented land because he could convince the owner. But this as he indicated was a tedious process by constantly talking at him. He stressed towards the owner that in the beginning the productivity might slightly drop but the taste of the “organic” rice is much better. Since the owner agreed, “he is very happy and satisfied” and supports the idea of “organic” cultivation. Farmers who rent land from Pak Sumarjana can also produce “organic” since he strongly supports “organic” cultivation practices. Still, there are also farmers who do not rent land from Pak Sumarjana and have different owners. These farmers have difficulties to switch to “organic” since the owners do not agree with the “organic” cultivation practices. Therefore, they are producing conventionally.

In Gedongsari, farmers do not have to follow strict rules on the variety to plant, neither on the planting distance. Also, water from the canal, is not such a limiting factor as in Mutihan effecting the agricultural practices so enormously. However, besides this exemption of Pak Sukijo, it can be commonly stated that farmers face difficulties to pursue their preferred practices when owners do not support such deviations.
5.4 Incentives for shifting towards “organic” cultivation practices

Farmers being convinced of shifting their practices from conventional to “organic” must also have taken their motivations from any sources of doing so. During my interviews, I was triggered to find out why farmers decided to produce “organically” although they were aware about the productivity drop in the first conversion year. The outcomes towards this investigation were very interesting. Although I assumed that the ‘higher price’ arguments might prevail, it turned out rather inversely. Very remarkably and unexpectedly from my personal point of view was that farmers most often referred to the incentive of ‘a better taste’ (see Figure 10). In all interviews except one, taste was mentioned as the incentive for producing “organic” rice followed by the health aspect. That “organic” rice is more delicious was stated frequently. "The taste is more distinctive, you have to try it” as farmers often said. Therefore, one farmer also invited me for lunch to taste the “organic” rice. His wife prepared a full meal with “organic” rice, meat, peanuts etc. When tasting the “organic” rice, I could indeed determine the distinctive flavour.

![INCENTIVES FOR PRODUCING "ORGANIC" RICE](image)

Figure 10: Incentives for producing “organic” rice (n=8)

Farmers for instance stated “my motivation to plant “organic” is because I want to have a healthy body and the rice is more delicious” or “it is healthier for the crop and for oneself and also the taste is better.” The fact that farmers like to produce “organic” rice because it is healthier and more delicious was often mentioned in combination. Since farmers like to keep their own rice before selling it further, the characterful and thereby better taste as well as the health characteristic were very important features for them. Another incentive which was highlighted during the interviews was the higher price for “organic” produce. Farmers usually receive 10.000 Rupiah (~0,70 €)/kg for selling the “organic” rice to the “Organic” Farmer Community which is about 1,400 Rupiah (~0,10€)/kg more compared to the conventional rice. However, the ‘price’ incentive was not the predominant one as I was in reality supposing. This outcome can be also supported by an interesting finding I made with regards to this aspect. There was one farmer named Sukijo who is selling his surplus “organic” rice in his Warung (small shop) in Gedongsari. Although he would earn 10.000 Rupiah per kilo when selling it to the “Organic” Farmer Community, he decided to sell it slightly cheaper for 9500 Rupiah/kg to inhabitants of the village. He claims that “I am happy that I can provide “organic” rice to the neighbourhood. Togetherness is more important for me than the price”. The fact that togetherness was mentioned as an important aspect within Gedongsari came often across among “organic” farmers who claimed that
they like to share information and exchange ideas on the “organic” practices. The ties among “organic” farmers have strengthened through the shared “organic” practices they are executing. I personally found the before mentioned attitude quite remarkable and therefore worth to mention. Also, it supports the outcome that a ‘higher price’ does not necessarily have priority amongst farmers. When further investigating if farmers would rather sell the “organic” or the conventional rice if having the choice, some supported the idea of rather keeping the “organic” rice for themselves. As a farmer stated for instance “I also keep the “organic” rice for myself and sell the rest to the “Organic” Farmer Community. The conventional rice is immediately sold.” (Pak Giyono). So also here, it becomes apparent again that farmers prefer to keep the “organic” over the conventional one although they could receive a higher price from it. Two other astonishing attributes were realized in the following statement of a farmer. He claimed that “my own land is full “organic” and it is very fertile. There is so much paddy on this field. I am confused. When the rain comes the paddy plant might drop because the plant is too heavy and collapses. If the land has become full “organic”, the plant will grow very good.” (Pak Qomarudin). Here, it needs to be highlighted that his field has been already “organic” for some years. He realizes an immense productivity which is almost hard to believe according to him. Another woman also said that on her land, the plants grow so high and almost drop. Although the higher productivity could not have been the incentive from the beginning, since they didn't know before, it can be still regarded as an incentive over time for continuing the “organic” cultivation practices. These two farmers saw great benefits with regards to the productivity and also see this as a fostering engine to continue “organic” paddy cultivation.

To sum up this sub-chapter, it was identified that the better taste of “organic” rice compared to the conventional often in combination with health characteristics were the most frequently mentioned incentives for shifting towards “organic” cultivation practices. This shows, that farmers were not just interested in the higher turnovers but rather in personal gains with regards to their well-being of keeping a healthy diet and actually eating food which is delicious. The awareness of keeping such features in mind must have arrived from somewhere and as suggested could relate to the educational programmes introduced beforehand which especially promotes such aspects. So there could be a link why farmers particularly pay attention to such issues in Gedongsari.

When asking farmers why they think that not even more farmers can be convinced of such incentives, it came often to light that farmers might be afraid that the productivity drops especially at the beginning of the conversion period. This is, as already mentioned beforehand, often the case but only in the conversion time which takes approximately one year. However afterwards, the yields are approximately the same or as even noticed by farmers a bit higher for the “organic” paddy cultivation. Here, it becomes especially apparent that the security aspect, in this case to have a high and therefore secure harvest, is still of great importance for certain farmers. However, the ones I interviewed became all “organic” farmers either on all their land or at least partly on some land.
CHAPTER 6: Discussion and Conclusion

The three empirical Chapters (Chapter 3, 4 and 5) showed how the IPM FFS influenced agricultural practices among small scale farmers in three sub-villages in the Yogyakarta regency. They showed that IPM FFS, seen as the programmes, in combination with certain context-specific features are decisive for changes of agricultural practices, the outcomes. As seen, farmers make use of the knowledge provided by IPM FFS and incorporate this knowledge to their situations, thereby influencing their agricultural practices and leading to specific outcomes. IPM FFS practices were thus either (I) adopted, (II) adapted or (III) rejected. As defined in Chapter 1.6.2, ‘adopted’ refers to practices which have been implemented as they were supposed to be implemented by practitioners, thus replacing the old practices. ‘Adapted’ on the other hand means that new practices were modified, thus creating hybrid practices (promoted IPM FFS practices with variances in its execution). And last, ‘rejected’ draws on practices which have been immediately or over time not incorporated by farmers. Thus they rather stick to their old practices or implement completely different ones. These three changes of agricultural practices (outcomes) were triggered by the IPM FFS (the programmes) in combination with context-specific features of farmers. The entire process of change of agricultural practices (mechanisms) can thus have three different forms. These are presented and explained in the following three scenarios.

First Scenario- adoption of IPM FFS practice

The first scenario relates to certain IPM FFS practices which have been adopted by farmers. For instance, IPM FFS practices such as the ‘square planting with garitan’ and ‘transplanting at an earlier stage’ were generally well adopted by farmers in Mutihan. Garitan is a wooden tool which helps farmers to draw square patterns into the soil thus creating wider and more exact distances as compared to the ‘old’ practice (for further explanation of this practice, see Sub-chapter 4.3.1). The IPM FFS practice of ‘transplanting at an earlier stage’ refers to an earlier transplanting stage of the paddy, about 14 days earlier as compared to the ‘old’ transplanting practice (for further explanation of the practice, see Sub-chapter 4.3.2). The ‘square planting with garitan’ and ‘earlier transplanting’ were well adopted IPM FFS practices by farmers where the block system, a context-specific feature, played a fundamental role. This block system operates on the basis of regulations, being enforced by the Farmer Community. The regulations which say that farmers have to plant the paddy in squares and synchronously at an earlier stage, creates social pressure and, thus, collective action is thereupon regulated. The two new IPM FFS practices (‘square planting with garitan’ and ‘transplanting at an earlier stage’) were in such a way well adopted due to the collectivism being created through the regulations enforced by the Farmer Community. The block system and its associated collectivism provided in such a way a suitable context for the consolidation of new IPM FFS practices.

The article by Palis (2006) showed that the IPM FFS introduced the practice of ‘synchronous planting’ to farmers in a village of the Philippines. Planting the crop at the same time brings the advantage that the risk of pests’ attacks is spread more equally among farmers. All farmers adopted this practice out of fear that when planting outside the scheme, pests might attack only the remaining field. In my study, ‘synchronous planting’ was not a practice being introduced by the IPM FFS. However, ‘synchronous planting’ was already enforced through the regulations of the block system before the IPM FFS got implemented. Therefore, the new practice of ‘transplanting at an earlier stage’ got smoothly implemented by all farmers since they had to follow the regulation of ‘synchronous planting’. In Wareng IV, the IPM FFS practices of ‘soil dike construction and ‘line sowing’ (for further explanation see Sub-chapter 3.3.1 and 3.3.2) were adopted since being promoted on experimental plots by significant persons in the sub-village. Their supportive commitment helped to consolidate
these IPM FFS practices and can thus be considered as a crucial context-specific feature. When looking at the ‘old’ practices before the new ones became implemented, no soil dikes were constructed at all and farmers broadcasted the seeds without any distance determination. Significant in all cases of practice adoption in Wareng IV, Mutihan and Gedongsari was that new practices came along with certain incentives, additional advantages farmers realized. For instance, in all three sub-villages, farmers recalled an increased productivity with the new respective practices of ‘soil dike construction’, ‘line sowing’ and ‘transplanting at an earlier stage’. Also, in all three sub-villages, farmers tended to apply less chemical pesticides as they used to do beforehand or even no chemical pesticides at all. Farmers referred to improved health aspects as a benefit: they said it is healthier for the body when not applying chemicals. As mentioned in Wareng IV and Mutihan, chemical pesticides were only used in rare cases depending on (I) the kind of pesticides being encountered and (II) the severity of the pest outbreak. Generally, few pest incidences were reported by farmers in all three sub-villages.

Second scenario – adaptation of IPM FFS practice

In the second scenario, adaptations of IPM FFS practices were especially made because of context-specific soil characteristics and weather conditions for ‘square planting with garitan’ and other circumstances such as pest severity, labour intensity and quality of agricultural inputs for ‘transplanting one seedling per hole’. For example, a farmer claimed to transplant three to four seedlings per hole when he encounters snails in his field. Snails usually eat the paddy seedlings and therefore transplanting just one seedling is too risky in this situation. The adaptation of the ‘transplanting one seedling per hole’ practice was thus taken into consideration depending on the pest severity. Certain circumstances made farmers not adopt, but rather adapt IPM FFS practices to reach higher production outcomes. Through the exposure to certain circumstances, farmers turned into innovative actors. Farmers in this respect were able to translate the knowledge gained from the IPM FFS into their own reality. This is also in line with the findings of Hoffmann et al. (2007) who claims that natural selection (for pests, drought, rainfall etc.) influences agricultural innovation processes with the farmer having the goal of reaching a ‘guaranteed production of the crops and an improved livelihood’.

Third Scenario – rejection of IPM FFS practice

The third scenario relates to the rejection of IPM FFS practices. When paying attention to the context-specific features towards this outcome, land ownership and its associated social norms and values were identified as a major constraining factor. Farmers (tenants of agricultural land) who were willing to changes certain agricultural practices were restricted in doing so when owners did not agree with such deviations. Especially when farmers wanted to change towards ‘organic’ cultivation practices in Gedongsari, land ownership presented a common issue. In Wareng IV and in Mutihan, land ownership was also notified as a constraining factor for changes of adopting IPM FFS practices and for conducting experiments. For instance, one farmer said that he would like to conduct an experiment on the paddy planting while applying a wider planting distance of 50cm*50cm. Since he is not the owner of the land, it is rather strange for him to implement such changes. So also the relationship to land owners and the norms and values people have restrict them in a way.

The fact that land ownership can be a limiting factor for adopting new practices is also found by Najjar (2013). Her study focused on the impact of FFS on environmental sustainability by gender centred learning in Kenya. Here, investigations showed that women were not able to adopt FFS practices since their husbands (being the owner of the land) disagreed with the respective methods. Although in her work there is special attention for the gender aspect, the overall issue is similar: power relations interfere with the agricultural practices being used. In my study, both men and women suffered from
the issue of land ownership. A study by Gill (2004) showed that cotton farmers in Senegal reject IPM FFS practices despite their interest in progressing towards more ecological farming systems. This is particularly attributed to the lack of choices farmers can make with regards to their agricultural practices since these are regulated indirectly by input-formula setting enterprises to which farmers sell their cotton to. These enterprises compose input packages (including seeds, pesticides and fertilizers) which cotton farmers are obliged to buy thus holding farmers in a vicious cycle of continuously using pesticides. What these findings additionally show is that limiting factors might vary from country to country hence posing existing barriers to agricultural development. What is thereby suggested is that the existing context (varying from place to place) is primarily screened for such barriers before new agricultural practices are implemented. Further, suggestions on how to sensitize these barriers can be approached.

Besides land ownership, also other context-specific features in my study presented difficulties for the implementation of IPM FFS practices. For instance in Mutihan and Gedongsari, farmers often rejected the IPM FFS practices on the ‘cow dung fermentation’ and the ‘preparation of natural pesticides’ (see Sub-chapter 4.3.3, 4.3.4, 5.2.2 and 5.2.3). Reasons for rejecting the practice of ‘cow dung fermentation’ were the non-availability of inputs (such as cow dung), easier and more practical options (such as ‘petroganik’) and the labour intensity. The practice of ‘preparation of natural pesticides’ was often rejected due to the non-availability of inputs (such as ingredients for natural pesticide production), generally healthy appearing plants thus being more resistant towards pest and diseases, more practical and updated options (e.g. Beauveria bassiana), labour availability encountered on individual level and personal values.

To provide a brief example, first of all, farmers would often not ferment cow dung because they do not have any cows. Secondly, even cows would be available, farmers frequently claimed that the process of cow dung fermentation is too labour intensive.

**Contradictive approaches of agricultural development discourses**

This section relates to the complexity farmers are still exposed to with regards to agricultural development programmes. In my point of view, farmers made great efforts in diversifying their farming practices moving towards more agro-ecological sound systems. Also, they seem to experience important benefits with it what is crucial for practices being adopted. Fact is, that farmers still depend on certain agricultural inputs (especially fertilizers) provided by either private sectors or the government. The relation between government and farmers is thus still a very strong connection (as further explained in Chapter 2.4.7). The FFS places originally the empowerment of farmers, their independency and thus the encapsulation of agricultural development bodies as a fundamental concept for reaching sustainable development. However, although extension officers implement IPM FFS, they also continue with providing agricultural inputs to farmers at the same time. Still, a paradox in itself which leaves room for further understanding the effect of the political context on agricultural practices.
Conclusion

IPM FFS showed considerable influences on agricultural practices among farmers. It can be concluded that the way how IPM FFS practices translate in the reality of farmers can take many directions depending on context-specific features. This research showed that existing means within farmer’s reality can take influence on the directions they are moving towards. For instance, the block system and its associated collective action helped to consolidate IPM FFS practices into the farming systems. On the other side, land ownership, seen as a socially constructed aspect was noticed to be a limiting factor for adopting IPM FFS practices for farmers. So social features were identified to be often part of the changing process of practices, playing crucial roles in how they turn out in reality of farmers. Also important for the incorporation of IPM FFS practices into farming systems was that they came along with obvious benefits for the farmers. Still, there might be instances where environmental or other circumstances come into play. These might be often difficult to take into consideration and are out of reach for agricultural development practitioners since they constantly change with regards to time and space. Here, farmers proved to be innovative actors by adapting the IPM FFS practices individually so that these fit into their personal realities.

Finally, there is still the question to what extent the IPM FFS was a reality in itself being introduced into another reality of the farmer. Although the IPM FFS should, as supposed, be part of farmer’s reality where they make practices fit suitably into their context, in this case it seemed that the practices were not evolving in the farmers’ reality themselves but placed in a separate reality, meaning the one of the farmers. So farmers rather took home the practices and made them suit to their reality instead of letting practices evolve and develop in their reality. If these practices would have further developed in the reality of the farmer, exploring immediately the suitability of the practices, maybe even more practice diversifications would have been created.
References


## Annex 1: List of interviewees (alumni IPM FFS participants)

<table>
<thead>
<tr>
<th>District</th>
<th>Subdistrict</th>
<th>Village</th>
<th>Subvillage</th>
<th>Name</th>
<th>Gender</th>
<th>Year of FFS participation</th>
<th>Age</th>
<th>Land size (m²) in total</th>
<th>Land structure</th>
</tr>
</thead>
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<td>Gunung Kidul</td>
<td>Wonosari</td>
<td>Wargen</td>
<td>Wargen 4</td>
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<td>43</td>
<td>4500 1500 owned (organic), 3000 rented (organic)</td>
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Annex 2: Coding scheme

1. IPM FFS Participation/Motivation
2. Practices before IPM FFS
3. IPM FFS practices learned
4. IPM FFS practices applied/not applied
5. Reason for applying/not applying IPM FFS practices
6. Awareness
7. Community Activity
8. Company promotion
9. Gender
10. Current challenges
11. Additional earning
12. Seed availability
13. Seed selection
14. Government support
15. Land distribution
16. Rice usage
17. Community life
18. Experiments
19. Personal gains from IPM FFS
20. Collaboration
21. Other issues
Annex 3: Overview of findings

**Wareng IV**

<table>
<thead>
<tr>
<th>Old practice (traditional practice)</th>
<th>New practice (IPM FFS practice)</th>
<th>Adopted</th>
<th>Adapted</th>
<th>Rejected</th>
<th>Incentives for practice adoption</th>
<th>Context-specific features</th>
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<tbody>
<tr>
<td>No soil dike construction</td>
<td>Soil dike construction</td>
<td>Well adopted</td>
<td></td>
<td></td>
<td>Water-saving and thus higher productivity</td>
<td>Farmers depend exclusively on rainfall, Practice adoption through the practice promotion with experimental plots</td>
</tr>
<tr>
<td>Broadcasting the seeds without distance determination</td>
<td>Line sowing of the seeds using a distance of 25cm*15cm</td>
<td>Well adopted</td>
<td></td>
<td></td>
<td>Higher productivity</td>
<td>Practice adoption through the practice promotion with experimental plots</td>
</tr>
<tr>
<td>Applying chemical pesticides</td>
<td>Preparation of natural pesticides</td>
<td>Adopted</td>
<td></td>
<td>Rejected</td>
<td></td>
<td>Practice adoption depends on pest severity; little severe pest incidences reported thus the preparation of natural pesticides stopped for the moment. The practice got also rejected since more practical options were made available to farmers (such as Supermax, a natural pesticide and fertilizer promoted by the company)</td>
</tr>
<tr>
<td></td>
<td>Using chemicals as a last resort (* not reported as an IPM FFS practice in the text but still)</td>
<td>Adopted</td>
<td></td>
<td></td>
<td>Health aspects</td>
<td>Practice adoption depending on (I) the kind of pest being encountered in the field and (II) severity of pest outbreak</td>
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</table>
Women seem to be more sceptical in using chemical pesticides compared to men. They consider small amounts of pests in the field as less severe as compared to men. Men are more afraid that productivity drops when not applying chemical pesticides.
## Mutihan

<table>
<thead>
<tr>
<th>Old practice (traditional practice)</th>
<th>New practice (IPM FFS practice)</th>
<th>Adopted</th>
<th>Adapted</th>
<th>Rejected</th>
<th>Incentives for practice adoption</th>
<th>Context-specific features</th>
</tr>
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<tbody>
<tr>
<td>Square planting with a rope (distance determination: 18cm*18cm), 20 kilos of seeds used for 2500m²</td>
<td>Square planting with <em>garitan</em> (distance determination: 23cm*23cm), 5 kilos of seeds used for 2500m²</td>
<td>Well adopted</td>
<td>Adapted</td>
<td>Less seed inputs needed</td>
<td>Less seed inputs needed</td>
<td><em>Garitan</em> is available in agricultural supply shops; practice combines traditional and modern techniques; Easy practice uptake through the collectivism (Farmer Community) setting up rules on similar practices, the distance being made by the tools is sometimes adjusted according to soil characteristics and weather conditions</td>
</tr>
<tr>
<td>Transplanting (after 21 days after sowing)</td>
<td>Earlier transplanting (7-14 days after sowing)</td>
<td>Well adopted</td>
<td></td>
<td>Higher productivity</td>
<td>Higher productivity</td>
<td>Practice combines traditional and modern techniques; well adopted through the collectivism enforcing rules on synchronous planting at an earlier stage</td>
</tr>
<tr>
<td>Transplanting 4 seedlings per hole</td>
<td>Transplanting one seedling per hole</td>
<td>Adapted</td>
<td></td>
<td></td>
<td>Practice adaptations due to external circumstances such as seed quality</td>
<td></td>
</tr>
<tr>
<td>Applying chemical pesticides</td>
<td>Preparation of natural pesticides</td>
<td>Adopted</td>
<td>Rejected</td>
<td>Health and taste aspects</td>
<td>Health and taste aspects</td>
<td>Practice adoption and rejection depending on the availability of inputs, labour availability encountered on individual level and personal values</td>
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<td>Practice</td>
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<tr>
<td>Using chemicals as a last resort (*) not reported as an IPM FFS practice in the text but still relevant to mention</td>
<td>Adopted</td>
<td>Little severe pest incidences reported, Practice adoption depending on the severity of the pest outbreak</td>
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<td>Applying synthetic fertilizers (ureaphonska, TSP), sometimes combined with organic fertilizer called ‘Petroganik’</td>
<td>Rejected</td>
<td>Practice rejection due to non-availability of inputs (such as cow dung), the availability of more practical options for ‘organic’ fertilizer (such as ‘Petroganik’) and the associated work load when fermenting the cow dung</td>
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## Gedongsari

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<th>Context-specific features</th>
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<td>Transplanting (after 25-30 days after sowing)</td>
<td>Earlier transplanting (after 15-18 days after sowing)</td>
<td>Adopted</td>
<td></td>
<td></td>
<td>Higher productivity</td>
<td>Practice combines traditional and modern techniques and was thus generally easy to adopt</td>
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<tr>
<td>Transplanting 5-8 seedlings per hole</td>
<td>Transplanting one seedling per hole</td>
<td>Adopted</td>
<td>Adapted</td>
<td></td>
<td>Higher productivity; less seed inputs</td>
<td>Practice adoptions and adaptations depending on personal limitations such as pest incidence and labour availability</td>
</tr>
<tr>
<td>Applying synthetic fertilizer (urea and phonska) and sometimes organic fertilizer called ‘Petroganik’</td>
<td>Cow dung fermentation</td>
<td></td>
<td></td>
<td>Rejected</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Applying synthetic fertilizer (urea and phonska) and sometimes organic fertilizer called ‘Petroganik’</td>
<td>Preparation of natural fertilizer</td>
<td>Adopted</td>
<td></td>
<td></td>
<td>Producing fertilizers on a natural basis</td>
<td>Plants seem generally healthy, little pest incidences reported, natural pesticides are provided for free to the farmers, ingredients for producing natural pesticides are available and easy to afford.</td>
</tr>
<tr>
<td>Chemical pesticides</td>
<td>Preparation of natural pesticides</td>
<td>Rejected</td>
<td>Little pest incidences reported since plants seem very healthy; Practice rejection due to more practical (no payment and no labour involved for preparation) and updated options of natural pesticides (e.g. <em>Beauveria Bassiana</em>).</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>