Enabling poor rural people
to overcome poverty

Independent Office of Evaluation

The Democratic Socialist Republic of Sri Lanka

Dry Zone Livelihood Support and Partnership Programme

Impact Evaluation

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Foreword

This report presents the findings of IFAD's first project impact evaluation. It applies the entire range of IFAD project-level evaluation criteria and draws from mixed methods including a quantitative survey of over 2,560 households (with and without project) undertaken by IOE in the area of the Dry Zone Livelihood Support and Partnership Programme in Sri Lanka.

Initially conceived as a food security intervention, the project was gradually refocused to better address the context of a middle-income economy, with diversification towards higher value crops and dairy farming. The project collaborated with national and local research institutions to bring improved technology to the farmers. It fostered partnerships with public and private companies: in Sri Lanka, larger private sector operators are entering rural areas to cater for the urban demand of dairy products and fresh fruits and vegetables.

The project targeted villages with lower access to basic infrastructure and households with lower asset base, but slightly better educational status and more diversified cropping patterns. The evaluation finds traces of the project's contribution in furthering agricultural diversification and introducing dairy farming in the dry zone. Compared with the project M&E data, independent analysis shows more modest socio-economic impacts. There are several reasons for these differences, including a more representative sample in the independent survey, the comparison with non-beneficiary households and the fact that most project initiatives have been delivered recently. The project can be considered as a pioneering intervention that built momentum, human capital and experience, although much remains to be done to consolidate the emerging dynamics.

The present report was prepared by Fabrizio Felloni, senior evaluation officer, IOE, and Ernst Schaltegger, senior consultant. The field impact survey, qualitative and quantitative, was undertaken by GreenTech Consultants (Pvt.) Ltd., a national company in Sri Lanka (in particular Diyath Gunawardena, Steve Creech, Dushanthi Fernando, Gamini Bambaradeniya, Sanjaya Karavita, Thisara Weerasinghe, and Isuri Dharmasoma). Support to sampling framework design, questionnaire preparation and initial data analysis was performed by Social Impact (in particular Mike Duthie, Patrick Howard, Molly Brune, Saman Hamangoda, Sunethra Weerapperuma) under the overall supervision of IOE. Further econometric analysis to test the robustness of results was conducted by the School of Economic Sciences, Washington State University (Sansi Yang, C. Richard Shumway, Jon K. Yoder). Anne-Marie Lambert, Senior Evaluation Officer and Miguel Torralba, Evaluation Officer, provided comments on a draft version of the report. Cristina Spagnolo, evaluation assistant, provided administrative support.

Thanks are also due to the Independent Evaluation Department of the Asian Development Bank, the Operations Evaluation Department of the African Development Bank for comments on the draft report and to the Evaluation Department of the Norwegian Agency for Development Cooperation for comments on the approach paper.

The Independent Office of Evaluation is grateful to IFAD's Asia and the Pacific Division as well as to the Statistics and Studies for Development Division for the inputs and comments provided throughout the evaluation process. Thanks are also due to the Government of Sri Lanka and to the DZLISPP national and district coordination units and other key stakeholders for their constructive collaboration.

Fabrizio Felloni
Officer in Charge
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Annexes

Currency equivalent, weights and measures

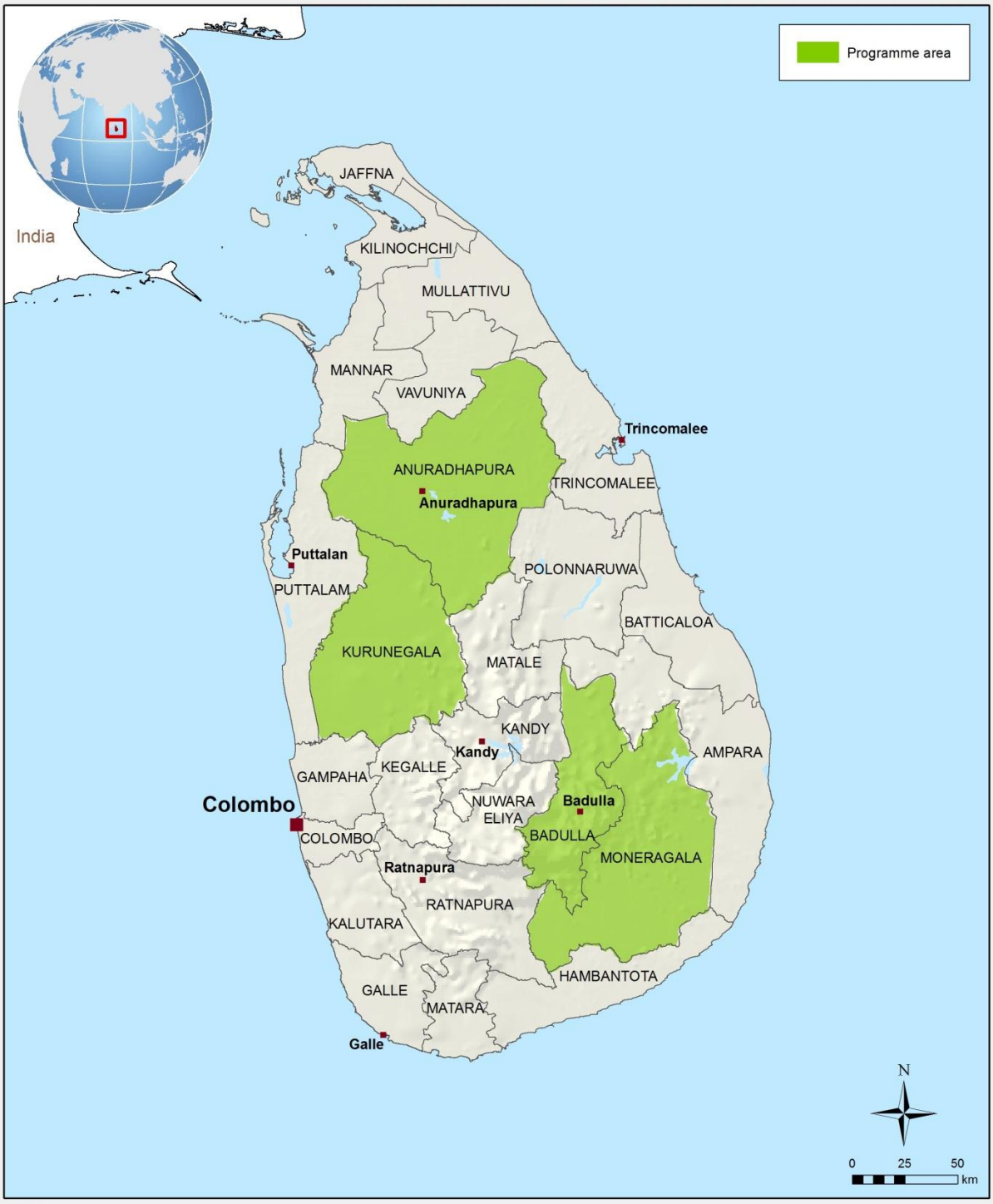
Currency equivalent

Currency unit = Sri Lankan Rupees
1 Sri Lanka Rupee = US$0.0075
(31 August 2013)

Abbreviations and acronyms

DSD	District Secretary's Division
DZLISPP	Dry Zone Livelihood Support and Partnership Programme
FAO	Food and Agriculture Organization of the United Nations
FFS	Farmers Field School
GND	Grama Niladhari Division
HARTI	Hector Kobbekaduwa Agrarian Research and Training Institute
IOE	Independent Office of Evaluation of IFAD
M&E	Monitoring and Evaluation
PCR	Project Completion Report
PSM	Propensity score matching

Map of the project area



Executive summary

1. As a part of IFAD-wide commitments in the ninth replenishment period (2013-2015), the Independent Office of Evaluation (IOE) of IFAD in 2013 IOE has conducted its first impact evaluation of an IFAD-supported project in Sri Lanka, the Dry Zone Livelihood Support and Partnership Programme (DZLISPP).

2. This evaluation has applied the entire range of project-level evaluation criteria outlined in IFAD's Evaluation Manual. For the first time at IFAD this evaluation has conducted extensive primary data collection and analysis, including a qualitative survey (30 key informant interviews with project staff, relevant government officers and 41 focus group discussions with beneficiaries), and a quantitative survey of over 2,560 households including project and comparison households.

3. DZLISPP was approved by the Executive Board of IFAD in September 2004 and completed in March 2013, with an actual cost of US$27.2million, financed by IFAD (a loan of US$21.97 million, and a grant of US$0.34 for policy work on land tenure). The rest was financed by the Government of Sri Lanka, and the beneficiaries. The project was under the responsibility of the Ministry of Agriculture. It included five components: (i) support to rain-fed upland agricultural and livestock development through farmer field schools; (ii) small-scale irrigation rehabilitation; (iii) marketing and enterprise development; (iv) microfinance and income-generating activities; (v) community infrastructure development.

4. The project design was relevant, with priority accorded to disadvantaged communities. Originally meant as a project for subsistence agriculture, DZLISPP **gradually aligned itself to changes in the country context**, such as the transition from low to middle income and from conflict to post-conflict phase (after 2009). In particular, focus was added to: (i) higher-value crops and livestock products; (ii) linkages to processing and marketing channels within existing value chains (e.g. milk, fruits and vegetables); (iii) introducing technology for seed multiplication (potato, onion). This transition was possible thanks to a new project management team and input provided by the mid-term review.

5. The project was broadly effective. Outreach figures are high (120,000 households or above compared to the 80,000 households target at appraisal) although quality of execution did not always keep the pace with quantity of outreach. Livestock development, initially not a major area of emphasis, succeeded in **integrating livestock production systems into dry land farming**. The project rehabilitated traditional village irrigation tanks, affecting a command area of 7,900 ha (against a target 6 600 ha) of which 3,362 ha were incremental, with an overall good quality of work but leaving behind rather weak water user associations. DZLISPP helped **expand marketing opportunities** establishing linkages between farmers and private firms. The latter cofinanced the construction and equipment of collecting and processing centres for agricultural and dairy produce.

6. The project was moderately efficient. Similar to other IFAD projects, DZLISPP suffered from serious delays during the first three years of implementation but managed to attain most of its targets by its completion. The actual project management cost ratio was about 22 per cent. This is a relatively high proportion although partly justified by the need to serve a scattered target population and to make up for the capacity constraints of local extension agencies. At completion, the project estimate of internal rates of returns was high (19.6 per cent) but heavily reliant on M&E data which deserve to be taken with caution.

7. **Methodological issues.** One of the fundamental constraints in the context of this evaluation was the absence of a baseline dataset. For this reason, the quantitative component of the survey adopted two strategies. On one hand it, attempted to reconstruct baseline information through recall methods. On the other hand, it adopted a quasi-experimental approach: statistical techniques that do not strictly require baseline data. In particular, the evaluation adopted "propensity score matching" as well as the "treatment effect model" (an application of the Heckman sample selection model) to test for consistency and robustness of results. Both can help address sampling bias when project participants have not been selected randomly.

8. In addition to the absence of a baseline dataset, other major constraints and issues that the impact assessment had to face were: (i) sample selection bias due to targeting; (ii) confounding effects of the general economic growth and poverty reduction experienced by Sri Lanka in the past eight years; (iii) the possible spreading of benefits from treatment to non-treatment groups; (iv) issues related to the project "incubation time": whereas project started in late 2005, most project interventions have taken place in the three-year period between late 2009 and early 2013.

9. **The project targeted disadvantaged communities.** As confirmed by this evaluation's survey, in line with the design, the project focused on more isolated communities, with a lower basic infrastructure endowment, such as primary, secondary schools, police post, community market. Within those communities, households assisted by the project cultivated more crops and had slightly higher education status but a poorer asset base, reflecting project field staff's orientation to focus on households based on both needs and interest in project activities.

10. **Impact.** The project M&E data tend to show high and generalised improvements of the welfare of beneficiaries, including agricultural productivity, incomes and assets. This evaluation acknowledges the efforts made by the project M&E system to collect a wide array of data and information. At the same time, the following main limitations have been found: (i) inaccuracies at the district-level reporting (e.g. double counting, incorrect entries); (ii) non-representative sampling; and (iii) no comparison made with households that did not benefit from the project (raising an attribution issue).

11. This evaluation benefited from primary data that are better representative and from comparisons with households that were not assisted by the project. Moreover, it triangulated between different methods and sources and tested the robustness of the analysis. The evaluation findings on impact are positive but more nuanced compared to the project M&E findings. Evidence suggests that the project has exposed small farmers to new crops and improved agricultural techniques. It has promoted a number of initiatives that can play a role in helping modernise agriculture in the dry zone of Sri Lanka. At the household-level, socio economic changes (e.g. in assets and expenditures) have been found as mixed and the results are sensitive to alternative estimation methods. The effects of project-supported training and extension service are still emerging, to a large extent.

12. Through Farmer Field Schools approaches, the project exposed smallholder farmers to **new techniques, crop varieties** such as turmeric and ginger, ground nuts, fruit trees (e.g. mango, papaya), onion cultivation practices and others. In a few instances, more advanced technology was introduced through the Department of Agriculture, such as seed production for B-onions and hydroponics for potato tuber production (Badulla district).

13. The project contributed to the development of **grassroots networks** at the village level, particularly through the support to water tanks societies, crop societies, dairy societies and the federations of these societies. In many of these, women held positions of president, secretary and treasurer.

14. Results in terms of household income and asset are mixed. The findings suggest that, given the project's emphasis on dairy farming, project-supported households have invested in cattle and purchased less of other household assets under external financial constraints. In most cases, participating household had to self-finance dairy farming investments, not only to buy cattle but also to build equipment and purchase special feed for lactating cows. More in general, project's beneficiaries had to self-finance the new investments encouraged by the project which may explain that they had to forego the purchase of other household assets. In assessing the project impacts, this evaluation has taken into account that most of the project initiatives have taken place between 2009 and early 2013.

15. The project contained **sustainability elements**: (i) the formation of farmer and producer societies (e.g., village irrigation tank, crop, dairy societies) and their federations; (ii) linkages with relevant government departments; (iii) grants for future maintenance of minor tanks and revolving micro finance and micro credit funds; (iv) linking farmers with private sector agro-business companies (fresh fruits and vegetables, milk). Because most project activities have been carried out in the past 36 months, they need further technical/organizational support. Indeed, fledgling farmers' organizations are not yet fully confident with accounting and marketing strategies.

16. **Pro-poor innovation and scaling up** has been satisfactory. The project has made direct efforts to bring farmers closer to the available technology frontiers (e.g. multiplication techniques for seed potato, quality seeds for cowpeas, maize, and groundnuts and chilling technology for dairy farming). The project worked with both private sector companies and provincial and district departments on the diffusion of the above innovations with some partnerships already under way. Current national policies favour larger infrastructure and plantation agriculture and tend to disregard the fact that successful commercial agriculture is not at odds with the active involvement of smallholder farmers.

17. The project's performance in **gender equality and women's empowerment** is assessed as highly satisfactory. Men and women work together equally in support of the household's management and income. Women are strongly represented in crop societies: they represented 43 per cent of presidents, 64 per cent of secretaries and 54 per cent of treasurers. The majority of loan beneficiaries are also women (60 – 100 per cent).

Recommendations

18. **Need for a follow-up phase and advocacy from IFAD's side.** Pioneering interventions such as this project require years to consolidate results: a single project phase is not sufficient. Focusing on the dry zone is consistent with the current priority accorded by the Government to the modernization of agriculture. This perspective needs to be conveyed more forcefully by IFAD to the Government.

19. **A more selective project format is required, revisiting several components and concepts.** In particular it is important to: (i) promote further linkages with existing value chains through public-private sector partnerships; (ii) support grassroots societies of farmers (e.g. crop, village tank, dairy societies) and their federations as an entry point for public extension programmes and for agreements with private sector operators; (iii) avoid subsidised interest rates credit schemes (lump-sum matching grants may be a better option).

20. **Advocacy on policy issues needs to continue**. This involves not only macro policy issues which are politically entrenched, such as land tenure, but also meso-level and practical issues such as the formal registration of village-level societies.

21. In the short term, **project commitments to provide a financial contribution to revolving funds** for maintenance of village tanks and other schemes **need to be honoured**.

22. **Better accuracy and quality control in M&E data is required.** The good practice of conducting thematic studies deserves to be retained. A simple baseline survey with both project and comparison observation is recommended and its database needs to be preserved with care.

Selected methodological considerations for future similar work at IFAD

23. **Absence of baseline** and of a **comparison group** is a typical constraint to impact evaluations at IFAD. This is further complicated by the **targeting** approach of many projects, likely to generate serious sampling bias. Use of statistical techniques that do not strictly require a baseline (propensity score matching, difference in difference, using recall questions, treatment effect model) is a viable option although it may not fully replace baseline data. It is also to be noted that the selection, **development and testing of the econometric approach** can be extremely **time consuming**.

24. **Timing of the survey**. Some reviewers may believe that it is preferable to wait until a project has gone through a sufficiently long "gestation period" before conducing an impact evaluation. However, undertaking an evaluation ex post (i.e. when the project has been closed for a few years and the management team is no more in place) can be extremely challenging: much information on the project area context would be missing and may result in survey design and sampling errors. When impact evaluations are conducted during implementation or just after project closure, surveys may have to focus more on shorter-term indicators (e.g. technology adoption).

25. Other challenges include: (i) practical sampling arrangements, when projects target specific agro-ecological areas, it may be problematic to find valid comparison areas and communities; (ii) the multi-component nature of many IFAD-funded projects, meaning that interventions are non-homogenous bundles of various activities and the relation of cause to effect is more difficult to detect and explain. And in general, data collection and analysis are highly time-consuming.

26. Finally, econometric analysis results are rarely self-explanatory and need to be interpreted. **Mixed methods**, combining both quantitative (mini-surveys) and qualitative techniques can help disentangle the causal nexus. A way forward for IFAD projects could be to conduct more **thematic studies** combining a simple survey format with more qualitative techniques. This would provide more context-specific findings adapted to each component that can be used to inform project implementation as well as final assessment at completion.

The Democratic Socialist Republic of Sri Lanka
Dry Zone Livelihood Support and Partnership Programme
Impact Evaluation

I. Background, methodology and process

1. Between 2013 and 2015, as a part of its commitment in the ninth replenishment period (2013-2015), IFAD will conduct 30 impact evaluations, applying internationally recognised quantitative data analysis techniques, in conjunction with other analytical approaches. In line with recent guidance received from the Evaluation Committee and the Executive Board, the Independent Office of Evaluation (IOE) of IFAD will provide support to the Fund through: (i) participation at in-house discussions on impact evaluations; (ii) close involvement in major international platforms on impact evaluation (e.g. NONIE, ECG, UNEG); and (iii) undertaking a Corporate Level Evaluation on IFAD's Approaches and Results in conducting Impact Evaluations at the end of the ninth replenishment period.

2. In addition, and as approved by the Executive Board[1] in December 2012, in 2013 IOE has conducted its first impact evaluation of an IFAD-supported project in Sri Lanka, the Dry Zone Livelihood Support and Partnership Programme (DZLISPP). Further impact evaluations will be conducted by IOE from 2014 onwards, based on the 2013 experience and subject to the availability of resources.

3. Similar to other project-level evaluations conducted by IOE, this impact evaluation is intended to assess the performance and impact of an IFAD project and provide recommendations for future operations. It applies mixed methods and triangulates from different sources. Compared to previous IOE evaluations, it benefits from a larger set of primary data collected through a qualitative and quantitative survey. For the first time the quantitative survey tests, within an IFAD project context, econometric approaches used by other international organizations. This is expected to highlight opportunities and constraints in adopting such approaches in an IFAD "project environment", better contribute to internal and external discussions on impact evaluation and, eventually, help prepare for the above Corporate-level Evaluation.

4. Among the factors taken into account in selecting this project in Sri Lanka were: (i) the availability of qualitative thematic studies on the project; (ii) the availability of relatively detailed M&E information on project sites (although the latter proved to be less accurate than expected); (iii) national technical expertise in quantitative and qualitative data collection; (iv) preference for a country where IOE had not recently conducted an evaluation; (v) availability of project staff in the capital and in the field during the foreseen survey implementation period. The latter point was crucial. While the project had reached completion and some field coordinators had terminated their contract, key project staff at the national and district level were in office until the end of May 2013. Interactions with these staff members were fundamental for verifying information and data, understanding key project implementation features, revising the sampling strategy and organizing the survey logistics.

5. **Methodology.** This evaluation applies the entire range of project-level evaluation criteria outlined in IFAD's Evaluation Manual.[2] Impact is thus one of the criteria considered here: exploring other criteria is essential to provide a balanced assessment. Compared to previous evaluations, an additional feature

[1] https://webapps.ifad.org/members/eb/107/docs/EB-2012-107-R-2-Rev-1.pdf
[2] http://www.ifad.org/evaluation/process_methodology/doc/manual.pdf
[3] http://Department of Agriculture, Department of Agrarian Development, Department of Animal Health and Production and

was the organization of extensive field work for primary data collection, both qualitative and quantitative. The qualitative component entailed 30 key informant interviews with project staff, relevant government officers[3] and 41 focus group discussions with beneficiaries in the four project district (men and women). Selection of the sites was done randomly in each district, taking into account the need to represent different project components.

6. The quantitative component entailed the fielding of a survey of 2567 households in 160 Grama Niladhari Divisions (GNDs)[4] split between 1302 households located in GNDs that had been covered by the project (general treatment households) and 1265 households located in GNDs without project (comparison households). Selection of sites and household was done through multi-stage cluster random sampling.

7. IOE reviewed the documents, reports and secondary data produced by the project, including the M&E data, the Project Completion Report (PCR), and the thematic studies carried out by the Hector Kobbekaduwa Agrarian Research and Training Institute (HARTI), a very distinctive feature of this project. IOE conducted a first reconnaissance mission in December 2012, a preparatory mission in March 2013 (including field visits in Kurunegala district) to fine-tune the methodology and evaluation questions and start data collection, as well as a synthesis mission from 21 to 31 May 2013. During the latter, in Colombo, the capital, meetings were held with the Ministry of Agriculture, the Ministry of Finance, the Central Bank, the World Bank country office, commercial banks, NGOs and staff of the programme management unit. Field visits were made to two of the four project districts, i.e. Monaragala and Badulla in Uva Province. At the end of the mission, the preliminary evaluation's findings were presented on 31 May 2013 at a wrap-up meeting organized by the Government.

8. The report was subsequently drafted and peer-reviewed by IOE. The draft report was also reviewed by the Independent Evaluation Department of the Asian Development Bank and the Operations Evaluation Department of the African Development Bank.[5] The draft report was shared with IFAD's Asia and the Pacific Division (Programme Management Department) the Statistics and Studies for Development Division (Strategy and Knowledge Management Department) and the Government of Sri Lanka, and their comments were taken into account when finalizing the report. A learning workshop was organised in Colombo on 3 December 2013 and attended by representatives of the Ministry of Agriculture, the Ministry of Finance and Planning, the Central Bank, and other concerned central Government authorities, district-level authorities from Anuradhapura, Badulla, Kurunegala and Monaragala, international organizations, private sector companies and NGOs active in Sri Lanka.

9. Since this is the first exercise of this type undertaken by IFAD, limitations, constraints and considerations for future undertakings of this type are presented throughout the report and summarised at the end.

II. The project

A. The country context

10. **Growing economy and transition to middle-income country status.** With a population of 21.2 million (mid 2012), Sri Lanka has experienced a major demographic transition during the past decades, entailing a reduction in

[3] *e.g.,* Department of Agriculture, Department of Agrarian Development, Department of Animal Health and Production and the Women's Bureau.
[4] In Sri Lanka, local governments below the district level include: (i) District Secretary's Divisions (DSD) and (ii) G*rama Nilhadari* Divisions *(*local government units below divisional secretariats).
[5] The approach paper of this evaluation benefited from comments from the Evaluation Department of the Norwegian Agency for Development Cooperation.

mortality (6 deaths per 1000 people in 2012 against 12.2 in 1962) and fertility: total fertility rate in 2012 was just above the replacement rate at 2.2 births per woman, compared to 5.3 in 1962.

11. According to the definitions of the Department of Census and Statistics, the population of Sri Lanka is classified as predominantly rural (85 per cent in 2011), although agriculture represents only 32 per cent of total employment and 12 per cent of the GDP (against 26 per cent in 1992).[6] Agriculture in Sri Lanka has an important export crop sub-sector, historically dominated by cash crop plantations (tea, rubber, coconut) but more recently including spices, fruits and vegetables grown by both large and smallholder farmers. With raising per capita income, the domestic demand is increasing for higher-value products such as fruits and vegetables, meat, as well as dairy products.

12. **Impressive poverty reduction, according to official statistics.** In Sri Lanka, GDP grew at an annual average of 5.5 per cent between 1992 and 2002 and 6.1 per cent between 2002 and 2012. With a GNI per capita of US$1,385 (2011), Sri Lanka has been recently classified as a middle-income country. Economic growth has contributed to the reduction of poverty prevalence: from 26.1 per cent at the national level in 1991 (29.5 per cent in rural areas) to 8.9 per cent in 2010 (9.4 per cent in rural areas). Most of this reduction has taken place since 2002. In the four districts where DZLISPP has intervened, poverty prevalence is estimated (2010) at: 14.5 per cent (Monaragala), 13.3 per cent (Badulla), 11.7 per cent (Kurunegala), and 5.7 per cent (Anhuradhapura), an impressive reduction since the time of project design.[7]

13. **Increasing inequalities and child malnutrition is still a problem.** During the above period, inequalities have initially increased (the Gini coefficient at the national level was 0.325 in 1991 and had reached 0.403 in 2007) and then slightly reduced (Gini coefficient was 0.364 in 2010). Child malnutrition prevalence (low height-for-age) has reduced although at a less impressive rate. At the national level, it declined from 31 per cent in 1987 to 19.2 per cent (still high) in 2009, with the highest prevalence in the districts of Nuwara Eliya and Badulla, 40.9 per cent and 23.9 per cent respectively.

14. **Post-conflict rebound**. The country's development was marred by a 26-year civil war, fought between the Government and the Liberation Tigers of Tamil Eelam from 1983 to 2009. A ceasefire agreement was signed in 2002 (two years before the approval of DZLISPP). However, the country slipped back into conflict in 2005 (just before project start-up): the Government resumed military operations which eventually led to the defeat of the Liberation Tigers of Tamil Eelam in 2009. In May 2010, the President of Sri Lanka Mahinda Rajapaksa established a Lessons Learnt and Reconciliation Commission.

15. The economy grew faster after the end of the conflict, also thanks to economic reforms. The business environment for the private sector has recently improved. The World Bank's ranking of Sri Lanka for the ease of doing business shifted from 96th place in 2012 to 85th in 2013 and Sri Lanka is considered as the best performer in the South Asia region in this domain.

16. **At the time of project design, agricultural strategies emphasised food security and small-scale agriculture.** When DZLISPP was designed (2003-2004), the main reference for development was the Poverty Reduction Strategy

[6] The data quoted in this section are drawn from the 2012 World Population Datasheet of the Population Reference Bureau, the World Bank Development Indicators database (retrieved in June 2013) and the 2013 UNDP Human Development Report).

[7] When the project was designed (2003-2004), the latest official statistics available were those of 2002 and reported the following poverty prevalence: Monaragala (37.2 per cent), Badulla (37.3 per cent), Kurunegala (25.4 per cent), and Anuradhapura (20.4 per cent).

of 2002. Elaborated at the time of the cease-fire, this strategy contained a reconstruction agenda to foster development and social harmony by negotiating a political settlement to the conflict and expediting development in the war-torn areas. In terms of agriculture, the main priority was to improve farm productivity, raise farm incomes, and ensure supplies of food at affordable prices. Support to small-scale agriculture was considered important for reducing poverty in rural areas.

17. **Current agricultural strategies emphasize the modernization of the sector, with a diminished interest for small-scale agriculture.** The Government has elaborated the *Mahinda Chintana Vision* for the period 2010-2016[8] establishing the following priorities for the agriculture and rural sector: (i) intensification of agricultural production (large-scale irrigation, higher quality seeds and planting material); (ii) diversification from paddy to higher value crops; (iii) support to the plantation economy; (iv) expansion of rural infrastructure (roads, electricity and telecommunications). Special emphasis is given to livestock production and dairy sector (the objective is to become fully self-sufficient in milk production by 2020).

18. The above national strategies reflect the transition of Sri Lanka to a middle-income status, with increasing demand for higher quality agricultural and dairy products as well as meat, and where the priorities gradually shift from food security to food quality and safety. Mahinda Chintana displays less interest for small-holder agriculture. Yet, as discussed in this report, support to smallholder agriculture is not necessarily at odds with agricultural sector modernization.

19. **Land tenure.** In Sri Lanka, in 1972 a land reform imposed ceilings of 50 acres of plantation land and 25 acres of paddy land for each family member above 18 years old. Within four years 563,400 acres of land were alienated and redistributed primarily to small-holders using the "Land Development Ordinance" instrument. Land was allotted on perpetual leases, based on a stipulated purpose (type of cultivation): it could not be mortgaged nor sold without government approval. In 1975 all estate lands owned by public stock companies were nationalised. The Government enacted land re-privatization programmes at the end of the 1990s.

20. Instruments such as the Land Development Ordinance have served the purpose of land redistribution but posed constraints to land re-alienation and lease that have been difficult to enforce (giving way to informal leasing and sale markets). At the same time, they have burdened agricultural land development. Other well-known land tenure issues in Sri Lanka include poor land recording (all compounded by a heavily centralised administration with the Land Commissioner's Department), with uncertain boundaries, and unclear nature of the tenure rights that landholders have over a particular parcel of land. All this generates issues of land dispute.[9] Among the consequence of the internal armed conflicts were about 300 000 internally displaced people. A resettlement process started in 2010, involving massive humanitarian operations to build shelters for returnees, facing problems of land demarcation (destroyed landmarks such as fences, trees, buildings), and mine contamination restricting access to land.

Key project information

21. IFAD's first loan for Sri Lanka, approved in April 1978, was also the first loan

[8] Overall goals of the Mahinda Chintana are: (i) doubling per capita incomes between 2009 and 2016; (ii) shifting the economy to be more knowledge-based, globally integrated and competitive, environmentally friendly, internally integrated and increasingly urban; (iii) ensuring improved living standards and social inclusion.

[9] Under the Mahinda Chintana, a new programme for digital land titling registration is planned to be completed by 2025. See also A.B.Quizon 2013. Land Governance in Asia: Understanding the debates on land tenure rights and land reforms in the Asian context. Framing the Debate Series, no.3 International Land Coalition, Rome. See also Land Watch Asia (2011). Land Ownership and the Journey to Self Determination. Sri Lanka County Paper

ever approved by IFAD. Since then, Sri Lanka received 16 loans for a total cumulated value of US$217.6 million and total project costs of US$402.0 million. DZLISPP was IFAD's eleventh loan to Sri Lanka. It was approved by the Executive Board in September 2004. It became effective in December 2005 and was completed in March 2013. The design foresaw a total cost of US$30.40 million, to be financed by IFAD (a loan of US$21.97 million, and a grant of US$0.34 for policy work on land tenure)[10], the Government of Sri Lanka (US$1.7 million) and beneficiaries (US$1.7 million).

22. Total cofinancing of US$5.5 million was also expected, of which US$1.5 million from the United Nations Development Programme (UNDP) and the remainder from the World Food Programme, the Japan Bank for International Cooperation, and the Canadian International Development Agency. While collaboration with UNDP materialized, the other organizations either financed an entirely separate programme or withdrew from cofinancing due to a shift of emphasis from financing discrete agricultural development programmes to supporting sectoral strategies and policymaking. The actual total programme cost was therefore US$27.24 million, with the reduction in cofinancing mainly affecting the community infrastructure component.

23. The project was implemented by the Ministry of Agriculture. At the time of its completion, DZLISPP was the only project implemented by this Ministry to be financed by international cooperation. Given the evolving institutional configuration in Sri Lanka, the line agencies of several other Ministries were involved in the implementation of the project as well, such as: the Ministry of Economic Development (Department of Agrarian Development), Ministry of Minor Export Crops Promotion (Department of Export Agriculture), Ministry of Livestock and Rural Community Development (Department of Animal Production and Health) and the Ministry of Land.

24. The project was managed by a National project management unit and four District programme management units, responsible for the day-to-day implementation in their districts, according to the approved annual work programme and budgets. This relatively large structure was justified by the novelty of the approaches promoted by the project as well as by the limited resources and capacity of local government extension agencies and explains the relatively high implementation costs (see below).

25. The programme targeted 80,000 households in four districts (Monaragala, Badulla, Kurunegala, Anhuradhapura) and included the following components: (i) support to rain-fed upland agricultural and livestock development through farmer field schools (10 per cent of programme costs);(ii) small-scale irrigation rehabilitation (15 per cent); (iii) marketing and enterprise development (13 per cent); (iv) microfinance and income-generating activities (12 per cent); community infrastructure development (27 per cent); and programme management (22 per cent). The World Bank supervised the programme but did not provide cofinancing.

26. In Sri Lanka, the definition of "dry zone" is below 1800mm of rain per year, of which about 70 per cent during the Maha season from September to February and about 30 per cent in the Yala season from March to June. This would be considered a favourable rainfall pattern in other parts of the world.

27. **Targeting criteria**. The project was to intervene in half of the GNDs in the four districts (i.e. 1077 Grama Nilhadari). In the choice of the Grama Nilhadari, the project would take into account a number of indicators: (i) housing conditions;

[10] The Government used the grant to commission policy work on land tenure to the Food and Agriculture Organization of the United Nations (a diagnostic survey, training and workshops for stakeholders, pilot studies on land alienation issues).

(ii) level of income per person; (iii) percentage of the population receiving Samurdhi support (a national programme for low-income households); (iv) area of arable land per person; (v) percentage of arable land area under irrigation; (vi) distance to District Secretary Division capital; (vii) female literacy rate; (viii) primary school enrolment rate.

B. Project implementation status

28. The main information sources for this section are the physical and financial project Progress Report as of March 2013 and the Project Completion Report (PCR, August 2013). The progress report contains exclusively tables of physical achievements and expenditures on 44 pages, with a wealth of information that is however not always easily understandable for outside readers (e.g. lack of units of measure and precise references). During the preparation of the impact survey, flaws in the accuracy were found in the M&E databases maintained by the four district project management units (cases of double counting, inexact representation of activities in the project sites, sometimes non-existing activities or outputs). Thus, the figures presented in this section are to be interpreted with some caution.

29. By May 2013, the IFAD loan was disbursed to the extent of 98.8 per cent, the Government contribution at 86 per cent and the beneficiaries' part at 100 per cent. The IFAD grant, which was used for the land tenure studies and related activities, stood at 67 per cent by March 2013. Back in June 2009, IFAD loan disbursement was only 23 per cent, and the Mid-term review of that date rated implementation progress as only moderately satisfactory.[11] This means that, since then, in terms financial performance, the project underwent a visible turnaround to reach the above disbursement status.

30. In March 2013, according to the progress report, the cumulative target population attended by the project was close to 122 000 households, above the 80,000 anticipated at design, again with some questions on M&E data accuracy and veracity. This figure does not include the beneficiaries of the community infrastructure development component with an additional 53,000 reported beneficiaries. However, multiple household counting across components is likely. Based on beneficiary households attended, it is fair to say that physical progress, as reported by the cited March 2013 project progress report, is commensurate with cumulative expenditures. A more detailed analysis of achievements follows in the section covering the assessment of effectiveness.

31. Land tenure policy related activities started only in 2010 and finished in the second half of 2012. It was decided that the IFAD grant of US$0.3 million would be awarded by the Ministry of Agriculture to FAO but, as explained in the aide-mémoire of the 2009 mid-term review mission, the contracting procedure required a long time. FAO sub-contracted most of the work to international consultants and a national company. Initiatives included a survey, training sessions, pilot activities, and a study tour. FAO published a report on the status of land tenure in the project districts and a policy brief (both in 2012). It organized several training sessions in the four project districts, in collaboration with the Land Ministry.[12] Pilot activities included: (i) surveying and demarcation of reservations in 20 small irrigation tanks in Kurunegala district; (ii) establishment of a Land Information Center in Monaragala district area and a land alienation scheme under four small tanks rehabilitated under the project in the same district; (iii) homestead survey and providing land titles deeds to 200 low income earning families in Badulla District. FAO also helped organize overseas study tours to study methods and techniques developed with the

[11] DZLISPP. Aide Memoire, Mid Term Implementation Support Review Mission, Colombo, September 2009.
[12] Customised training modules were prepared for Divisional Secretaries, District Land Commissioners, Assistant Land Commissioners, and Assistant Divisional Secretariats, Colonization Officers, Program Assistants, Management Assistants Grama Niladhari, community leaders of farmer's societies and the opposition leaders of the respective local authorities.

support of the Government of Australia and the World Bank. A policy workshop was held in 2012 to expose the lesson learned.

32. The above cited physical and financial project progress report as of March 2013 provides details on the component-wise IFAD and Government allocations and expenditures up to November 2012. The components with the comparatively lowest expenditures are the land tenure related activities and the marketing and micro-enterprise promotion. As Table 1 implies, the expenditures for the former remained below allocations, arguably because of its complicated set-up. In the case of the marketing and microenterprise promotion component, the originally foreseen forward sales contracts negotiations carried out by selected service providers did not substantiate into tangible marketing arrangements. The remaining components display satisfactory allocation-expenditure patterns.

Table 1
Component-wise fund allocations and expenditures

		Cumulative allocations and expenditures. up to November 2012 (Rupees million)		
No	**Component**	Allocation	Expenditure	%
1	Upland agriculture	380	359	94%
2	Irrigation	488	453	93%
3	Community infrastructure	740	716	97%
4	Microfinance	275	274	97%
5	Marketing and microenterprise.	320	231	72%
6	Project management	686	604	88%
7	Land tenure	42	28	66%
	Total	**2,891**	**2,665**	**92%**

Source: DZLISPP, Physical and financial project progress, March 2013

C. Project performance

Relevance of the objectives

33. The first question to examine is whether the design of DZLISPP was pro-poor. The choice of the 1,077 Grama Nilhadari Divisions (GNDs) where the project was to intervene (according to the M&E data, the project actually intervened in 1,648 GNDs) was made using poverty-relevant criteria. Observations from the qualitative and quantitative survey confirm that the project gave priority to disadvantaged communities (see under "impact"). On the other hand, findings from the qualitative survey suggest that parts of the project area belong to an "intermediate zone" rather than to the dry zone proper and benefit from higher rainfall.[13]

34. **Coherence with the 2002 country strategy and gradual adaptation to a changing country context.** Project design was coherent with country policies and IFAD strategies. Sri Lanka's 2002 Poverty Reduction Strategy included infrastructure building and improving market linkages for poor rural populations. In IFAD's 2003 COSOP, the dry zone of the country was the first priority. The evaluation noted the project's adaptation capacity. Originally meant as a project for subsistence agriculture and food security, DZLISPP continued to support paddy production but gradually aligned itself to changes in the country context, i.e. the transition: (i) from

[13] e.g. large portions of the Badulla District, the District Secretary Divisions to the south of Kurunagala District and the District Secretary Divisions of Madulla in Monaragala District.

low to middle income; (ii) from cease-fire to conflict (after 2005) and finally (after 2009) to post-conflict. Indeed, the project added initiatives related to:[14]

- Higher-value crops and livestock products;
- Linkages to processing and marketing channels within existing value chains (e.g. milk, fruits and vegetables) by reducing transaction costs; and
- Facilitating farmer organizations' access to the state-led multiplication system of certified seeds, which allowed value addition by poor households.

35. The qualitative field survey study findings confirm this assessment. Initially, the project's design was strongly skewed in favour of boosting production (input-orientated, training and infrastructure development). At a later stage (2010-2012) the project made an effort to emphasise marketing and boosted support to dairy farming which was not initially contemplated as a major focus area. At present, government departments are increasingly focusing on post-harvest assistance, value chain development and value addition, expanding markets and developing market linkages.

36. **Generally sound design with some weaker points.** In general terms, the component mix as designed was adequate. It made sense to include both irrigated and upland agriculture and to include livestock, especially dairy, into the latter. The adopted extension approaches, the Farmer Field Schools (FFS) favour direct testing and innovation.[15] The project adapted them with equipment funding, the set-up of revolving funds, the creation of FFS societies and federations. Given the prevailing poverty levels at appraisal, the inclusion of a community infrastructure development component was pertinent.

37. Some components were less well designed, for instance:

    a. In the marketing and enterprise development component, the project expected to set up a system of forward sale contracts as a tool to reduce risks related to the volatility of prices. This was a difficult task and the service providers selected for this task were companies devoid of previous experience and of the "right" connections to private processors/buyers and their performance was dismal. Through a turn-around decision, the project opted to facilitate the set-up of vegetables and fruits collection centres operated by private companies (e.g. Cargills). This proved to be a simpler and safer path to agricultural produce marketing.

    b. The microfinance and income-generating component was based on subsidised interest rates. This is not enticing for participating banks and often not necessary (e.g. there are good returns from dairy farming to make commercial rates viable[16]) and created problems of credit rationing. This was also not in line with the IFAD Rural Finance Policy of 2000.

38. As in many IFAD logframes formulated in the first years of the last decennium, the results chain, especially at purpose and goal level, lacked clarity and sustenance by

[14] This shift occurred without an explicit reorientation provided by the MTR but was rather an expression of a fresh look at opportunities by a new project management team after the MTR.

[15] Farmer Field School, first tested in Indonesia for integrated pest management in the 1980s emphasises "horizontal information and learning exchanges" between farmers, facilitated by extension workers in a colloquial and collegial setting. The farmers play an active role in initiating discussion and action, thereby ensuring that their priority issues will be addressed. After discussing indigenous agricultural practices and identifying what works and what does not, they engage in practical demonstrations. Constraints and opportunities are identified by the FFS members themselves, becoming a platform for practical hands-on learning. While widespread, the FFS model also received critiques, probably because results are context-specific. See K. Davis et al (2010), Impact of Farmers Field School on Agricultural Productivity and Poverty in East Africa. IFPRI. Feder, G, Murgai, R and Quizon, J.B. 2004. *Review of Agricultural Economics*, 26(1), 45-62.

[16] For the Baghya loan category, unsubsidised monthly interest rates have been estimated in a range of LKR 375 to 1 500 LKR for selected activities ranging from handicraft to dairy farming, against reported monthly net revenues of 2,000 to 4,000 LKR excluding the payment of interests.

pertinent indicators. Poverty, income and asset indicators appear on both levels, and out of the 51 indicators, only three had some form of magnitude, but none was time-bound. As such, the logframe was an un-prioritized list of indicators to be measured by the project rather than a helpful guidance for project monitoring and evaluation. Despite these flaws, project design was flexible enough to operate the observed shift to serve existing and emerging value chains.

39. Weighing the overwhelmingly positive factors against some odds in the design of the project, relevance is rated as satisfactory.

Effectiveness

40. **Impressive outreach of farmers' field schools, although quality was not always at par with quantity**. Can the general objective (purpose) be considered achieved, i.e. "to put in place a mechanism to mobilize resources and services sustainably to increase production and add value to produce in the dry zones"? Despite the observed accuracy issues of M&E data, the answer can be in the affirmative. DZLISPP recorded a substantial outreach, of 120,000 households or above compared to the 80,000 households target at appraisal (although the already noted caveat on data accuracy applies). Out of a target of 2,800 Farmer Field Schools, 2,535 are reported to have been set up.

41. In promoting the farmer field school approach, the project was to operate through the Agricultural Instructors of the Agrarian Service Department (later the Department of Agriculture) who would receive training in FFS and implement the approach. The limited resources and capacity of the line agencies were a serious constraint to project implementation in the first three years. The turn-around decision by the project management was to recruit agriculture diploma holders, as technical assistants for field-level project extension activities, paid for through the project's budget.

42. In quantitative terms, results were impressive but qualifications can be made on the quality of work and present status of operation of these FFS. A HARTI study, based on a random sample, warns that only about 50 per cent of the crop FFS have an operational status of moderately satisfactory and above and three quarters have low perspective of continuation after project closure. It can also be questioned whether societies of 20 members or less can be viable with limited external support. On the other hand, the formation of divisional and district FFS federations, which the project has undertaken, may add some stability to these organisations.

43. The FFS model chosen by DZLISPP presents four main modifications to the prototype model, namely: (i) the FFS society, (ii) the program facilitator, (iii) the revolving fund; (iv) technology transfer. Some concepts of the prototype FFS model have been omitted: common field and curriculum. Findings from the available documentation and the field observations of this evaluation's mission suggest that the project was innovative in implementing the FFS activities but further coaching and follow-up support would be required to maintain focus and momentum, given the still fragile operational status of half of the FFS. The HARTI study praises the emphasis of FFS in building upon farmers' experience and skills (less weight on lecture and more on farmers' initiatives) but critiques the omission of the curriculum component arguing that some element of standard training is necessary even in a participatory environment.

44. More concretely, did DZLISPP set up mechanisms to increase production and add value to produce in the dry zones? To answer this question, the five immediate objectives will be reviewed.[17] The first immediate objective reads: *Rain-fed upland farm* productivity *increased and integrated with livestock production systems.* As the

[17] IFAD. Report and Recommendation of the President to the Executive Board on Proposed Financial Assistance to the Democratic Socialist Republic of Sri Lanka for the Dry Zone Livelihood Support and Partnership Programme, Rome, September 2004.

preceding paragraph infers, most of the quantitative and qualitative achievements under this immediate objective have been generated through FFS. The project documentation, based reportedly on a sample of 12 000 farmers, claims the results presented in Table 2.[18]

Table 2
Most common crops and average yield increases

Anuradhapura District	**Maize**	**Onion**	**Pulses w/o cowpeas**	**Seed paddy**	**Cowpeas**
Number of farmers	3,591	2,229	1,635	625	527
Average yield increase %	26%	35%	15%	26%	10%
Kurunegala District	**Maize**	**Onion**	**Pulses w/o cowpeas**	**Seed paddy**	**Cowpeas**
Number of farmers	773	149	250	304	250
Average yield increase %	36%	80%	44%	20%	44%
Badulla District	**Maize**	**Onion**	**Pulses w/o cowpeas**	**Seed paddy**	**Cowpeas**
Number of farmers	1,366				
Average yield increase %	30%				
Monaragala District	**Maize**	**Onion**	**Pulses w/o cowpeas**	**Seed paddy**	**Cowpeas**
Number of farmers	6,094	757	1041	883	
Average yield increase %	22%	22%	10%	13%	
All districts	**Maize**	**Onion**	**Pulses w/o cowpeas**	**Seed paddy**	**Cowpeas**
Number of farmers	**11,824**	**3,135**	**2,926**	**1,812**	**777**
Per farmer weighted average yield increase %	**25%**	**34%**	**16%**	**19%**	**21%**

Source: DZLISPP, Physical and financial project progress, March 2013

45. Again, these figures are impressive. However, there are important caveats to the above data: (i) it is not known precisely in which lapse of time this has been achieved; (ii) it is not clear whether data have been obtained from a representative sample; (iii) there is no comparison with households or sites without project (attribution to the project is an open question). While some examples of yield increase of this type have been documented and observed during the evaluation field visits, it is not obvious whether they can be generalised to the number of farmers quoted in Table 2. In fact, the impact survey invites treating the above data with caution.

46. Regarding livestock development, initially not a major area of emphasis, DZLISPP succeeded in integrating livestock production systems into dry land farming. The cited project status report indicates that, cumulatively, 10,300 dairy farming households have been supported via 634 Dairy Farmers Field Schools. As observed in the HARTI study on dairy production, there was a decrease in the total number of cattle owned by farmers but an increase in the productive cattle units (cows and heifers for milk production), confirmed by this evaluation's survey. So the project contributed to the beginning of a rationalisation of cattle management, where cattle is valued less as status symbol and more for its productivity, although much remains to be done.[19] The single most important measure in this context was to build milk collection centres in the project area and to encourage public and private milk collecting firms to install milk coolers and to establish a daily milk collection routine. Milk price is in the range of 50 LKR/litre in Sri Lanka (high demand for dairy products

[18] In Badulla District where there are four other main crops reported (ginger, potato seed, banana and chilies), the increases are all between 23 and 45 per cent, thus in comparable ranges for a total of 7 000 additional farmers.
[19] HARTI reports household milk production increase of 32 per cent: HARTI. DZLISPP, Impact of Dairy Development Programme, Paper 05, Colombo, 2012.

in a middle income-country). Such levels are in the range of farm gate milk prices in the European Union.

47. The second immediate objective of DLZSPP states that *irrigation infrastructure is rehabilitated and operated.* A total of 708 schemes were rehabilitated (373 tanks and 334 small water conveyance systems; so-called anicuts). Close to 7,900 ha of irrigated land were rehabilitated (against a target 6,600 ha) of which 3,362 ha are incremental area. This corresponds with the additionally irrigated areas in the main and secondary seasons (Maha and Yala, respectively) plus a third irrigation season on 332 ha, which applies only to Badulla District. In total, the irrigation development component benefitted 17,250 households.

48. A dedicated HARTI study[20] in relation with the small-scale irrigation component confirms that the **irrigation rehabilitation** works undertaken in all the selected schemes are overall **good in quality** from an engineering point of view. However, **water user associations** in the majority of the areas are **relatively weak** and as per the indicators developed by the study. Thus, the longevity of the rehabilitations may be at stake.

49. The third immediate objective of DZLISPP focused on *expanded marketing opportunities and micro-enterprises developed*. At design, it was planned to implement two instruments to add value to produce: forward sales contracts and inventory credit schemes. As explained, the planned forward sales contracts to be negotiated by selected service providers was not a successful attempt because the providers did not have the required insight into the existing agricultural produce marketing channels. The inventory credit schemes did not substantiate either.

50. Instead, the project opted for **establishing interfaces between buyers and producers** in concert with private firms, e.g. Cargills, Nestle and Milco, which got access to produce in 791 collecting or processing centres (with cofinancing from the project and from private companies). The case of two major vegetable collection centres in Monaragala and Badulla Districts is well documented.[21] Both centres serve several hundred vegetable producers each. On average, the producer prices paid by Cargills are substantially higher than reference prices in nearby markets, in the range of 25 per cent. In most cases, the producers are paid the same day or within a few days. What the surveyed farmers also appreciate is the reduction of transport distances and the availability to receive advice for production techniques and post-harvest handling of the produce.

51. The Micro-finance and micro-enterprise development component targets the following: *micro-finance services expanded and income generating activities undertaken with profit*. It has raised great expectations with subsidised interest rates under two different schemes. The Bhagya scheme was implemented with the involvement of state and regional banks in the area and with supervision and provision of refinance facilities by the Central Bank of Sri Lanka. The Bhagya scheme provided 4,651 loans at 10 per cent per annum interest rate and displayed an average recovery record of around 90 per cent.[22]

52. The second scheme, Apeksha, was pre-existing and operated by the Women's Bureau (WB). DZLISPP simply opted in under the micro-finance and micro-enterprise component. Under Apeksha, 2,714 loans have been issued in total at 6 per cent annual interest rate. More than 8,000 women are on the waiting list in Monaragala District alone where 887 women have been served too date. Both schemes have

[20] HARTI, M.M.M. Aheeyar and M.A.C.S. Bandara. Impact of Small Scale Irrigation Rehabilitation and Water Management under Dry Zone Livelihood Support and Partnership Programme (DZLISPP), Colombo, August 2013
[21] HARTI, R.P. Vidanapathirana and W.H.D. Priyadarshana. Vegetable Collection Centres in Badulla and Moneragala Districts: Impacts & Lessons, Colombo, September 2012.
[22] HARTI, J.K.M.D. Chandrasiri and R.L.N. Jayatissa. Impacts and Lessons of Microfinance Component of the Dry Zone Livelihood Support and Partnership Programme, Colombo, October 2012

been less effective than the land-based components, foremost because of their low respective coverage.

53. The fifth component of DZLISPP pursued the immediate objective of *realising priority community infrastructure and assuring use to effect.* The inclusion of such a component was relevant, because the GNDs selected by the project were in relatively secluded areas. An additional argument is the difficult topography in some project area, especially in Badulla District. Even short, but safe, road communications are important for a village community (e.g. access to school, markets).[23] In total, the project facilitated the construction of about 740 km of such access roads, 120 community buildings and 113 drinking water supply schemes. Besides providing access for the marketing of produce, roads and drinking water supplies are likely to have an incidence on health and education.

54. Taking into account the achievements and the qualification made on the accuracy of figures and quality of selected interventions, DZLISPP has shown a satisfactory level of effectiveness in achieving its main objectives. This evaluation has identified sustainability issues[24] but treats them in a dedicated section in the remainder of the report.

Efficiency

55. **Project management efficiency.** As in many IFAD supported projects, implementation was sluggish during the first three years, with a 23 per cent IFAD disbursement rate after 43 months.[25] As noted, this delay was largely made up until March 2013, the original project completion date. This is an indication of the capacity of project management to operate a successful turnaround as well as of the contribution of the mid-term review to improving implementation performance. The part of project management cost was 22 per cent at appraisal, and remained at that level over project life. This proportion is high but observed also in other IFAD funded projects attending a relatively scattered target population.[26] This cost proportion responded to the need to reinforce local support teams, anticipating that the existing line agencies may not have had sufficient resources and experience.

56. **Efficiency of activities and results.** The PCR calculates economic internal rates of return for the main project components (upland agriculture 23.9 per cent, irrigation infrastructure 16.5 per cent, community infrastructure development 17.0 per cent and micro finance and enterprise development 23.3 per cent) and computes an aggregated internal rate of return of 19.6 per cent, compared to 17.4 per cent at appraisal. This is a high value although the calculation relies on project M&E data on number of beneficiaries and yields which are to be taken with caution.

57. A HARTI study on irrigation also attempts the calculation of economic internal rates of return based on a sample of 35 rehabilitated schemes. It finds that 25 schemes have positive rates of return (with district averages ranging from 18 to 79 per cent), while ten have negative or undetermined returns. However, a rapid inspection of cash flow assumptions used to calculate rates of return suggests that maintenance costs have been seriously under-estimated or ignored.

58. Other project documents present estimates of very high returns on specific crops (e.g. estimates of incremental profits of 150 per cent or more for seed potato or big onions against the pre-project baseline). This evaluation notes that many crops and

[23] According to the president of the road maintenance committee in a village visited by this evaluation's mission, the children were unable to go to school on heavy monsoon days because the footpath was too dangerous before the project. DZLISPP invested LKR 700 000 for 45 families, with a village contribution of KLR 100 000.
[24] The original definition of the overall project objectives contained the adverb "sustainably" (see at the beginning of the effectiveness section). However, IFAD evaluation methodology considers sustainability as a separate criterion.
[25] DZLISPP. Aide Memoire, Mid Term Implementation Support Review Mission, Colombo, September 2009
[26] IFAD. Eastern Republic of Uruguay, Uruguay Rural Project Performance Assessment, Rome, 2013. See also IFAD. Republic of Nicaragua, Programme for the Economic Development of the Dry Region in Nicaragua, Project Completion Report Validation (PCRV), Rome, 2012.

activities have potential for high return. However, impact survey findings suggest that potential has translated into reality only to a limited extent and that adoption rates have been progressing at a slower pace compared to M&E data. With the project's completion in March 2013, it is unlikely that the pace will increase.

59. This evaluation also notes that subsidised credit (Bhaghya loans and Apeksha scheme) is not an efficient use of resources. It leads to credit rationing for activities that are profitable (e.g. dairy farming).

60. Finally, a consideration for the future: from a strategic perspective, projects like DZLISPP are seminal interventions and require systematic follow up to ensure that new techniques and practices are adopted by a relatively large number of beneficiaries. It would be very inefficient not to finance a second project phase. It would amount to wasting experience, human capital (e.g. dynamic project teams), know-how, and risking a reduction in the future stream of benefits (see also the section of sustainability).

61. In sum, given quality issues with M&E data, and some disconnects with the observations made by the impact survey, it is appropriate to assess efficiency in the "positive zone" but as moderately satisfactory.

D. Rural poverty impact

Methodological issues

62. The present section seeks to **triangulate evidence from different sources**, including secondary ones (project M&E data, PCR, HARTI studies), as well as primary data from the qualitative and quantitative survey conducted in April-June 2013, and field observations made during the May 2013 mission. One of the fundamental constraints to this evaluation is the absence of a baseline dataset (as in many other IFAD projects). The project conducted a baseline survey in 2006, including both project and comparison households. Quite surprisingly, the electronic dataset has been lost and this may have happened at the time of the change in the project management team (2008-2009).

63. Project secondary sources as well as existing administrative statistics provide interesting information on the project area context but not of the type, quality and disaggregation that would be suitable for an impact assessment. For this reason, the quantitative component of the survey adopted two strategies. On one hand it attempted to reconstruct selected baseline information through recall methods.[27] While there are threats to recall methods, a mitigation path was to limit recall to items that could be more easily remembered (e.g. the presence of certain physical assets in the house or farm).[28] Moreover, the time of the project start-up (2005) coincided with the time of the resumption of conflicts in the country, so that it was possible to anchor the recall to known events.

64. **Quasi-experimental design approach**. On the other hand, and more importantly, the quantitative survey adopted "propensity score matching", an analytical technique that does not strictly require baseline data.[29] Propensity score matching

[27] Recall methods consist of asking questions about the past, for example whether a household owned certain agricultural implements five years before the interview. Typical problems with recall methods include telescoping" (i.e. projecting an event backwards or forwards in time from when it actually occurred).

[28] Challenges of recall methods include: (i) incorrect recollection and (ii) telescoping, i.e. projecting an event backward or forward. For example, the purchase of a durable good which took place seven years ago (before the project started) might be projected to a point in time just four years ago, during project implementation. It is often useful to anchor the recall method to major events that took place in a community.

[29] Propensity score matching is a statistical procedure that mimics random assignment. Given a treatment and a comparison group, the procedure works in two steps. First, it calculates for all units (both in treatment and comparison groups) the probability to receive the treatment (based on a set of observable characteristics that are unlikely to be affected by the treatment). Second, it compares outcome indicators between treatment and comparison units that have a very close propensity score. This ensures that differences in outcome indicators are assessed on a sub-group of units that are comparable according to a set of observable characteristics. According to the available literature, one of the recognized advantages of this procedure is its adoptability when baseline data are not available. An obvious limitation is

can be used to pair a subset of households with and without project intervention according to a set of observable characteristics that are not likely to have been affected by the project.[30] This is particularly important at IFAD where projects focus on disadvantaged regions and communities and sometimes disadvantages groups or categories within those communities. Controlling for targeting bias is a major challenge. While propensity score matching is widely used, this technique also has limitations. The most obvious one is that the pairing of households with and without project can only be done based on "observable" characteristics. If households with and without project differ on other essential characteristics that are not captured by the survey or the statistical model, then the results may still be biased.

65. To test the consistency and robustness of results, the evaluation also applied an alternative technique: the "treatment effect model", a derivative of the Heckman sample selection technique. The treatment effect model is useful in producing improved estimates when data were generated by a non-randomized experiment, and thus selection bias is non-ignorable. [31]

66. As presented in Table 3, the quantitative survey covered 2,567 households, of which 1,302 in Grama Nilhadaris Divisions (GNDs) covered by the project (general treatment households) and 1,265 in comparison GNDs. This involved 160 GNDs, through a multi-stage cluster random sampling. Within treatment GNDs, the survey further distinguished between direct beneficiaries households and other households that did not receive project interventions (they might be considered as indirect beneficiaries). In addition, based on the number of intervention packages received, the survey established a sub-sample of high-intensity of interventions (six or more). Further information on the sampling strategy is in the annexes.

Table 3
Numbers of Treatment and Comparison Households Surveyed

District	*Total Number of Households Surveyed*	*Num. comparison hh*	*Number General Treatment hh*	*Num. Direct Beneficiaries hh (%)*	*Num. hh with Intense Treatment (%)*
Anuradhapura	1029	509	520	278 (53.5%)	32 (6.2%)
Kurunegala	514	259	255	177 (69.4%)	32 (12.6%)
Badulla	767	368	399	273 (68.4%t)	160 (40.1%)
Monaragala	257	129	128	106 (82.81%)	113 (88.3%)
Sum	**2567**	**1265**	**1302**	**834 (64.1%)**	**337 (25.9%)**

Source: IOE Impact Survey 2013

67. The quantitative analysis has been conducted according to four analytical paths by comparing: (i) households in treatment (i.e. with project) communities against household in non-treatment (i.e. without project) communities; (ii) direct

that matching can only be done on "observable" characteristics but not on other characteristics. For an introductory discussion to this method, see Gertler et al. (2011), *Impact Evaluation in Practice*, The World Bank, Washington DC. For a more advanced treatment see the classical article by Rosenbaum P., Rubin D. (1983), "The Central Role of the Propensity Score in Observational Studies for Causal Effects", *Biometrika*, 70, pp. 41-50.

[30] For examples of applications by IFIs, see Asian Development Bank Impact Evaluation of the Community Groundwater Irrigation Sector Project in Nepal; Impact of Rural Water Supply and Sanitation in Punjab, Pakistan; Impact of the Asian Development Bank's Assistance for Low-Income Housing Finance in Sri Lanka; Impact of Microfinance on Rural Households in The Philippines.

[31] The Heckman sample selection also works in two steps. The first step, similar to propensity score matching, consists in estimating the conditional probability of participation. In the second step, the conditional probability of participation is inserted in a regression equation, together with other variables (it requires a specific functional form), see Guo and Fraser 2009. The "correct" functional form is rarely known but sensitivity analysis can help compare different functional forms.

beneficiaries against households in non-treatment communities; (iii) households in high intensity treatment communities against households in non-treatment communities; and (iv) direct beneficiaries households against non-beneficiary households within the same treatment community (Table 4).

Table 4
Different types of treatment in the quantitative survey

Treatment Type	*Treatment Population*	*Number in Treatment*	*Comparison Population*	*Number in Comparison*
A. General Treatment	Households in communities where there was an intervention.	1,302	Households in communities with no intervention (comparison).	1,265
B. Direct Treatment	Households that directly participated (Direct Beneficiaries).	856	Households in communities with no intervention (comparison).	1,245
C. Intense Treatment	Households in communities that receive between seven and twelve interventions.	337	Households in communities with no intervention (comparison).	1265
D. Direct versus Indirect Beneficiaries	Households that directly participated (Direct Beneficiaries).	856	Non-beneficiary households in direct treatment communities (indirect beneficiaries).	446

Source: IOE Survey 2013

68. In addition, as a further means of validation and in order to cover less standardizable aspects (e.g., human and social capital, gender equality, policy issues), IOE conducted a qualitative survey including 30 key informant interviews with project staff, relevant government officers[32] and 41 focus group discussions with beneficiaries in the four project district (Table 5). Selection of the sites was done randomly in each district, taking into account the need to represent different project components. Finally, IOE conducted a validation mission that included field visits in late May 2013.

Table 5
Number of key informant interviews and focus group discussions undertaken in the context of the qualitative survey

District	*Key Informant Interviews*	*Community focus group discussions (one per Grama Nilhadari Division)*
Anuradhapura	4	17
Kurunagala	9	9
Badulla	7	11
Monaragala	10	4
Sum	**30**	**41**

Source: IOE Impact Survey 2013

69. There were several challenges to the conduct of the survey. First, as already noted, the multi-component nature of the project complicates the result chain. In fact, the real problem was not just the number of component but the high diversity and scattering of interventions within certain components (notably for FFS) and it was very difficult to establish a group of core intervention packages that would yield a sufficient number of observations for the quantitative survey. While creating dedicated modules in the survey for sub-component was contemplated, this proved impractical during the questionnaire pre-testing. Triangulating with other sources

[32] *e.g.,* Department of Agriculture, Department of Agrarian Development, Department of Animal Health and Production and the Women's Bureau.

(qualitative survey, thematic studies, direct field observations) proved to be more informative. Second, there were several imprecisions in the project household lists which required accurate work at the field data collection level.

70. There is thus a relatively wide corpus of evidence on DZLISPP. It should be noted, however, that there are inconsistencies between findings from difference sources. Several secondary sources (notably, project M&E data, reflected in the PCR) are not based on random sampling techniques nor do they compare with households or communities without project. This poses the threats of: (i) representativeness of data; and (ii) attribution of results to the project. The second point is crucial in Sri Lanka, a country that has experienced high economic growth and poverty prevalence reduction in the past decade. Observed changes may well depend on the project activities but may also be related to the burgeoning economy of Sri Lanka.

Targeting

71. **The project targeted communities that had lower access to basic infrastructure.** As explained in the introductory section, the project was supposed to target GNDs according to a list of criteria. During the evaluation interviews, project district staff explained that they selected communities that were more geographically secluded and disadvantaged in terms of social services. Data from the quantitative survey support these claims and suggest that treatment communities had lower access to basic infrastructure. It is important to note that the survey focused on infrastructure not built by the project and that was in place before the project start-up.[33]

72. As a first step in propensity score matching, the analysis considered community factors affecting the probability of being served by the project. It was found that communities that are further away from their DSD capital were more likely to be served by the project.[34] Finally, communities with less access to basic infrastructure before the project start-up (calculated through a principal-component based index)[35] were more likely to receive project assistance (Table 6).

73. **Within the selected communities, the project tended to target households that owned fewer assets but had more diversified cropping patterns, and slightly higher educational status.** Project field staff explained that, within the selected communities, households were selected (and sometimes self-selected) based on both their needs and their interest in specific training / extension schemes and their belonging to informal village groups. Interviews with district project staff yielded similar responses.

74. According to our modelling (Table 6), households covered by the project grew more crops than comparison households but had a weaker asset base (an index has been established through principal component analysis)[36] and these differences are statistically significant.[37] Other significant characteristics pertain to household education (positively correlated to project participation) and household head age (significantly and weakly negatively correlated to project participation). In the case of the comparison between treatment and non-treatment households with the same

[33] As an example, 58.8 per cent of the GNDs with project (treatment) had a primary school building, 37.1 per cent a secondary school building, 7.4 per cent a policy post and 7.4 per cent a community market, compared to 72.2 per cent, 53.2 per cent, 19.2 per cent and 17.9 per cent in GNDs without project (comparison) respectively.

[34] It was also found that communities that are closer to the District capital were more likely to be served by the project, although this is less intuitive to explain.

[35] Principal component analysis is a technique to convert a set of correlated variables into a smaller set of non-correlated ones.

[36] Household surveys often include estimates of expenditures as more reliable than estimates of income, under the assumption that respondents find it less sensitive to answer questions on expenditures rather than sources and amounts of revenues and that responses would be more precise and reliable.

[37] More disaggregated analysis has shown similar results. Interestingly, direct beneficiaries within treatment communities and intense treatment households appear to have wider disadvantages in household asset index (for example, television, electric fan, refrigerator, gas cooker).

GND (last column of Table 6), the above observations on assets and education still hold. In addition, the number of children under age five appears to (negatively) affect the likelihood of participating in the project, probably reflecting time constraints of household members (and possibly a negative correlation between educational status and number of children).

Table 6
Probit Estimates for Participation in the Program

Characteristics	*General Treatment*	*Direct Beneficiaries*	*Intense Treatment*	*Direct vs. Indirect Treatment*
Distance to DSD Capital	0.279***	0.406***	0.624***	
	(0.074)	(0.079)	(0.101)	
Distance to the District capital	-0.171***	-0.183***	-0.388***	
	(0.039)	(0.044)	(0.061)	
2006 Community Infrastructure Index	-0.080***	-0.052***	-0.029	
	(0.016)	(0.018)	(0.024)	
Household Head Age	-0.007***	-0.006***	-0.007***	0.007**
	(0.002)	(0.002)	(0.003)	(0.003)
Household Head Sex	0.033	-0.032	-0.157	-0.181
	(0.090)	(0.104)	(0.142)	(0.130)
Household Highest Education	0.075***	0.064**	0.025	
	(0.029)	(0.032)	(0.041)	
2006 Asset Index	-0.040***	-0.044***	-0.069***	-0.042**
	(0.014)	(0.016)	(0.022)	(0.021)
2006 Total Crops	0.301***	0.326***	0.303***	0.053
	(0.027)	(0.031)	(0.040)	(0.035)
2006 Livestock Index	0.031	0.036	-0.038	0.032
	(0.023)	(0.025)	(0.043)	(0.031)
Number of Children under Age 5				-0.151**
				(0.074)
Household Head Education				0.135***
				(0.038)
Constant	0.039	-0.309	-0.398	-0.183
	(0.193)	(0.216)	(0.284)	(0.257)
Observations	2,550	2,108	1,592	1,291
Pseudo R-square	0.0616	0.0674	0.0820	0.0156

Note: Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Impact

Impact on human and social capital and empowerment

75. As agricultural-related project activities were the mainstay of the project, one of the key project interventions was the support to the diffusion of new crops (notably higher-value crops), improved techniques and skills. As already noted, extension and training was provided through the FFS approach. Table 7 presents a first indication of participation rates in training programmes and some form of feedback on

respondent's perception of their own skills in crop and soil management. Data in the table are those from statistical analysis after propensity score matching.

76. As expected, households in the treatment groups were both more likely than comparison households to participate in agricultural training and in a larger average number of training programmes. This is confirmed for the four analytical blocks. It is to be noted that comparison households also appear to participate in some sorts of training programmes, probably conducted by the provincial or district departments with their own funding or by NGOs (reportedly, no other internationally funded programme of the type of DZLISPP was active in the evaluated period in the concerned districts). The proportion of households reporting a member's participation in a training activity hovers around half in the intensive and direct treatment group which may seem a relatively modest percentage. This might either indicate that either some DZLISPP interventions did not involve training or some activities were not perceived as training (the FFS approach focuses on participatory activity and minimises the "lecture" framing).

77. The survey included questions on the degree of satisfaction with knowledge and skills in soil and crop management, a rather crude indicator. Scores are clustered at the "middle point" (neutral) for both treatment and comparison groups, with a significant and positive difference only for intensive treatment. Interestingly, one of the secondary sources, a thematic study conducted by HARTI showed that 46 per cent of households considered knowledge received through training as adequate. On the other hand, satisfaction is subjective and context-specific. From secondary data and qualitative survey, more information is available on specific areas.

Table 7
Agricultural Training Participation by Treatment Level – Propensity score matching

General Treatment				**Direct Beneficiaries**			
Matching	*Treatment Mean*	*Comparison Mean*	*T-stat of difference*	*Matching*	*Treatment Mean*	*Comparison Mean*	*T-stat of difference*
Have any household members participated in any agriculture trainings since 2006? ? 0=No; 1= Yes							
Unmatched	0.471	0.305	8.71***	Unmatched	0.517	0.305	9.99***
Matched	0.471 (1279)	0.363 (1238)	5.28***	Matched	0.517 (845)	0.371 (1238)	6.32***
How many training programs?							
Unmatched	1.530	0.848	7.93***	Unmatched	1.681	0.848	8.70***
Matched	1.530 (1265)	1.032 (1241)	5.47***	Matched	1.681 (842)	1.060 (1241)	5.81***
What is your level of satisfaction with your knowledge and skills in relation to soil and crop management? (1 = unsatisfied, 2 = neutral, 3 = satisfied)							
Unmatched	2.096	2.078	0.58	Unmatched	1.854	1.892	-0.94
Matched	2.096 (999)	2.083 (682)	0.39	Matched	1.854 (677)	1.856 (678)	-0.05

Table 7 - continued

Agricultural Training Participation by Treatment Level – Propensity score matching

Intense Treatment				Direct versus Indirect Treatment			
Matching	*Treatment Mean*	*Comparison Mean*	*T-stat of difference*	*Matching*	*Treatment Mean*	*Comparison Mean*	*T-stat of difference*
Have any household members participated in any agriculture trainings since 2006?							
Unmatched	0.488	0.305	6.34***	Unmatched	0.517	0.383	4.57***
Matched	0.488 (334)	0.354 (1238)	4.23***	Matched	0.517 (845)	0.407 (433)	3.70***
How many training programs?							
Unmatched	1.707	0.848	6.76***	Unmatched	1.681	1.235	3.09***
Matched	1.707 (334)	0.999 (1241)	4.33***	Matched	1.681 (842)	1.328 (422)	2.51**
What is your level of satisfaction with your knowledge and skills in relation to soil and crop management? (1 = unsatisfied, 2 = neutral, 3 = satisfied)							
Unmatched	2.154	2.078	1.66*	Unmatched	2.111	2.064	1.10
Matched	2.154 (259)	2.083 (682)	1.51	Matched	2.111 (685)	2.075 (314)	0.83

Number of observations in parentheses
Note: Level of significance: *** p<0.01, ** p<0.05, * p<0.1
Average Treatment Effect on the Treated - Kernel matching[38]
Source: IOE Impact Survey 2013

78. **Exposure to new techniques, crops, enhanced confidence vis-à-vis public agencies, private operators and banks.** Project documentation and the Progress Completion Report find that DZLISPP beneficiaries acquired or strengthened technical knowledge and skills and improved their self-esteem and this was observed for both men and women. These findings are confirmed through the focus group interviews conducted within the qualitative survey.[39] According to the latter, in the area of crop cultivation, extension (mainly through FFS) focused on the use of fertilizers and pesticides, introduction to new crop varieties such as turmeric and ginger, post-harvest processing for cinnamon, and fruit trees (e.g. mango, papaya) and many others. In a few instances, more advanced technology was introduced through the Department of Agriculture, such as seed production for B-onions and hydroponics for potato tuber production (Badulla district).

79. In paddy cultivation, the extent of knowledge improvement was minor as farmers were already well experienced. Instead the (re-)introduction of the role of "caretakers" (*Jalapalaka*) in the water users' associations for small minor irrigations tanks, and the training of these individuals in tank maintenance and water management aimed at diffusing good water management practices.

80. Regarding dairy production, according to the qualitative survey, the main project's contribution was to promote basic knowledge on cattle sheds to keep cattle cool and clean, varieties and selection of dairy cows, cattle nutrition (including types of feeds, feeding regimes, and micro-nutrients), good practices in milking cows (to improve fat content of milk, fetching better prices), prevention of diseases (such as mastitis) and vaccinations; reproduction and fertility, including artificial insemination.

81. Within the Bhagya loan programme, beneficiaries received basic notions on financial management and banking. More importantly, field observations point to increased confidence levels of beneficiaries in engaging with banks (previously seen with suspicion). In the case of Apeksha loans, the DZLISPP intervention was an add-on to an existing government programme and it consisted of providing financing for revolving funds without specific incremental training elements.

[38] For easiness of presentation, this report only shows results of propensity score matching (average treatment effect on the treated). Among the several matching algorithms, the kernel matching has been used but sensitivity of results has been tested through other methods such as nearest neighbour, caliper, stratification matching, obtaining consistent results.

[39] The results of focus group discussions have been coded according to: impact domain, project component, district and village. This has generated over 95 pages of interview summaries which is briefly summarised in this report.

82. **High diversification and scattering of activities.** Two qualifications need to be made to the significant results reported. First, the qualitative survey showed that the extension activities were highly diversified and scattered: this was not evident from the project documentation. Second, the sampling exercise of the quantitative survey showed that sometimes the project activities in a community involved a very small number of participants. According to district project teams the rule of thumb was 20 participants in an FFS but in practice this was often done with fewer farmers. This is a typical feature and sometimes a limitation of the FFS approach (risk of insufficient critical mass, unclear pathway for spill-over effects), which the project actively sought to correct by reinvigorating farmers societies, as described in the next section.

Social capital

83. According to project documentation and the qualitative survey, the **project contributed to the development of grassroots networks** at the village level, particularly through the support to tanks societies, crop societies, dairy societies and the federations of these societies. In many of these, women held positions of president, secretary and treasurer.

84. Regarding crop cultivation, while the crop societies (and federations) formed under the project are 'new', the members belong to previously existing groups or organizations in the village (e.g., farmers' organization, women development organization). These societies have benefited from new focus on higher-value crops and revolving crop cultivation funds' and in the future may serve as an entry point for line departments of the Ministry of agriculture to conduct training programmes. For line departments, it is simpler and less costly to deal with societies that have a minimum of organizational structure than to scout for individual farmers. Some federations have now an office with paid staff.

85. In the small irrigation sub-component, the main project's contribution was the promotion of village tank societies and the re-introduction of "caretakers", in charge of coordination of tank rehabilitation, annual maintenance of the canals and water management. The introduction of a tank maintenance fund has provided impetus to the mobilization of paddy farmers for tank maintenance. However, beneficiaries and project staff expressed concerns regarding the project's failure to match the maintenance funds raised by tank societies and the consequences this may have on the medium and long term sustainability.

86. Dairy societies also increased the confidence of their members and their ability to engage with the private sector, increasing their bargaining position in relation to buying price and conditions (i.e., milk protein and fat-content based pricing) and helped establish relationships between dairy farmers and the extension services of the Department of Animal Production and Health. The establishment of revolving funds by beneficiaries was a crucial factor in sustaining dairy societies.

87. Within the Bhagya loan sub-component, the vast majority of groups formed were new associations, often of close friends in a village with high levels of trust and cooperation. This also strengthened bonds between women (the majority of clients) solidarity guarantors of group loans and facilitated women's contacts with local banks. Within the Apeksha loan sub-component, women's savings groups, societies and federations were already established by the Women's Bureau and mechanisms were in place to solicit, verify, approve, disburse, monitor and repay micro finance loans. The project's inputs were restricted to providing an additional source of credit, which was appreciated by the beneficiaries, but did not result in major changes in social capital at the village or divisional level.

88. The support to farmers' societies and to the creation of federations was to a large extent an additional element brought in by the project management to respond to two interconnected issues: (i) risk of isolation and scattering of FFS; (ii) need for support among farmers and of a minimum scale of activities to attract the support of

public agencies. This was well meant to ensure inter-alia better perspectives of sustainability of benefits. A limitation is that the building of grassroots organization needs itself time. As already noted under effectiveness, only about half of FFS societies were found as well functioning according of several indicators and only 39 per cent had a functioning revolving fund. Overall and with the above qualifications, impact on human and social capital can be considered as satisfactory.

Food security and agricultural productivity

89. **Pathway towards crop diversification.** According to all the project documents, including the PCR, DZLISPP made a positive contribution in this domain, with the main argument based on M&E data on data on crop productivity increases. The HARTI thematic study on FFS interventions, based on a random sample of 52 FFS and 125 farmers in the four districts, found that slightly more than a third of the interviewed farmers had adopted new crops or varieties during the project period (Table 8).

Table 8
Distribution of Farmers who have adapted to New Crops/Varieties by Districts

Description	*Kurunegala*	*Badulla*	*Anuradapura*	*Monaragala*	*Overall*
% of Farmers Adopted New Crops/ Varieties	81	43	0	4	34

Source: HARTI Survey Data, 2012.

90. Through the qualitative survey and this evaluation's own mission observations and interviews, a common observation was that farmers assisted by the project were exposed to new crops including higher value crops (e.g. groundnuts, vegetables, sometimes fruit trees and spices). Anecdotal evidence also pointed to increasing interest (and acreage) for fodder production, given the growing attractiveness of dairy farming (cost of commercial feed is high and increasing auto-production of fodder makes economic sense). Naturally, exposure does not automatically translate into (successful adoption) of new varieties and techniques.

91. The quantitative survey provides initial evidence in support of the above. For example, according to the results of propensity score matching, participation in the project is positively correlated with indicators of crop diversification and productivity. Households supported by the project were significantly more likely to report an increase in the number of crops grown between 20012 and 2006 (based on recall), a higher percentage of crops for which an increase in production had been observed and a lower proportion of crops for which a decrease in production had been observed (Annex 7, Table B.1a and B.1b), although differences were small. Results were sensitive to the technique used: statistical significance of differences was lower under the treatment effect method (Annex 7, Table A.1).

92. While the survey attempted to collect more information on individual crops, only for paddy and maize could the survey collect a large number of observations. In the case of paddy, under both propensity score matching and treatment effect method, positive correlation was found between project participation and higher yields for the Maha season harvest (the major paddy harvest season) only in a few cases (Annex 7, Table A.1 and Table B.1a and B.1b).[40] No significant difference was found for yields of maize.

93. As a proxy indicator of food security, the survey collected data on the prevalence of eating of eating a limited number of meals. Data analysis through the treatment effect method suggests that project-supported households were less likely to report eating only on or two meals per day when compared to households without project

[40] It is to be noted that the number of observations was low for the Yala season (secondary growing season), reflecting the fact that in the dry zone farmers typically have one paddy growing season.

in the same village (Annex 7 Table A.2), while data analysis through propensity score matching shows no significant differences.

94. In sum, secondary sources point to the introduction of improved techniques, diversification of crops, improved yields, the qualitative survey and this evaluation's mission helped observe concrete examples. Quantitative data preserve some echo of these observations although differences tend to be small. Taking all the above into account, and considering that most of the project interventions have been carried out fairly recently (between 2009 and early 2013), a rating of moderately satisfactory is assigned to this domain.

Natural resources and the environment (including climate change issues)

95. Natural resources and environmental management was not a major project focus area. According to the qualitative survey, the beneficiaries recollected being introduced to basic measures to reduce soil erosion and improve water management (for small-scale irrigation schemes). In Kurunagala and Badulla districts, beneficiaries and government officers spoke of the potential benefit to dairy farmers from the introduction of a drought resistant variety of grass known as Clone 13.

96. Given the high diversity of sub-components and activities, it proved very difficult to address specific issues through a standardised questionnaire and therefore questions in the quantitative survey were kept at a general level for water management and soil fertility: changes in access to irrigation, satisfaction with access to water and perception of soil fertility. Only in a few cases, did the survey find positive and significant difference households assisted by the project (Annex 7, Table A.3 and Table B.3a and B.3b). However, water and soil fertility involves many nuances which are better captured through thematic studies and field visits.

97. Field visit showed that, in those GNDs were a village water tank had been rehabilitated, the project had provided training packages for the maintenance of the dam, soil and water management and set up a water user association. Focus group discussions with farmers showed that they often adopted good practices in terms of water rotation, keeping paddy fields moist but reducing field flooding. A HARTI study on small scale irrigation made similar observations. It also found that the rehabilitation of irrigation tanks helped increase not only the capacity of the tank and storage of water but also had positive externalities on the ground water level (including agro wells and domestic wells) of the adjacent settlement area. At the same time, it noted that several water user associations were dormant and could not be expected to manage the schemes effectively in the future. While environment and climate change were not at the core of project interventions, several relevant packages have been recorded by project studies, by this evaluation's mission and the qualitative survey. Effects on the general project beneficiary population are probably taking up and not yet fully perceived. The rating for this impact domain is moderately satisfactory.

Household income and assets

98. In this section we review the results of the analysis on estimates and expenditures as well as asset indexes. Regarding expenditures, the quantitative survey included questions on relatively expensive food consumption items (fish, meat/eggs, milk/dairy, prepared foods, and tobacco alcohol) as well as on a set of non-food consumption items. Estimated expenditures are widely used in the literature as a proxy of income status and are known to be more reliable than income indicators when collected through interviews.

99. Project M&E documents argue that household income and expenditures increased in the project area due to the enhanced profitability of several types of farming enterprises as well as for non-farm enterprises. Similar findings are presented in the HARTI studies although in a more cautious fashion and with qualifications. This evaluation's qualitative survey and the evaluation mission gathered mixed evidence. There was evidence of the project's contribution to introducing crops and activities,

including dairy farming (see also the impact sections above for the types of crops and activities) that are potentially profitable. At the same time, the uptake was not always uniform and linear. Constraints pertained to the local village context (e.g. access to a market), limited availability of follow-up training and extension, or financial services and the size of the initial investment required.

100. **Findings** from the quantitative surveys **are mixed** and sensitive to the econometric method adopted. Regarding expenditures, the treatment effect model shows a positive correlation between project participation and several categories of expenditures when comparing household with project and households without project in the same village (Annex 7, Table A.4). Instead, there are cases of negative correlation when project households in a community with high number of project interventions are compared with households without project. In most of the other cases, differences are not significant. When using the propensity score matching technique, correlations tend to be negative in many cases (Annex 7, Table B.4a and B.4b).

101. Regarding household asset indexes, both the treatment effect model and propensity score matching suggest that project participation is negatively correlated with several household indexes but positively correlated with ownership of cattle in 2013 (Annex 7, Table A.5 and Table B.5a and B.5b). The number of cattle has been singled out in the quantitative analysis because, as observed through focus group discussions and field visits, dairy farming emerged as one of the most appreciated activities, according to project participants.

102. While the above results are not immediately intuitive, triangulation with evidence gathered through the qualitative survey and field visit helps build an explanatory scenario. Given the increasing emphasis of the project on dairy farming, the data is likely to reflect the fact that project-supported households have invested in cattle and purchased less of other household assets under external financial constraints. In most cases, participating household had to self-finance these investments, not only to purchase cattle but also to build cow sheds and to purchase special feed for lactating cows. More in general, project's beneficiaries had to self-finance the new investments encouraged by the project which may explain that they had to forego the purchase of other household assets. Combining the findings from different methods and considering that most of the project activities are fairly recent, this impact domain is assessed as moderately satisfactory.

Institutions and policies

103. **FFS societies as a platform for district level extension programmes.** The project collaborated with the staff of the Department of Agriculture in the four districts and with the Department's Agricultural Inspectors at the field level. The project's derivative version of FFS was appreciated by the Department of Agriculture. Senior officers of the Department of Agriculture in several districts expressed their commitment to continuing support and using the 'crop societies' established by the project as a cost-effective entry point to contact farmers (rather than having to scout for individual farmers in the field). They also noted that in many Districts, the Department has several vacant positions for field extension officers and former project staff at the district level could be competent candidates to recruit and thus bring back project experience to the Department. Directors of the District Department of Export Agriculture (cash crops), Department of Animal Production and Health made similar observations. The project allowed them to extend outreach beyond their normal budget and staff resource capacity. Their aim is to build on the grassroots organizations set by DZLISPP although their own budgetary resources will probably allow for a more modest coverage.

104. **The current regulatory system allows for the registration of only some of the village-level producers' societies set up by the project.** While many producers' societies have been formed, the legal registration of the same emerged

as a policy issue for the crop and dairy societies. Lack of registration means that the society is not officially recognised and cannot benefit from public support programmes. At the moment, the Divisional Secretary Office and the Department of Agrarian Development are the only two government agencies with legal provision to register societies at the village level and they only deal with village tank societies (small-scale irrigation component). This leaves crop and dairy societies formed by the project without formal links to the respective line departments. Cognizant of these constraints, in Badulla District the Department of Agriculture, with the support of the project, has submitted an amendment proposal of the legal statute to the Provincial Council in order include provision of legal registration of societies under the provincial Department of Agriculture (for crop societies). If the amendment is approved and the project's societies are registered with the Department of Agriculture they will be entitled to official support.

105. **In small-scale irrigation, the project revitalised traditional village institutions but did not deliver matching funds to the extent pledged.** The project's emphasis on rehabilitating small village irrigation tanks has been appreciated by the Department of Agrarian Development, responsible for smaller reservoirs but constrained by a limited annual capital budget. The project's assistance has re-activated many tanks that were only partially used or close to being abandoned and introduced or re-introduced traditional institutions such as the "tank societies", or the water caretaker, and village-raised and managed maintenance funds. The Department of Agrarian Development is interested in pursuing this approach in the years to come. Staff of this Department explained that the project had pledged to provide additional matching funds for long-term maintenance of the village tanks but in many instances they were not released due to a halt to all financial commitments decided by the Ministry of Agriculture at the central level in March 2013 (corresponding to the project completion date). This may create problems for funding the maintenance of schemes. Reportedly, the situation is being addressed and the project has started releasing matching funds.[41]

106. **Land tenure: work has just started**. As already noted, the FAO-implemented policy component, financed through an IFAD grant to the Government produced studies, policy briefs, training activities, an overseas study tour. Inter alia, these initiatives sought to document, discuss and deal with: (i) land fragmentation; (ii) informal selling and leasing of land under Land Development Ordinance provision;[42] (iii) encroachment of reserve lands; (iv) limited capacity and equipment of the district land administration; and (v) lack of formal title documents, permits, grants or leases on land. According to an assessment commissioned by the project[43], participants rated training and study tours as pertinent and well organized. Land tenure policy making requires long-term efforts and it would not be realistic to expect concrete policy changes within the time span of the project. These activities started late (in 2010) and project closure may cause discontinuity. Most of the initiatives were sub-contracted by FAO to external consultants. If these activities are not capitalised and built upon by present or future IFAD or FAO interventions, they risk having little traction.

107. Apart from the land tenure initiative, which deserves to be seen as the beginning of a long-term commitment, the project did not entail major policy dialogue work. Some of the approaches devised (e.g. farmers field school) may inspire future work of public institutions (particularly for extension approaches). All this seems subject to continued support by IFAD and its partners (see also the section on sustainability). The overall rating for institutional impact is moderately satisfactory.

[41] Source: Mr A.Herath IFAD Country Presence Officer, personal communication, end October 2013.
[42] In theory, the lease and alienation of land under ordinance would require government approval, which is impractical leaving to a high number of informal arrangements.
[43] J. Weerahewa (2013). An Evaluation of The Interventions on Land Tenure By DZLISPP.

Overall impact assessment

108. The overall assessment for impact on rural poverty is positive but more nuanced and mixed, compared to the project's self-assessment. While the project's own M&E data convey a sense of generalised high impacts, this evaluation takes a more prudent stance and assesses overall impact as moderately satisfactory. As already explained, in spite of the project's efforts, M&E data present a problem of representativeness and attribution (no comparison with households without project, particularly in a period of generalised economic growth).

109. This impact evaluation, based on mixed methods and drawing from an impact survey with a more representative sample and comparison observations, confirms that DZLISPP has promoted a number of initiatives that can contribute to improve productivity and modernise agriculture in the dry zone of Sri Lanka. The question is to what extent these initiatives have already spread out enough for results to be observable on a sufficiently large scale. In the case of impact on human and social capital and agricultural productivity, there is common support between the different methods to the claim that the project has exposed farmers to new knowledge, techniques, crops, and practices with some initial observable effects on crop diversification. Two other areas of impact (natural resources on one hand and institutions and policies) have received comparatively less resources and generated less tangible results at least up to present.

110. Evidence is mixed for the impact on household income and assets. The findings suggest that, given the project's emphasis on dairy farming, project-supported households have invested on cattle while purchasing less of other household assets under external financial constraints. In most cases, participating household had to self-finance dairy farming investments, not only to buy cattle but also build equipment and purchase special feed for lactating cows. More in general, project's beneficiaries had to self-finance the new investments and thus forego the purchase of other household assets.

111. This impact evaluation had to face a number of difficulties and constraints: (i) the absence of a baseline dataset (a problem encountered by many other project evaluations at IFAD); (ii) the presence of targeting mechanisms which generate a serious sampling bias problem; (iii) confounding effects of the general economic growth and poverty reduction experienced by the country; (iv) potential "contamination" effects , spreading of benefits from project to non-project groups (to quote an example, vegetable collection centres did not exclusively procure the produce of farmers assisted by the project); (v) limited "incubation time", whereas the project started in early 2006, most project interventions have concentrated in the period between late 2009 and early 2013. On the latter point, the sections on sustainability and up-scaling of this report argue that, in the absence of a follow-up support phase, the full project impact potential may not be brought to bear.

112. Interestingly, there are no clear-cut patterns emerging from the four analytical blocks (treatment communities vs. comparisons; direct beneficiaries vs. comparisons; intensive vs. comparisons; and direct vs. indirect beneficiaries). In particular households in intensive intervention villages (i.e. villages with six or more project interventions) do not perform better than other analytical blocks. It is possible that the proxy adopted for the intensive intervention case (six or more project interventions in the same village) does not reflect adequately the scale and quality of work (e.g., double counting or simply repeating the same intervention if it was not successful in previous attempts).

E. Other performance criteria

Sustainability

113. **Institutional development requires longer-term plans.** As already noted, the project contained some sustainability elements: (i) the formation of farmer and producer societies (e.g., village irrigation tank, crop, dairy societies) and their

federations; (ii) linkages with relevant government departments (see above); (iii) grants for future maintenance of minor tanks and revolving micro finance and micro credit funds (e.g., for crop societies, Apeksha and Bhaghya loans). As a "society" of 15-20 farmers may not be viable, the project tried to aggregate societies into larger federations.

114. The HARTI Paper 15, entirely devoted to sustainability aspects, concludes that due to various kinds of constraints such as the delay in DZLISPP implementation for the first two-three years, project implementers had to give more weight to quantitative outreach (working in as many GNDs as possible) while the grassroots organizations supported by the project were still in their formative stage and less likely to sustain without external assistance for some more years. This evaluation stresses the following points regarding general sustainability prospects: most project activities have completed in the past 36 months; they need further technical/organizational support. Indeed, fledgling farmers' organizations are not yet fully confident with accounting and marketing strategies and only a minority of them have been officially registered.

115. **Linkages to agricultural value chains are a gage to sustainability.** With specific regards to rainfed agricultural and livestock-based systems, the focus on seed production groups (potatoes, cereals, pulses) is a positive sustainability factor. In an agricultural sector transitioning towards enhanced market linkages and value addition, quality seed is in high demand. The remarkable achievements in the multi-stage seed potato production system are a good example of this trend. The foreseeably growing demand is a driver of sustainability, but the dependence on further scientific and technical support remains critical. Another telling example is dairy farming (linkages with large dairy processors). The high farm-gate price for milk is an incentive. Milk farm gate prices per litre are at European Union level, i.e. around EUR 0.30.[44]

116. **Sustainability of rehabilitated irrigation systems.** While increased financial revenues from crop sales may allow for routine maintenance, not all water users collect maintenance fees. Another concern regarding sustainability is related to the tank maintenance fund set up by the project and the project's possible failure to meet its commitment to paddy farming communities in the form of a matching grant of LKR 50,000 for scheme maintenance. These commitments need to be honoured and the project has sought to address this matter in the past months.

117. **Sustainability of marketing and enterprise development.** The main questions concern the sustainability of the recent marketing arrangements. Positive examples exist such as the two vegetable collecting centers cofinanced and now managed by the private company Cargills. The project has established a committee under the Divisional secretary concerned and represented by the stakeholder agencies to oversee their operations and provide necessary guidance. In addition, arrangements have been made to establish a welfare fund for farmers through contributions of the company. These arrangements still need to materialise. They are important for the longevity of this approach, which is attracting buyers close to the production sites and, vice-versa, providing better farm gate prices, predictability and a social safety net to the producers.

118. **Promising examples from community infrastructure development.** Two specific measures are meant to enhance the sustainability of community infrastructure built with the help of the project. First, community buildings and drinking water supply schemes are handed over to the community-based organizations concerned for maintenance. Second, for access road maintenance, the Local Government Bodies (Pradesheeya Sabha) have been involved. Usually, the

[44] A caveat to be mentioned here is that farmers are not always adopting good practices (e.g., overstocking of unproductive cattle), which tends to depress sustainability.

village roads are damaged due to monsoon rains. Therefore, immediately after rainy season, minor repairs are attended to, before they turn into major repairs. If this scheme works over the villages attended by the projects, sustainability prospects for this component are encouraging.

119. **Sustainability prospects are low for the credit components**, notably Apeksha loans. In this scheme, interest rates per annum are below market rates and simply not viable (6 per cent). This scheme will be swiftly eroded by inflation. Similar issues exist for Bhaghya loans, albeit at higher annual interest rates of 10 per cent. In the view of this evaluation, the architecture of this scheme corresponds to a lost opportunity. Rather than promoting subsidised interest rates, a more viable scheme could have been to introduce one-time lump-sum subsidises in the form of matching grants, while maintaining interest rates at the market level. This may have marked a path to graduation of borrowers towards formal credit with regional banks, on top of being more consistent with IFAD rural finance policies.

120. Based on the above considerations, sustainability prospects are rated as moderately satisfactory.

Pro-poor innovation and scaling up

121. The project has made direct efforts **to bring farmers closer to the available technology frontiers**. The economic potential of some of many of these is noteworthy:

- Multiplication techniques for seed potato, involving the first two multiplication steps with advanced but still small farmers. The first step, the production of pre-basis seed in hydroponics, is remarkable, and was possible thanks to the support by an agricultural research centre, the Seethaeliya Research Station and the seed certification services of the Department of Agriculture. Eight farmers have invested in greenhouses with hydroponics so far. The second multiplication step is also more than adequate as it uses controlled, self-made substrates from tea waste and carbonised rice husk, which are freely available in the area.[45]
- Introduction of improved varieties (e.g. onions), quality seeds (cowpeas, maize, paddy and groundnuts). The involvement of small farmers in seed production is a proxy of progress towards commercial agriculture and away from mere subsistence. As a rule, seed of any crop get roughly a double farm gate price compared to commercial produce.
- Chilling technology for dairy farming, which is provided by large milk purchasing firms, some of them private and some state-owned.
- Organizational innovation: variations on the Farmer Field School approach reinforced by setting up federations have shown promising results, albeit with a half of such organisations still in a fragile state.

122. In terms of **up-scaling**, the project worked with both **private sector companies** (technologies) **and provincial and district departments** (FFS) on the support to diffusion the above innovation with some partnerships already under way.

123. For the future, this is a challenge to IFAD and the Government. Scaling-up has just started, thus it needs support. On one hand, there is private sector potentially interested in doing business with smallholders but there is need of public intervention for reducing transaction costs. On the other hand, current national policies are not really putting emphasis on this type of projects. As they are favouring mostly larger infrastructure and plantation agriculture, they tend to disregard the fact that successful commercial agriculture does not exclude the active involvement of smallholder farmers. DZLISPP has advocated for this case.

[45] According to a HARTI paper, farmers have produced evidence that the technology can produce table potato at a cost of Rs.18.00 – Rs.23.00/per kg at 2012 prices, which is 50 per cent less compared to the pre-project situation.

124. In spite of the above limitations, mainly related to national policies, the management team of DZLISPP deserves to be recognised for the attempt to promote new technologies and approaches and also the work done recently in building external partnerships (public and private) for up-scaling. This criterion is rated as satisfactory.

Gender equality and women's empowerment

125. Project data systematically display gender disaggregated figures, which helps forming an opinion on this evaluation criterion. Table 14 indicates per district figures on women's involvement in the project.

Table 14
Number of male and female farmers attended in major dry land crops per district

Districts	*Totals*	*Male*	*Female*
Anurapura	**8,607**	3,676	4,931 (57%)
Kurunegala	**3,408**	n.a.	n.a.
Badulla	**17,290**	10,046	7,244 (42%)
Monaragala	**11,540**	6,613	4,927 (43%)
Grand totals	**40,845**	**20,335**	**17,102**

Source: DZLISPP. Physical and Financial Progress Report, Colombo, March 2013:
No gender disaggregated data available for Kurunegala district

126. According to the impact qualitative survey and this evaluation's field visits, men and women repeatedly stressed that they work together equally in support of the household's management and income. Men and women commonly share tasks including cooking, child care, marketing and washing clothes at home and various aspects of cultivation, marketing (milk), and mutually support household micro enterprises. Household are dependent on multiple crops none of which are sufficient to provide a sole source of income.

127. In addition, women are strongly represented in crop societies; often the majority of members are women, and held executive positions, i.e., president, secretary or treasurer in almost all crop societies observed, as among beneficiaries across all components of the project (Table 15).

Table 15
Sex Distribution among FFS society Office Bearers

	Male		*Female*	
	#	%	#	%
President	41	57	31	43
Secretary	26	36	46	64
Treasurer	33	46	39	54
Total	90	44	116	56

Source: HARTI Survey Data, 2012.

128. The majority of Bhaghya beneficiaries are women (60 – 100 per cent). However, men (husbands or sons) are often involved in some aspect of the enterprise financed by the Bhaghya Loan. Bhaghya Loans have fostered cooperation and strengthened cooperation between men and women at the household level. The greatest difference is perceived by women beneficiaries in terms of self-confidence as 'entrepreneurs'

and their ability and willingness to engage with the formal banking sector. In view of the above, this evaluation criterion is rated as highly satisfactory.

F. Performance of partners

IFAD performance

129. IFAD supported an overall sound project design. After the initial period of slow disbursement, closing the project at the time of Mid-term review was considered as an option and IFAD, in consultation with the World Bank, decided to support its continuation. This was a correct choice. Upon reflection, the mid-term review mission could have taken a stronger decision to reduce project physical targets which would have helped DZLISPP focus more on quality and continuity rather than on outreach.

130. As the World Bank was responsible for supervision and loan administration, IFAD did not lead supervision missions but had consultants join those missions. At a later stage, IFAD's support and advocacy roles have been less visible. In part this may be due to a shift of attention from DZLISPP to the supervision of more recent projects. Another factor, as conveyed during several partners interviews, may be that the absence of a country office in Colombo (IFAD has a national country presence officer who resides in Kandy in the Central Province), constraining regular engagement with national counterparts. This limits advocacy for a follow up phase particularly at a moment when the Government is not strongly supportive of interventions in the dry zone. In addition to the concern for consolidation (sustainability), another important item is building partnerships for up-scaling (donors, public and private sector). While many of the project achievements have been attained in the last 36 months, the pioneering character of DZLISPP, the technological and market challenges ahead and the still vulnerable farmers' organisations warrant extended support. Globally, IFAD's performance is assessed as moderately satisfactory.

Government performance

131. The most striking trait related to Government performance is that DZLISPP was capable of **vigorously re-bouncing after a deceiving first half of project life**. This may be indicative of the quality of staff assigned at the helm of the project after MTR and after the reshuffling of the management team, and the commitment of the staff of the four District project management units, an observation corroborated by the evaluation mission. The key findings of the qualitative survey reveal a good degree of transparency and accountability in the project's transactions with project beneficiaries.

132. The project's commissioning of 15 **thematic studies** to HARTI can be considered as a very good practice. They provide precious insights in technical and methodological matters. Furthermore, thematic studies can be context-specific and provide appropriate technical feedback to project managers. Given their high number, quality and interest varies considerably between these studies. Ideally, it would have been preferable to concentrate on fewer (say 4-5 rather than 15) and at an earlier project stage (to allow project management to take corrective measures) but this is certainly an excellent example for many other IFAD projects.

133. On the other hand, the mission has to voice the often-heard concern that the final financial commitments of the project towards farmers' organizations may not be fulfilled. Tank maintenance and farmer organisations critically depend on the promised matching grants. In addition, while the project conducted a baseline survey in 2006, it is very unfortunate that the database has not been preserved.

134. While the current project team, notably the national coordination unit, has made serious efforts to communicate and share the project experience, so far there has been lukewarm support from the Ministry of Agriculture and from central Government authorities for accompanying the DZLISPP in its last months of operation and for requesting the financing of a follow-phase of the project. Given the achievements and challenges of this seminal project, consolidation efforts are

necessary. In sum, while the work of the current project management unit (at both national and district level) after the Mid Term Review is considered as strong and warrants a high score, the above critical issues must be taken into account and the overall government performance is rated as moderately satisfactory.

135. The **World Bank**, responsible for supervision, was very supportive of the project throughout its implementation phase. Its role was determinant, at the time of the mid-term review when the continuation of the project was at stake. The World Bank contributed to the visibility of the project vis-à-vis the national authorities. It inspired the preparation of thematic studies which were eventually commissioned to HARTI and represent a good practice case. Its supervision aide memoires and presentations try to strike a balance between achievements and shortcomings of the project. As noted, at the time of mid-term review, it would have been more prudent for both the World Bank and IFAD to revise the project quantitative targets downwards, and avoid incentives to over-stretching outreach.

Overall assessment of project achievements

136. The overall assessment of the project's achievements needs to balance across the different criteria and take into account that, for many aspects, DZLISPP can be considered as a pioneering project. Key interventions (agricultural extension, small irrigation rehabilitation and community infrastructure) responded to existing needs with broadly valid approaches. On the other hand rural finance and microenterprise interventions did not conform to recognised good practice (e.g. subsidised loan rates).

137. Following a typical pattern of IFAD's projects, implementation was seriously delayed in the first three years. The effort and capacity to bring execution levels back on track were impressive but caused over-stretching and focus on quantity to the detriment of quality and depth. Concerning impact, this evaluation's assessment is overall positive but more mixed and nuanced compared to the project's self-assessments.

138. Introducing innovative techniques and approaches was an achievement of the project, fully confirmed by direct observations of the evaluation mission. The question relates to the number of farmers successfully adopting such innovations. For future scaling up, there is interest from private sector and from extension agencies of local governments but, without external funding, uptake may be sluggish. By the same token, maintaining benefits after the project closure is possible but with the risk of sacrificing many fledgling grassroots organizations and achievements. Regarding gender equality and women's empowerment, progress has been very strong. Overall, a rating of satisfactory is justified.

III. Assessment of the PCR quality

139. **Scope.** The Project Completion Report is a relatively short, yet easy to read document. It follows the standard IFAD criteria for project-level evaluation, although it does not include an explicit assessment of the performance of IFAD. Rating: satisfactory.

140. **Quality (methods, data, participatory process).** The PCR makes full use of the M&E data and selectively quotes from the HARTI studies. While M&E data are abundant, they need to be taken with caution. The PCR indicates that there has been no stakeholder workshop prior to carrying out the analysis. Such a workshop could have been a good opportunity to obtain stakeholder views in addition to advocating for future follow-up support. Rating: moderately satisfactory.

141. **Lessons.** The section on lessons learned contains five points, three of operational nature (dairy sub-component, the role of the local facilitators hired by the project, and the forward sale contracts sub-component) and two at a broader level (the consequence of over-ambitious targets for the marketing and rural enterprise component, and the role of farmers' organizations and federations). The issues

reviewed by the PCR are valid. The document could have further reflected on the available documentation (including HARTI studies) and come up with more elaborate "strategic" issues and recommendations in view of future similar interventions. Rating: moderately satisfactory.

142. **Candour.** The PCR makes efforts to keep a reasonable balance between recognising and praising the achievements and identifying the shortcomings of the project. It might have insisted further on the trade-off between quantitative outreach and quality and the need for achieving a "critical mass" of interventions. Overall, candour can be rated as satisfactory.

IV. Conclusions, recommendations and selected methodological considerations

A. Conclusions

143. **Gradual refocus to a middle-income country context.** Initially conceived as a food security project within a national reconstruction effort, DZLISPP was gradually refocused to match the needs of a middle-income economy. While quantity and quality of nutrition is still an issue in rural Sri Lanka, economic growth also means increasing demand of higher-value agricultural produce and dairy products. The project took this challenge and, while maintaining the commitment to staple crops (e.g. rehabilitation of traditional village water tanks for paddy cultivation), it fostered diversification towards higher value crops and dairy farming.

144. **Supporting the introduction of improved technology.** The project collaborated with national and local research institutions to bring existing technology to the farmer's field and homestead. Technology for seed potato multiplication, improved varieties and quality seeds for onions, cowpeas and groundnuts are among the best examples. Cooling machines for milk are another example, in this case through a public-private sector agreement.

145. **The project lived up to the commitment to foster partnerships.** Partnership was one of the objectives of the project and the number of agreements signed (albeit an imperfect indicator of partnerships) is impressive. The World Bank 2012 final supervision mission counted about 60 partnerships, of which twelve with private sector organizations and the others with central and local (provincial, district) public agencies. In Sri Lanka, private sector operators are entering rural areas to cater for the urban demand of dairy products and fresh fruits and vegetables. DZLISPP's cooperation with the private sector was focused and opportunistic: rather than venturing to develop value chains *ex novo*, the project opted for linkages with well-established processors and retailers and co-financed with them the construction of collection centres (for vegetables, fruits, milk) where farmers bring produce at regular dates, so that collectors do not have to visit farmers one by one, thus reducing transaction costs.

146. **Impact evaluation findings are generally positive but more mixed and nuanced than in M&E.** While the project M&E data convey a sense of strong and generalised impact on household incomes and assets, this evaluation finds initial supporting evidence in some areas (human, social capital, agricultural productivity), while evidence is more mixed in other areas (household income and assets). Exposure of farmers to new crops and techniques has yet to translate into adoption on a large scale. Compared to the project M&E data, this evaluation benefited from a more representative household sample, a comparison with households without project, econometric analysis and triangulation between qualitative and quantitative sources.

147. **Pioneering interventions imply risks and require years to consolidate results.** Seeking to introduce improved techniques and technologies trough a new approach for Sri Lanka (FFS) implied risks. A single phase of a project such as DZLISPP is not sufficient to consolidate results. This is particularly the case when a

project suffers from important implementation delays. The project has built momentum, human capital, experience and knowledge, but much remains to be accomplished. While some elements of sustainability are in place and there is interest from both private operators and local government agencies to build upon the project's seminal contribution, there is a risk that benefits will accrue at a slow pace after closure. While the learning curve is steep in a first phase, not building upon knowledge and experience leads to inefficiency.

148. **Strengths and weaknesses in the project's self-assessment**. The number of data, figures, reports, excel tables produced by the project M&E is impressive but there are inaccuracies (double-counting and unclear representativeness of the samples adopted). An even more conspicuous gap was the disappearance of the database of the 2006 baseline survey, which made ex post assessment far more complicated. On the positive side, the production of **thematic studies** (HARTI) was a very important feature of this project, providing contextualization and detailed narrative and analysis.

B. Recommendations

149. **Need of a follow-up phase and advocacy from IFAD's side.** This point has been hinted to several times in the body of this report: for sustainability, efficiency and up-scaling reasons. Focus on the dry zone is consistent with the current priority accorded by the Government to modernization of agriculture. Potential exists for fostering production of high value crops and introducing improved technology. This perspective needs to be conveyed more forcefully by IFAD to a somehow reluctant Government partner.

150. **A more selective project format is required, revisiting several components and concepts.** While further investment on this type of project seems well grounded, it would not be appropriate to simply repeat the same project design. A project with fewer components and lower ambitions in terms of geographic coverage would be a better choice. For the future:

    - there is need to promote further linkages with existing value chains through public-private sector partnerships, taking the opportunity of the presence of medium-large agro-business operators in the rural areas;

    - it will be essential to support grassroots societies of farmers (e.g. crop, village tank, dairy societies) and their federations. They can reduce transaction costs for future support programmes sponsored by provincial and district agencies, as well for linkages with private sector operators;

    - IFAD and the Government should avoid subsidised interest rates credit schemes. They are not necessary (returns from many investments types can support commercial rates), nor efficient (credit rationing), nor consistent with IFAD's policy for rural finance. Smarter approaches may include the signing of memoranda of understanding with state-owned regional banks or private banks and providing subsidies in the form of lump-sum matching grant to be provided as equity contribution to the borrower (for a first loan for example), while applying commercial interest rates.

151. **Advocacy on policy issues needs to continue**. This involves not only macro policy issues which are politically entrenched, such as land tenure, but also meso-level and practical issues such as the formal registration of village level societies (see the section on impact on institutions). However, this requires work not only at an individual project level but also across the entire country programme and deserves consideration in the next COSOP.

152. In the short term, **project commitments to provide a financial contribution to revolving funds** for maintenance of village tanks and other schemes **need to be honoured**. While formal termination of financial commitment was set as of end March 2013, several grassroots societies had mobilised their own funds but did not

receive the project counterpart as established. Solutions have been sought by the project and they need to be vigorously pursued.

153. **M&E and self-assessment**. In spite of the efforts of project staff, better accuracy and quality control in M&E data is required. The good practice of conducting thematic studies deserves to be retained, better if focusing on a limited number of quality reports. It would also be useful to produce them earlier on, so that time is available for corrective actions. Finally, a simple baseline survey with both project and comparison observation is recommended, with particular care and attention for preserving the integrity of its electronic database. A follow-up survey could be undertaken towards the end of the project life span.

C. Selected methodological considerations for future similar work at IFAD

154. In spite of the limitations already pointed out, the use of mixed methods allowed the evaluation to gain a richer view of the project's performance and results. As a first attempt at impact evaluation, this exercise helped unveil a number of challenges which are likely to appear in future similar endeavours, including in the 30 impact evaluations that IFAD will conduct by 2015. They are briefly reviewed in the following paragraphs.

155. First, the **absence of a baseline** has traditionally been a common constraint to evaluating IFAD projects. More recent projects have conducted baseline surveys under the Result and Impact Management System of IFAD (focusing on anthropometrics and household asset indicators) yet they generally **lack a comparison group**. In addition, sample selection bias is a serious issue for IFAD projects due to their **targeting** approach: disadvantaged areas, communities or groups are expected to take precedence in receiving project's support. Use of statistical techniques that do not strictly require a baseline (propensity score matching, difference in difference using recall methods, derivative approaches of the Heckman sample selection method), combined with a selection of a fresh comparison group, is in order but it is also recommended to adopt mixed methods (including qualitative techniques), as argued further below. It is to be noted that the selection, **development and testing of the econometric approach** and model specification can be extremely **time consuming** and that, in any case, advanced econometric techniques are an imperfect substitute for baseline data.

156. **Timing of the survey**. Some reviewers may believe that it is desirable to wait until a project has gone through a sufficiently long "gestation period" before conducting an impact evaluation. However, an ex post exercise (i.e. undertaking an impact survey a few years after project closure) can pose tremendous survey management challenges in terms of practical organisations, learning and feedback to management. Fielding a survey is very difficult without interactions with the project team on the ground (a typical situation in an ex post evaluations). This may give rise to petty errors (e.g. confusing between a project and a comparison site) but also deprive the evaluators' team of understanding of key project implementation aspects (e.g. how targeting was done). Similarly, an impact evaluation that takes place late has limited chances to inform project management or the design of a follow-up project phase. In the end, it seems preferable to conduct an impact survey before project closure. And earlier on, during project implementation, it would be useful to undertake thematic studies (see further below).

157. Linked to the timing of the survey is the matter of **choice of indicators**. At IFAD, impact evaluation indicators relate to medium-longer term indicators. However, if impact evaluations are conducted during the project implementation or just before project closure, surveys may have to focus more on intermediate shorter-term indicators (e.g. technology adoption) rather than on final impact (e.g., income and expenditures).

158. Decisions on **practical sampling arrangements** can be more complicated than expected. When projects target areas with specific agro-ecological characteristic, it is difficult to find adequate comparison sites if the project covers a very large proportion or the totality of that area. Many other issues arise when the survey hits the ground, such as deciding whether the unit of analysis should be only the direct project beneficiaries or other households in the same community (e.g. to test for spill-over effects). This requires not only strong statistical sampling skills but also knowledge of the terrain and discussion with project field staff can be essential: an additional argument to undertake impact surveys when the project has not been closed.

159. Another challenge is the **multi-component nature** of IFAD projects. The logical chain of cause effects becomes fuzzier to model and assess when several concomitant components are operating. One of the tacit assumptions of quantitative impact techniques is that the interventions studied are homogenous, producing the same type of results more or less in the same fashion (e.g. as a vaccine, a medicine or, under certain conditions, a training programme). This may not be the case in a multi-component project setting. Designing an "omnibus survey" can be a daunting task when components include a large number of sub-components and sub-activities (as in DZLISPP).

160. And finally, econometric analysis results are not always self-explanatory, they need to be interpreted and can yield inconsistent results. **Mixed methods**, combining both quantitative (mini-surveys) and qualitative techniques can have an important hermeneutical contribution. Combined with the need to be more component or sub-component-specific, this evaluation suggests that a way forward for IFAD projects is to conduct more **thematic studies** concentrating on a single component or a cluster of components (along the line of those prepared by HARTI for DZLISPP) combining a simple survey format with more qualitative techniques. Such studies could be conducted during the project implementation and follow-up thematic studies could also be fielded at completion or for the purpose of evaluating the project.

Rating comparison

Criterion	*IFAD-PMD rating*[A]	*Evaluation rating*[A]	*Rating disconnect*
Project performance			
Relevance	**5**	**5**	**0**
Effectiveness	**4**	**5**	**+1**
Efficiency	**4**	**4**	**0**
Project performance [B]	**4.3**	**4.6**	**+0.3**
Rural poverty impact			
Household income and net assets	5	4	-1
Human, social capital and empowerment	5	5	0
Food security and agricultural productivity	5	4	-1
Natural resources and environment	5	4	-1
Institutions and policies	4	4	0
Rural poverty impact [C]	**5**	**4**	**-1**
Other performance criteria			
Sustainability	**4**	**4**	**0**
Innovation and scaling up	**5**	**5**	**0**
Gender equality and women's empowerment	**5**	**6**	**+1**
Overall project achievement [D]	**5**	**5**	**0**
Performance of partners			
IFAD	np	4	
Government	5	4	**-1**
Average net disconnect			**-0.18**

[A] Rating scale: 1 = highly unsatisfactory; 2 = unsatisfactory; 3 = moderately unsatisfactory; 4 = moderately satisfactory; 5 = satisfactory; 6 = highly satisfactory; n.p. = not provided; n.a. = not applicable.
[B] Arithmetic average of ratings for relevance, effectiveness and efficiency.
[C] This is not an average of ratings of individual impact domains.
[D] This is not an average of ratings of individual evaluation criteria but an overarching assessment of the project, drawing upon the rating for relevance, effectiveness, efficiency, rural poverty impact, sustainability, innovation and scaling up, and gender.
[E] The rating for partners' performance is not a component of the overall assessment ratings.

Ratings of the PCR Document

Ratings of the PCR Document Quality	IFAD-PMD ratings	PCRV Rating	Rating Disconnect
Scope	6	5	-1
Quality	5	4	-1
Lessons	5	4	-1
Candour	5	5	0
Overall rating PCR Document	na	5	

Basic project data

A. Basic Project Data					Approval (US$m)	
Region	APR	Total project costs	27.24		30.40	
Country	Sri Lanka	IFAD Loan and % of total	21.7 loan 0.34 grant	81% 1%	21.7 loan 0.34 grant	72% 1%
Loan Number	636	Borrower Sri Lanka	1.7	6%	1.7	6%
Type of project (sub-sector)	AGRIC	Co-financier 1 UNDP *Domestic Fin. Inst.s*	1.5	6%	1.5	5%
Financing Type	F	Co-financier 2 WFP	0		1.06	4%
Lending Terms[1]	Highly concessional	Co-financier 3 JBIC	0		1.14	4%
Date of Approval	09 Sep 2004	Co-financier 4 CIDA	0		0.963	3%
Date of Loan Signature	15 Dec 2004	From Beneficiaries	1.7	6%	1.7	6%
Date of Effectiveness	22 Dec 2005	From Other Sources:				
Loan Amendments	-	Number of beneficiaries (if appropriate, specify if direct or indirect)	80 000		80 000	
Loan Closure Extensions	-	Cooperating Institution	The World Bank		The World Bank	
Country Programme Managers	S.Jatta Y.Tian	Loan Closing Date	30 Sept 2013		30 Sept 2013	
Regional Director(s)	T.Elhaut H.Kim	Mid-Term Review	August 2009			
PCR Reviewer	**-**	IFAD Loan Disbursement at project completion (%)	98.8%			
PCR Quality Control Panel	-					

Sources: President's report, PCR, Mid-term review, supervision reports, PPMS, LGS

[1] There are four types of lending terms: (i) special loans on highly concessional terms, free of interest but bearing a service charge of three fourths of one per cent (0.75 per cent) per annum and having a maturity period of 40 years, including a grace period of 10 years; (ii) loans on hardened terms bearing a service charge of three fourths of one per cent (0.75 per cent) per annum and having a maturity period of 20 years, including a grace period of 10 years; (iii) loans on intermediate terms with a rate of interest per annum equivalent to 50 per cent of the variable reference interest rate, and a maturity period of 20 years, including a grace period of 5 years; (iv) loans on ordinary terms with a rate of interest per annum equivalent to one hundred per cent (100 per cent) of the variable reference interest rate, and a maturity period of 15 to eighteen 18 years, including a grace period of 3 years.

Note on the surveys

Qualitative

1. This part of the survey used Focus Group Discussions (FGD) and Key Informant Interviews to gather qualitative data from project staff, relevant government officers (e.g., Department of Agriculture, Department of Agrarian Department, Department of Animal Health and Production, Department of Export Crop Development, the Women's Bureau, and project beneficiaries in each of the four districts under the DZLiSPP: Anuradhapura, Kurunagala, Badulla and Monaragala. The guidelines for the focus group discussions and key informant interviews were developed in response to the Terms of Reference prepared by the IOE using the local experience and knowledge of the national organization's qualitative field survey team. The guidelines sought to ensure equal participation of men and women in the qualitative field survey. In addition, a series of discussions specifically targeting female beneficiaries, i.e., women who had participated in the Apeksha micro credit programme and the Bhaghya micro finance programme, were included in the strategy for the collection of qualitative data during the field survey.

2. The number of villages (GND[1]) in each district in which focus group discussions were conducted with project beneficiaries, was dependent on the proportion of the total number of project GND present in each district. A larger number of focus group discussions were conducted with project beneficiaries in the districts (*i.e.,* Anuradhapura and Badulla) where the DZLiSPP had implemented project interventions in a larger number of villages (Table 1).

3. At the district level, Divisional Secretary Divisions (DSD) were randomly sampled using the list of DSD covered by the project provided by the District Project Management Unit and a DSD map of each district. In each district, DSD in which the project had implemented interventions were divided into 'groups' according to their relative geographic location in the district (i.e*.,* northern, southern, eastern or western areas of the district) and the number of field days available for the quantitative field survey. A random number was generated to select a DSD from each "geographic group" in each district.

Table 1
A summary of the proportion of total number of GND under the DZLiSPP together with the target number and achieved totals of field days, key informant interviews and focus group discussions completed under the qualitative field survey in four districts

District	% GND	Target				Achieved			
		Days	KII	FGD	Total	Days	KII	FGD	Total
Anuradhapura	37%	7	11	7	20	7	4	17	21
Kurunagala	20%	5	07	5	12	5	9	9	18
Badulla	33%	5	11	5	20	6	7	11	18
Monaragala	10%	4	07	4	12	4	10	4	14
		21	**36**	**21**	**64**	**22**	**30**	**41**	**71**

4. At the DSD level, individual target villages were selected using the convergence lists provided by the district project units. In Anuradhapura and Kurunagala districts the Convergence Lists were used to identify two villages in each DSD in which the project had implemented suitable combinations of the main types of project intervention, i.e*.,* crop, dairy, paddy, community infrastructure, Apeksha and Bhaghya.

[1] Grama Niladhari Division is roughly equivalent to 'a village' at the local level.

Table 2
Sub sampling groups and DSD selected for the qualitative field survey in four districts in each district

District	DSD Group	DSD - Randomly Selected DSD ***underlined***
ANP	DSD N	Padaviya ***Kebithigolwewa***, Medawachchiya Horowpathana
	DSD S	Palagala, ***Thirappane,*** Nachchaduwa, Thalawa, Nuwaragam Palatha East
	DSD E	***Kahatagasdigiliya,*** Gelenbidunuwewa, Palugaswewa
	DSD W	***Nuwaragam Palatha Central***, Rajanganaya, Maha Wilachchiya
KUR	DSD N	***Giribawa,*** Galgamuwa
	DSD SE	Polpithigama, ***Ehethuwewa*** and Mahawa
	DSD SW	Ambanpola, Kotawehera and ***Rasnayakepura***
BAD	DSD E	Mahiyanganaya DSD and Rideemaliyadda
	DSD C	Kandaketiya, Meegahakivula, Lunugala, Soranathota, Badulla, Passara, ***Uva Paranagama,*** Hali Ela, Ella
	DSD W	Haldumulla, Bandarawela, Welimada ***Haputale***
MON	DSD NE	**Madulla,** Siyambalanduwa
	DSD SW	Buttala, **Wellawaya,** Thanamalwilla, Sewanagala

5. A total number of 312 project stakeholders were interviewed, including representatives of the project, government agencies, Development Banks, together with project beneficiaries who had received project assistance for crop cultivation (12 villages), paddy farming (9 villages), dairy production (10 villages), Apeksha (7 villages) and Bhaghya micro finance programmes (8 villages) and the rehabilitation and or development of community infrastructure (17 villages). A total of 88 project interventions were discussed with the national organization, during the course of the qualitative field survey. A little over half of the stakeholders and beneficiaries who participated in the 71 key informant interviews and focus group discussions were women (52 per cent).

Table 3
A summary of the number of participants disaggregated by district and gender who participated in the focus group discussions and key informant interviews conducted with beneficiaries representing each of the six main interventions under the DZLiSPP

	FGD & KII Participants				DZLiSPP Interventions							
District	**Total**	**Men**	**Women**	**%**	**Crop**	**Paddy**	**Dairy**	**MF/A**	**MF/B**	**CI**	**All**	**Total**
Anuradhapura	101	41	60	59%	5	4	4	3	3	3	2	**24**
Kurunagala	71	37	34	48%	4	4	3	3	3	1	1	**19**
Badulla	103	46	57	55%	5	3	4	3	2	10	1	**28**
Monaragala	37	27	10	27%	3	3	3	2	3	3	0	**17**
Total	**312**	**151**	**161**	**52%**	**17**	**14**	**14**	**11**	**11**	**17**	**04**	**88**[2]

Quantitative

6. The survey team collected data from a total of 2,567 households in 160 communities across the four districts where the project had been implemented: Anurahdhapura, Kurunegala, Monaragala, and Badulla.[3] In addition to a household

[2] The total of 88 exceeds the total of 71 KIIs/FGDs indicated in table 1 due to the fact that Community Infrastructure discussions took place together with FGDs.

[3] At the time of design the requirement for sample size was tentatively estimated at 2500 households equally split between project and comparison. This estimate is made under the assumption of a 5 per cent type 1 error, 20 per cent type 2 error and a value between 8 and 9 of the ratio between the standard deviation of the outcome and the minimum detectable effect. In this case, a type 1 error means falsely concluding that there is a significant difference between the treatment and comparison group when in fact there is no difference. A type 2 error means failing to detect a difference between treatment and comparison group when there is in fact a difference between the two. As a general formula, the

survey, the team also collected data at the community level using a separate questionnaire. The study included households and communities that received assistance from the DZLiSPP (treatment) and households and communities that did not receive DZLiSPP program interventions (comparison).

Instrument Development

7. An initial draft of the household survey questionnaire was iteratively piloted first in Kurunegala and then, with a revised version, in Badulla.[4] The pilot focused on comprehension, applicability, and time. During the piloting process, the instrument was significantly reduced to ensure it could be implemented in less than 45 minutes. Following instrument finalization, the survey was translated to Sinhala[5] and formatted.

8. Since the baseline dataset was not available,[6] the survey team included recall questions for selected control variables that were expected to be recalled quite accurately. For example, while it was expected that assets could be accurately recalled, no question was asked of recalled expenditures or crop production even though these represent important predictors of final outcomes, as it was expected that they could not be accurately recalled.

9. To aid in recall, "anchoring" to known events was promoted by asking participants to think about the time of the "Mavil Aru", an event connected to the resumption of conflict in the country which happened around the beginning of the project. For participants that were unfamiliar with this event, enumerators probed other, more household-specific events which could serve as anchors (e.g., a wedding which occurred near the beginning of the project). Qualitative feedback from respondents indicates that this anchoring aided in recall.

10. The household survey instrument was developed around the following modules:

- *Metadata:* This module includes informed consent; information about the enumerator and supervisor; date, time and result of visit; and identifying information (which was removed from responses after the interview).
- *Demographics*: This module included a brief household roster along with child measurement data (height and weight at birth and at least measurement) through available health books. Each child under 5 years old in Sri Lanka is supposed to keep a child health book in which their height and weight, as measured by a community health worker, are regularly recorded. Data were used from these books rather than directly measuring children due to cost, time, and logistical constraints.
- *Assets*: This section includes questions on housing conditions (e.g. housing materials, electricity, and water access), household assets measured currently and recalled for 2006, and a livestock list both currently and recalled for 2006.

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following could be considered: $nT = nC = 2(t_{\alpha/2}+t_{\beta})^2 (\sigma/\delta)^2$ where nT is the sample size for the treatment group; nC is the sample size for the comparison group; $t\ \alpha/2$ is the t statistics for a significance level of α; tβ is the t statistics for a probability β of committing a type II error; σ is the standard deviation of the outcome variable; δ is the minimum detectable difference in the means of the outcome variable between treatment and comparison. Issues related to intra-cluster correlation and multi-indicator measurement of impacts will have to be considered as well. If cluster sampling is adopted, then the above equation will have to be augmented by the additional factor of $(1 + (m -1) \rho)$, with ρ as the coefficient of intra-cluster correlation and m as the average number of observations within each cluster (see List, Sadoff and Wagner, 2009; and Carletto, 1999).

[4] The questionnaire was developed iteratively through exchanges between IOE, a national company (GreenTech Consultants Pvt.), an international company (Social Impact). It is to be noted that the international company had two advisors from Sri Lanka with previous professional experience in rural development including work in one of the project districts. The questionnaire was shared in its draft and revised form with the project coordination team of DZLISPP.

[5] Translation was conducted by Green Tech and verified through two, independent translators by Social Impact. A few minor issues in translation were identified and fixed during enumerator trainings. The enumerator team also included Tamil speakers to translate questions.

[6] A survey was conducted by the project in 2006 but the electronic database was not available to the project team at the time of the conduct of this survey. The electronic database was probably lost at the time of the shift in project management that took place in 2008-2009.

- *Expenditures*: This section includes a short list of higher-value consumption items (Fish, Meat/Eggs, Milk/Dairy, Prepared Foods, and Tobacco/Alcohol) plus other possible household expenses which may indicate wealth (Transport, Electricity, Water, Health, Clothing, Ceremonies, Settlement of debt, and Education). Information on expenditures was asked over a typical two weeks or month or over the last year (depending on the item). Although research[7] indicates that expenditure recall is more accurate over a defined time period rather than a 'typical' time period, we did not ask about the last two weeks (or month), as that time period included a major national holiday for part of the data collection period, which could have greatly increased variance in response.
- *Agricultural Production:* This module includes a table for up to 15 common crops which recorded whether anyone in the household had cultivated the crop in 2012, and if so, the amount of land cultivated, the production, and estimated value per unit of production. It was also asked if the crop was cultivated in 2006, and if so, whether production had increased, decreased, or stayed roughly the same between 2006 and 2012.
- *Other:* A set of questions around perceived changes to soil fertility and access to irrigation since 2006, as well as satisfaction with access to irrigation and knowledge of crop management practices. Finally, questions were included about participation in trainings on topics related to agriculture.

11. The community questionnaire included information on distance to main towns, number of agriculture programs implemented in the community, and a community asset list including things like primary and secondary schools, health clinics, police post, market facilities (they were not provided by the project). Respondents were asked about availability of these in the community currently as well as in 2006.

Sampling

12. Due to resource constraints, data collection concentrated on 160 GNDs in 20 DSDs across the four project Districts, even though the program was implemented in more than 1,600 GNDs in 45 DSDs. The 160 GNDs included both GNDs that received programming from the DZLiSPP and those that did not. The evaluation team used a three-stage cluster sampling approach:

- **Stage 1: DSD Level** The number of DSDs to be sampled in each District was determined in order to match the total percentage of project DSDs that came from that District. To select DSDs within a District, the team sampled based on probabilities proportional to the number of GNDs in the DSD (based on the convergence list prepared by the project). This means that DSDs with more GNDs were more likely to be selected.
- **Stage 2: GND Level** In the second stage, the team sought to sample four treatment and four comparison GNDs per DSD. To do this, the team sampled separately (stratified) by comparison and treatment GNDs.
    - For comparison: randomly selected up to 4 comparison GNDs from each DSD. In cases where a GND did not have sufficient comparison GNDs available, we randomly selected an additional comparison from a randomly selected DSD.
    - For treatment: In each DSD, the team randomly selected the required number of treatment GNDs to yield a total of 8 sampled GND per DSD[8]. That is, if a DSD had only 2 comparison GNDs, the team randomly

[7] Beegle, et al. 2009 "Methods of Household Consumption Measurement Through Surveys" *World Bank Policy Research Working Paper* 5501 (Dec 2010): 1-47

[8] Due to implementation logistics, the field team required 8 GNDs per DSD, although in practice we ended up with a few DSDs with more or less than 8 GNDs due to replacements.

sampled 6 treatment GNDs, and if the DSD had 5 comparison GNDs, the team sampled 3 treatment GNDs.

13. During data collection, it was found that some sampled GNDs were incorrectly classified in the convergence list (i.e. a GND classified as comparison actually received program interventions and vice versa). In such cases, a replacement was randomly sampled from the DSD, if a replacement was available in the DSD, or from a randomly selected DSD in the District if not.

- **Stage 3: HH Level** In the third stage, the team sampled HHs according to the GND-type:
    - Sample from Beneficiary List: For villages where the implementation office had beneficiary lists (i.e. those villages with individual level interventions such as farmer field schools, microfinance, etc.), the team randomly sampled 16 primary respondents, plus 6 replacements, from the aggregated list of all beneficiaries in the GND. This group is considered the *direct beneficiaries*. If less than 22 beneficiaries were listed, all listed beneficiaries were sampled, and enumerators were instructed to identify additional respondents in the GND. This group is considered the *indirect beneficiaries.*
    - Sample from Community List: For intervention types without clear beneficiary lists (i.e. comparison and GNDs with only community infrastructure projects), the team randomly sampled 16 primary respondent households, plus 6 replacements, from the most recent election office lists, which are supposed to include a complete list of households in a given GND. Households selected this way in GNDs where community level treatments were implemented are considered *group beneficiaries*, and households in the comparison communities are considered *comparisons.*

Data Collection

14. Prior to data collection, all field staff went through a two day training exercise jointly led by Green Tech and Social Impact, which included an introduction to the project, a question-by-question review of the survey instrument, field logistics, and at least two full rounds of practice with the instrument. Data collection occurred in May-June 2013 and was staggered across the four Districts, first in Anuradhapura, then Kurunegala, followed by Badulla, and lastly Monaragala. Following completion of data collection, all questionnaires were double entered and reconciled in a specifically designed database in SPSS which included logic checks. Additional review and cleaning was conducted in STATA.

Identification Approach – propensity score matching

15. The survey team used a "comparison group" of communities and households that have not participated in the program to account for any alternative causes of change and estimate the *counterfactual*, or the level of change in program participants the team would have expected in the absence of the program.

16. In order for the comparison group to validly estimate the counterfactual, the treatment and comparison groups should be similar along all baseline characteristics that may influence outcomes of interest. This similarity is best achieved using random assignment to treatment and comparison status. However, in the case of DZLiSPP, it was not possible to randomly assign which communities and individuals would participate in the program interventions, as the program was specifically targeted to communities of highest need, as identified by the implementation team's project offices. Because random assignment was not possible in this case, propensity score matching was applied to identify a plausible counterfactual and distinguish the impact of the DZLiSPP from other interventions.

17. This technique approximates randomization and reduces (but may fail to entirely eliminate) selection bias by making treatment and non-treatment groups more comparable. Confounding is reduced by using observable household and community characteristics to predict the receipt of the treatment and by matching the participating and non-participating households on a range of observable characteristics. Baseline data would allow for a more robust evaluation of changes due to the intervention; however, baseline data were not available to the evaluation team. Therefore, households are matched only on variables collected through the final household and community surveys, including a mix of current variables that are unlikely to have been unaffected by program participation (e.g. sex of household head) and recall variables (e.g. recall of household assets at the beginning of the program). While the lack of baseline data and the subjective assignment to treatment prohibit the use of the most robust evaluation designs, the propensity score matching approach (PSM)[9] is considered the best options available under these circumstances.

18. It is important to note that PSM, as any quasi-experimental approach, is only able to account for observable characteristics. The omission of any potentially predictive unobserved characteristics that may influence both a household's participation and outcomes could thus still contribute to potential bias.

19. PSM utilizes the household and community characteristics as predictors in a probit regression to calculate the probability that a particular household participated in DZLiSPP, based on a set of predictor variables. Using this methodology, the expected probability of treatment, called the propensity score, can be calculated for each household, and households can be matched on this propensity score which mitigates selection bias. Each sampled household is assigned a propensity score, which represents the likelihood of project participation based on the household's characteristics. After estimation of the propensity scores, tests were carried out for balance and overlap, called common support, of propensity scores for the treatment and comparison households, and observations outside the region of common support were dropped.

20. After verification of balance and common support, the analysis used propensity scores to match each treatment household with its comparison. While the choice was for kernel matching as a matching algorithm (it includes data from all comparison observations within the region of common support, weighted by the similarity of the propensity scores; i.e. those comparison units with very similar propensity scores are more heavily weighted), sensitivity tests for other common matching algorithms were conducted as well.

21. One important condition for the propensity score matching to correctly estimate the impact of a program is $(Y_1, Y_0) \perp D|X$ (Rosenbaum and Rubin, 1983). This says that after controlling for the observed covariates, the treatment assignment is independent of the potential outcomes. It requires that all variables relevant to treatment assignment and outcome are included in the set of independent variables, X (Rosenbaum and Rubin, 1983). To satisfy this condition, variables that influence simultaneously the treatment status and outcome variable should be included (Sianesi, 2004; Smith and Todd, 2005). Omitting important pre-treatment variables can increase bias in resulting estimates (Heckman et. al., 1998; Dehejia and Wahba, 1999).[10]

22. In the initial propensity score estimation only 5 variables had been included in the probit model with only one community variable (which characterizes the distance from GND to District Capital). Since the program was specifically targeted to

[9] PSM was first published by Rosenbaum and Rubin in: Rosenbaum, PR, and DB Rubin. "The central role of the propensity score in observational studies for causal effects." *Biometrika* 70, no. 1 (1983): 41-55.

[10] Revision to the analysis was performed by the School of Economic Science, Washington State University.

communities of highest need, other community level characteristics that are likely to influence the participation should also be considered in the model.

23. A revised flexible specification that includes a more complete set of pre-treatment variables of household and community under different treatment levels in the first-stage of the PSM can help overcome the above problems. Only variables that are unaffected by treatment should be included in the model. To ensure this, variables should either be fixed over time or measured before participation (Caliendo and Kopeinig, 2008). Because some important variables that were measured before participation are unavailable and because of the known lack of reliability of lengthy recall, greater emphasis was given to variables that were fixed over time.

24. These issues were addressed by examining the balance property in a revised PSM. Based on the covariates that have been included, the balance property was satisfied by including for *General Treatment*, *Direct Treatment,* and *Intense Treatment*, characteristics such as:

    - on community level: distance to the DSD capital; distance to the District capital; index of community infrastructure in 2006;
    - on household level: household head age; household head sex; highest education level in the household; index of household assets in 2006; total number of crops in 2006; index of livestock in 2006.

25. Other characteristics were examined, including the number of people in the household, number of children under age 5, and total acres of cultivated land. Each of these was statistically insignificant under alternative specifications for the three treatment levels. They were dropped from the specification so as not to increase the variance of the estimates and worsen the common support problem.

26. For *Direct versus Indirect Treatment*, since the treatment assignment was based on household level, only household characteristics relevant to selection and outcome were included: number of children under age 5 in 2006; household head education; household head sex; household head age; index of household assets in 2006; total number of crops in 2006; index of livestock in 2006. The model examined the highest education level in household and number of people in the household, but they were both insignificant in explaining the participation under various specifications. They were dropped from the model so as not to exacerbate the common support problem.

27. The **Heckman correction model**, also known as the treatment effect model, is a direct application of Heckman's sample selection model to estimation of treatment effects. It is useful in producing improved estimates of average treatment effects, particularly when data were generated by a nonrandomized experiment, and thus selection bias is non-ignorable (Guo and Fraser, 2009) and when selection processes are known and are correctly specified in the selection equation. The "correct" functional form is rarely known but sensitivity analysis can help compare different functional forms. In this report, the analysis uses a two-step procedure in implementing an estimation of the Heckman correction model: (a) first specify a selection equation to model the selection process; (b) use the conditional probability of receiving treatment to control for selection bias in the outcome regression equation.

28. The first step estimates the selection process, which is the same as the first stage of the revised PSM, included variables the same as those characteristics controlled in the probit model of the revised PSM based on the previous testing results. For *General Treatment*, Direct *Treatment,* and *Intense Treatment*, covariates included in the selection equation are: distance to the DSD capital; distance to the District capital; index of community infrastructure in 2006; household head age; household head sex; highest education level in the household; index of household assets in 2006; total number of crops in 2006; index of livestock in 2006. For *Direct versus*

Indirect Treatment, covariates included are: number of children under age 5 in 2006; household head education; household head sex; household head age; index of household assets in 2006; total number of crops in 2006; index of livestock in 2006.

29. In the outcome regression equation, variables that can influence household's decisions on expenditures and assets are all included:

    - Community-level variables that are correlated with community affluence and remoteness, which can influence households' decisions on expenditures and assets: distance to the DSD capital; distance to the District capital; index of community infrastructure in 2006;
    - Household-level variables that are correlated with decisions on expenditures and assets: household head age; household head sex; highest education level in the household; index of household assets in 2006; total number of crops in 2006; index of livestock in 2006; number of people in the household; number of children under age 5.

30. **Difference in differences** model is an alternative method of analysis, comparing with and without project samples before and after the treatment. However, the decision was taken to abandon it because of limited number of reliable household data before the treatment began.

The survey and IFAD's impact domains

31. IFAD's Evaluation Manual adopts five domains for impact assessment (see Table 4, first column on the left). DZLISPP design document included a logframe but not a formal "model of change" in a graphic form, nor an explanation of the causal chain through which certain interventions would contribute to certain results. This is quite a common case at IFAD and elsewhere. From the general project description and the available documentation (supervision, progress reports, HARTI studies), in principle all impact domains could be relevant to the programme. In fact, in addition to improving households' economic conditions (e.g. incomes and assets) and nutrition status, the programme had an important agricultural extension component aimed at improving knowledge on crop management (a dimension of human capital).

32. Similarly, the support to grass-roots organizations can be expected to have affected community groups and networks (social capital). Agricultural development initiatives are likely to have interacted with the environmental resources (soil and water, for example). Finally, the process of engaging with poor rural clients may also have brought about changes in institutions and private-sector organizations operating in rural areas (e.g. public agencies, NGOs, private companies), and the FAO work on land tenure may have led to policy dialogue activities.

33. Tables 4 and 5 illustrate, respectively, the expected focus area of the quantitative and qualitative analysis, which were envisaged taking into account information available and the type of data that could be realistically be collected under time and data constraints.

34. Given that a formal description of the impact pathway was not provided in the original project design, rather than "rationalizing ex post" the project, which would have been quite artificial, it was decided to create a much more simple map of the likely relationship between the project's main components, their immediate effects and the main impact domains of IFAD (Table 5) and use this map as a reference point for the exercise.

Table 4
Impact domains and analytical focus areas of the survey

	Analytical focus areas	
Impact domains	*Quantitative*	*Qualitative*
Household income and assets	Household income sources, household expenditures and their main composition Household productive assets (including agricultural implements, livestock) and durable goods (including house quality improvements)	-
Human and social capital and empowerment	Access to health services and basic infrastructure Access to training, extension and adoption of improved practices Access to farmers' organizations and their networks	Better knowledge of crop and livestock management. Collective action of grass-roots organizations Gender equality in (i) information and training and income-generating activities; (ii) rural institutions; (iii) economic and social benefits
Food security and agricultural productivity	Data on household food self-sufficiency (e.g. number of months of food self-sufficiency). Data on child malnutrition Data on crop yields	-
Natural resources, environment, climate change	-	Soil and water management, vegetative cover
Institutions and policies	-	Changes in policies and pro-poor orientation of public agencies and private-sector organizations

Source: IOE (2013)

Table 5
Examples of chain of effects from programme components to impact domains

Programme components	Immediate effects	Impact domains concerned
Dryland agriculture and livestock: technical packages through farmer field schools	▪ Availability of improved seeds, inputs ▪ Exposure to improved crop and fruit tree management and enhanced cattle- rearing techniques ▪ Diversification to higher- value crops and products ▪ Strengthened grass-roots organizations ▪ Intended / unintended effects on soils	▪ Human capital (technical know-how on crops and water management) ▪ Household income and assets (through higher agricultural profits) ▪ Farm productivity and food security (higher yields and better crop management) ▪ Environment and natural resources, either positive (watershed protection, fertility enhancement) or detrimental (e.g. erosion)
Rehabilitation of village micro tanks	▪ Complementary irrigation and larger command area ▪ Village ponds allow for fish production	▪ Farm productivity and food security (higher yields and better crop management)
Microenterprise development, marketing Microfinance	▪ Processing of agricultural products, demand increase for agricultural products, value chain linkages ▪ Non-agricultural income-generating activities ▪ Availability of improved inputs	▪ Human capital (entrepreneurial skills) ▪ Household income and assets (diversification of income sources, stabilization of income) ▪ Institutions and policies (Public and private organization work more with poor clients)
Basic community infrastructure (roads, health posts)	▪ Mobility of people enhanced ▪ Reduced transportation costs for agricultural produce ▪ Storage and collection points for agricultural produce	▪ Social capital (contacts with people, groups and organizations) ▪ Household income and assets (through better access to roads and markets) ▪ Human capital (better access to health care, education facilities)

Source: IOE (2013)

Definition of the evaluation criteria used by IOE

Criteria	*Definition*[a]
Project performance	
Relevance	The extent to which the objectives of a development intervention are consistent with beneficiaries' requirements, country needs, institutional priorities and partner and donor policies. It also entails an assessment of project design in achieving its objectives.
Effectiveness	The extent to which the development intervention's objectives were achieved, or are expected to be achieved, taking into account their relative importance.
Efficiency	A measure of how economically resources/inputs (funds, expertise, time, etc.) are converted into results.
Rural poverty impact[b]	Impact is defined as the changes that have occurred or are expected to occur in the lives of the rural poor (whether positive or negative, direct or indirect, intended or unintended) as a result of development interventions.
• Household income and assets	Household income provides a means of assessing the flow of economic benefits accruing to an individual or group, whereas assets relate to a stock of accumulated items of economic value.
• Human and social capital and empowerment	Human and social capital and empowerment include an assessment of the changes that have occurred in the empowerment of individuals, the quality of grassroots organizations and institutions, and the poor's individual and collective capacity.
• Food security and agricultural productivity	Changes in food security relate to availability, access to food and stability of access, whereas changes in agricultural productivity are measured in terms of yields.
• Natural resources, the environment and climate change	The focus on natural resources and the environment involves assessing the extent to which a project contributes to changes in the protection, rehabilitation or depletion of natural resources and the environment as well as in mitigating the negative impact of climate change or promoting adaptation measures.
• Institutions and policies	The criterion relating to institutions and policies is designed to assess changes in the quality and performance of institutions, policies and the regulatory framework that influence the lives of the poor.
Other performance criteria	
• Sustainability	The likely continuation of net benefits from a development intervention beyond the phase of external funding support. It also includes an assessment of the likelihood that actual and anticipated results will be resilient to risks beyond the project's life.
• Innovation and scaling up	The extent to which IFAD development interventions have: (i) introduced innovative approaches to rural poverty reduction; and (ii) the extent to which these interventions have been (or are likely to be) replicated and scaled up by government authorities, donor organizations, the private sector and others agencies.
• Gender equality and women's empowerment	The criterion assesses the efforts made to promote gender equality and women's empowerment in the design, implementation, supervision and implementation support, and evaluation of IFAD-assisted projects.
Overall project achievement	This provides an overarching assessment of the project, drawing upon the analysis made under the various evaluation criteria cited above.
Performance of partners • IFAD • Government	This criterion assesses the contribution of partners to project design, execution, monitoring and reporting, supervision and implementation support, and evaluation. It also assesses the performance of individual partners against their expected role and responsibilities in the project life cycle.

[a] These definitions have been taken from the OECD/DAC *Glossary of Key Terms in Evaluation and Results-Based Management* and from the IFAD Evaluation Manual (2009).

[b] The IFAD Evaluation Manual also deals with the "lack of intervention", that is, no specific intervention may have been foreseen or intended with respect to one or more of the five impact domains. In spite of this, if positive or negative changes are detected and can be attributed in whole or in part to the project, a rating should be assigned to the particular impact domain. On the other hand, if no changes are detected and no intervention was foreseen or intended, then no rating (or the mention "not applicable") is assigned.

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Tables from the quantitative household survey

A. Results of Treatment Effect Method

Table A.1
Trends in crops grown and yields of paddy and maize - Treatment Effect Method

Agriculture	General Treatment		Direct Beneficiaries		Intense Treatment		Direct versus Indirect Treatment	
	Coefficient	N	Coefficient	N	Coefficient	N	Coefficient	N
Proportion of crops grown where there is an increase in crop harvest	1.036 (1.22)	1621	-1.611 (-0.81)	1328	-0.109 (-0.28)	919	0.157 (0.44)	953
Negative of proportion of crops grown where there is a decrease in crop harvest	1.383 (1.17)	1710	1.061 (0.69)	1392	0.987* (1.78)	964	-0.291 (-0.70)	1007
Total number of crops grown in 2012/total number of crops grown in 2006	-0.079 (-0.11)	1641	-0.041 (-0.04)	1343	0.303 (0.80)	931	-0.056 (-0.16)	963
Log of productivity of paddy crops during the Yala season (kg/acre)	-5.322 (-0.54)	563	2.222 (0.80)	476	-2.133 (-1.63)	355	-4.086 (-0.57)	242
Log of productivity of paddy crops during the Maha season (kg/acre)	-0.567 (-0.21)	1329	4.323 (0.67)	1083	1.638* (1.65)	730	-0.068 (-0.10)	743
Log of productivity of Maize (kg/acre)	-0.341 (-0.14)	534	0.651 (0.26)	425	1.222 (0.85)	293	-2.003 (-1.31)	360

Note: t statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table A.2
Eating a limited number of meals - Treatment Effect Method

Meals	General Treatment		Direct Beneficiaries		Intense Treatment		Direct versus Indirect Treatment	
	Coefficient	N	Coefficient	N	Coefficient	N	Coefficient	N
Over the last month, how often did you consume only one or two meals per day? (1-Often, 2-Sometimes,3-Never)	0.683 (1.52)	2536	-0.271 (-0.66)	2096	-0.278 (-1.35)	1584	0.509** (2.10)	1284

Note: t statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table A.3
Water and soil fertility - Treatment Effect Method

Agriculture	General Treatment		Direct Beneficiaries		Intense Treatment		Direct versus Indirect Treatment	
	Coefficient	N	Coefficient	N	Coefficient	N	Coefficient	N
How has your access to irrigation changed since 2006? (1 = decreased, 2 = same, 3 = improved)	1.120*** (18.44)	1647	-0.016 (-0.03)	1337	-0.643 (-1.24)	921	0.222 (0.35)	971
What is your level of satisfaction with access to water, including irrigation, for agriculture? (1 = unsatisfied, 2 = neutral 3 = satisfied)	0.547 (0.92)	1688	0.348 (0.40)	1361	1.016 (1.34)	940	0.318 (0.51)	993
How has the fertility of your soil changed since 2006? (1 = decreased, 2 = same, 3 = improved)	0.345 (0.40)	1673	-0.858 (-1.58)	1369	-0.338 (-0.77)	945	-0.611 (-1.08)	999

Table A.4
Expenditures – Treatment Effect Method

Log of Expenditures	General Treatment		Direct Beneficiaries		Intense Treatment		Direct versus Indirect Treatment	
	Coefficient	N	Coefficient	N	Coefficient	N	Coefficient	N
Log of total expenditures in a typical two weeks	0.621 (0.78)	2549	0.389 (0.49)	2108	-0.839** (-2.04)	1592	1.305** (2.39)	1290
Log of total food expenditures in a typical two weeks	0.715 (0.76)	2523	0.195 (0.21)	2086	-0.684 (-1.45)	1575	0.520 (0.94)	1277
Log of total non-food expenditures in a typical two weeks	0.191 (0.20)	2549	-0.172 (-0.18)	2108	-1.164** (-2.36)	1592	1.810*** (2.60)	1290
Log of expenditures on fish in a typical two weeks	0.679 (0.73)	2363	0.056 (0.06)	1952	-0.452 (-0.94)	1473	0.036 (0.07)	1201
Log of expenditures on meat and eggs in a typical two weeks	1.167 (0.94)	2073	-0.398 (-0.32)	1703	-0.511 (-0.84)	1294	-0.262 (-0.43)	1055
Log of expenditures on milk and dairy foods in a typical two weeks	2.231 (1.62)	1807	1.760* (1.69)	1500	0.128 (0.27)	1163	1.043* (1.73)	872

Table A.4
Expenditures – Treatment Effect Method

Log of Expenditures	General Treatment		Direct Beneficiaries		Intense Treatment		Direct versus Indirect Treatment	
	Coefficient	N	Coefficient	N	Coefficient	N	Coefficient	N
Log of expenditures on prepared food (including bread) in a typical two weeks	1.214 (1.12)	1797	0.963 (0.89)	1492	-0.713 (-1.40)	1117	0.752 (1.21)	915
Log of expenditures on fruits in a typical two weeks	0.725 (0.77)	1303	0.844 (0.93)	1076	-1.186* (-1.73)	831	1.146** (2.08)	606
Log of expenditures on tobacco and alcohol in a typical two weeks	2.737 (1.06)	427	5.438 (0.95)	338	0.791 (0.36)	238	1.711 (0.77)	235
Log of expenditures on transportation in a typical two weeks	1.448 (1.03)	2280	0.032 (0.02)	1886	-1.261* (-1.89)	1407	0.630 (0.92)	1169
Log of expenditures on electricity in a typical month	-2.220* (-1.85)	2162	-0.617 (-0.60)	1771	-0.396 (-0.65)	1337	1.567** (2.49)	1078
Log of expenditures on water a typical month	0.415 (0.47)	862	1.524 (1.64)	706	0.641 (1.05)	552	-0.304 (-0.36)	401
Log of expenditures on health in the last year	-2.144 (-1.34)	2406	-2.743* (-1.68)	1996	-2.738*** (-3.49)	1505	1.338 (1.55)	1214
Log of expenditures on clothing in the last year	0.083 (0.09)	2345	0.153 (0.16)	1935	-0.583 (-1.26)	1450	0.413 (0.81)	1203
Log of expenditures on ceremonies in the last year	0.430 (0.36)	2377	0.788 (0.61)	1969	0.064 (0.10)	1466	1.232* (1.85)	1222
Log of expenditures on settlement of debt in the last year	0.267 (0.16)	923	2.560 (1.00)	758	0.647 (0.49)	524	4.978 (1.19)	514
Log of expenditures on education in the last year	1.211 (0.75)	1478	-0.880 (-0.48)	1209	-1.983** (-2.06)	898	1.209 (1.03)	789

Note: t statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table A.5
Assets, revenue and livestock – Treatment Effect Method

Assets, Revenue and Livestock	General Treatment		Direct Beneficiaries		Intense Treatment		Direct versus Indirect Treatment	
	Coefficient	N	Coefficient	N	Coefficient	N	Coefficient	N
Principal components of 2013 assets	0.105 (0.06)	2546	-4.713** (-2.06)	2105	-4.370*** (-4.43)	1589	1.454 (1.48)	1289
Change in principal components of assets	0.105 (0.06)	2546	-4.713** (-2.06)	2105	-4.370*** (-4.43)	1589	1.454 (1.48)	1289
Principal components of 2013 livestock	-1.396 (-0.95)	2550	-2.656* (-1.80)	2108	0.294 (0.53)	1592	-0.311 (-0.36)	1291
Change in principal components of livestock	-1.396 (-0.95)	2550	-2.656* (-1.80)	2108	0.294 (0.53)	1592	-0.311 (-0.36)	1291
Number of cattle owned in 2013	7.666** (2.09)	2550	5.590** (1.97)	2108	0.263 (0.22)	1592	-0.855 (-0.57)	1291
Change in cattle owned	-11.384 (-0.62)	562	-16.302 (-0.66)	454	49.237** (1.96)	299	-2.764 (-0.34)	387

Note: t statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1

B. Results of Propensity Score Matching

Table B.1a
Trends in crops grown and yields of paddy and maize – Propensity Score Matching

General Treatment							Direct Beneficiaries						
Matching	Treatment Mean	Treated N	Control Mean	Control N	Difference	T-stat	Matching	Treatment Mean	Treated N	Control Mean	Control N	Difference	T-stat
Proportion of crops grown where there is an increase in crop harvest													
Unmatched	0.183		0.136		0.047	2.77***	Unmatched	0.196		0.136		0.060	3.22***
Matched	0.183	953	0.156	668	0.027	1.55	Matched	0.196	660	0.155	668	0.041	2.12**
Proportion of crops grown where there is a decrease in crop harvest													
Unmatched	0.400		0.443		-0.043	-1.90*	Unmatched	0.401		0.443		-0.042	-1.70*
Matched	0.400	1,007	0.426	703	-0.025	-1.07	Matched	0.401	689	0.429	703	-0.028	-1.09
Total number of crops grown in 2012/total number of crops grown in 2006													
Unmatched	1.105		1.073		0.032	1.78*	Unmatched	1.096		1.073		0.023	1.25
Matched	1.105	963	1.069	678	0.035	1.93*	Matched	1.096	665	1.068	678	0.028	1.42
Productivity of paddy crops during the Yala season (kg/acre)													
Unmatched	1426.338		1402.454		23.884	0.35	Unmatched	1428.383		1402.454		25.929	0.32
Matched	1426.338	242	1433.064	321	-6.726	-0.10	Matched	1428.383	155	1429.671	321	-1.288	-0.02
Productivity of paddy crops during the Maha season (kg/acre)													
Unmatched	1571.525		2021.733		-450.208	-1.04	Unmatched	1694.116		2021.733		-327.618	-0.62
Matched	1571.525	743	2161.727	586	-590.202	-1.18	Matched	1694.116	497	2062.421	586	-368.305	-0.69
Productivity of Maize (kg/acre)													
Unmatched	1238.410		1176.250		62.160	0.56	Unmatched	1239.168		1176.250		62.918	0.52
Matched	1238.410	360	1209.027	174	29.383	0.23	Matched	1239.168	251	1197.653	174	41.514	0.31

Note: Level of significance: *** p<0.01, ** p<0.05, * p<0.1

Table B.1b
Trends in crops grown and yields of paddy and maize – Propensity Score Matching

Intense Treatment							Direct versus Indirect Treatment						
Matching	Treatment Mean	Treated N	Control Mean	Control N	Difference	T-stat	Matching	Treatment Mean	Treated N	Control Mean	Control N	Difference	T-stat
Proportion of crops grown where there is an increase in crop harvest													
Unmatched	0.169		0.136		0.033	1.37	Unmatched	0.196		0.154		0.042	1.69*
Matched	0.169	251	0.157	668	0.012	0.45	Matched	0.196	660	0.154	293	0.042	1.74*
Proportion of crops grown where there is a decrease in crop harvest													
Unmatched	0.466		0.443		0.023	0.67	Unmatched	0.401		0.399		0.002	0.06
Matched	0.466	261	0.421	703	0.045	1.23	Matched	0.401	689	0.410	318	-0.009	-0.28
Total number of crops grown in 2012/total number of crops grown in 2006													
Unmatched	1.042		1.073		-0.031	-1.32	Unmatched	1.096		1.123		-0.027	-1.05
Matched	1.042	253	1.060	678	-0.019	-0.83	Matched	1.096	665	1.121	298	-0.024	-0.89
Productivity of paddy crops during the Yala season (kg/acre)													
Unmatched	1424.422		1402.454		21.967	0.15	Unmatched	1428.383		1422.693		5.690	0.06
Matched	1424.422	34	1403.815	321	20.607	0.16	Matched	1428.383	155	1419.013	87	9.371	0.10
Productivity of paddy crops during the Maha season (kg/acre)													
Unmatched	2324.580		2021.733		302.847	0.31	Unmatched	1694.116		1323.852		370.263	1.18
Matched	2324.580	144	2160.557	586	164.023	0.18	Matched	1694.116	497	1310.015	246	384.101	1.72*
Productivity of Maize (kg/acre)													
Unmatched	1157.791		1176.250		-18.459	-0.12	Unmatched	1239.168		1236.664		2.504	0.02
Matched	1157.791	119	1273.494	174	-115.703	-0.75	Matched	1239.168	251	1251.871	109	-12.704	-0.10

Note: Level of significance: *** p<0.01, ** p<0.05, * p<0.1

Table B.2a
Eating a limited number of meals - Propensity Score Matching

General Treatment							Direct Beneficiaries						
Matching	Treatment Mean	Treated N	Control Mean	Control N	Difference	T-stat	Matching	Treatment Mean	Treated N	Control Mean	Control N	Difference	T-stat
Over the last month, how often did you consume only one or two meals per day? (3-Never, 2-Sometimes,1-Often)													
Unmatched	2.920		2.920		0.000	-0.02	Unmatched	2.930		2.920		0.010	0.74
Matched	2.920	1,285	2.932	1,251	-0.012	-0.87	Matched	2.930	845	2.931	1,251	-0.001	-0.06

Note: Level of significance*:* *** p<0.01, ** p<0.05, * p<0.1

Table B.2b
Eating a limited number of meals - Propensity Score Matching

Intense Treatment							Direct versus Indirect Treatment						
Matching	Treatment Mean	Treated N	Control Mean	Control N	Difference	T-stat	Matching	Treatment Mean	Treated N	Control Mean	Control N	Difference	T-stat
Over the last month, how often did you consume only one or two meals per day? (3-Never, 2-Sometimes,1-Often)													
Unmatched	2.934		2.920		0.014	0.74	Unmatched	2.930		2.900		0.030	1.61
Matched	2.934	333	2.926	1,251	0.008	0.44	Matched	2.930	845	2.902	439	0.028	1.32

Note: Level of significance*:* *** p<0.01, ** p<0.05, * p<0.1

Table B.3a
Water and soil fertility - Propensity Score Matching

General Treatment							Direct Beneficiaries						
Matching	Treatment Mean	Treated N	Control Mean	Control N	Difference	T-stat	Matching	Treatment Mean	Treated N	Control Mean	Control N	Difference	T-stat
How has your access to irrigation changed since 2006?													
Unmatched	2.113		2.102		0.010	0.32	Unmatched	2.100		2.102		-0.002	-0.05
Matched	2.113	966	2.115	674	-0.002	-0.05	Matched	2.100	657	2.111	674	-0.010	-0.28
What is your level of satisfaction with access to water, including irrigation, for agriculture?													
Unmatched	1.859		1.892		-0.033	-0.88	Unmatched	1.854		1.892		-0.039	-0.94
Matched	1.859	988	1.865	678	-0.005	-0.14	Matched	1.854	677	1.856	678	-0.002	-0.05
How has the fertility of your soil changed since 2006?													
Unmatched	1.598		1.547		0.051	1.69*	Unmatched	1.609		1.547		0.062	1.91*
Matched	1.598	994	1.554	680	0.043	1.40	Matched	1.609	683	1.549	680	0.060	1.77*

Table B.3b
Water and soil fertility - Propensity Score Matching

Intense Treatment							Direct versus Indirect Treatment						
Matching	Treatment Mean	Treated N	Control Mean	Control N	Difference	T-stat	Matching	Treatment Mean	Treated N	Control Mean	Control N	Difference	T-stat
How has your access to irrigation changed since 2006?													
Unmatched	2.045		2.102		-0.057	-1.19	Unmatched	2.100		2.139		-0.039	-0.85
Matched	2.045	243	2.113	674	-0.068	-1.34	Matched	2.100	657	2.158	309	-0.057	-1.24
What is your level of satisfaction with access to water, including irrigation, for agriculture?													
Unmatched	1.872		1.892		-0.020	-0.36	Unmatched	1.854		1.871		-0.018	-0.34
Matched	1.872	258	1.848	678	0.024	0.42	Matched	1.854	677	1.888	311	-0.034	-0.65
How has the fertility of your soil changed since 2006?													
Unmatched	1.606		1.547		0.059	1.37	Unmatched	1.609		1.572		0.037	0.88
Matched	1.606	259	1.550	680	0.056	1.21	Matched	1.609	683	1.564	311	0.045	1.08

Note: Level of significance: *** p<0.01, ** p<0.05, * p<0.1

Table B.4a
Expenditures – Propensity Score Matching

	General Treatment						Direct Beneficiaries				
Matching	Treatment Mean	Comparison Mean	Difference	S.E.	T-stat	Matching	Treatment Mean	Comparison Mean	Difference	S.E.	T-stat
Total expenditures in a typical two weeks											
Unmatched	6448.772	6733.984	-285.211	221.278	-1.29	Unmatched	6254.010	6733.984	-479.974	211.849	-2.27**
Matched	6448.772	6747.320	-298.548	236.415	-1.26	Matched	6254.010	6784.907	-530.897	224.579	-2.36**
Total food expenditures in a typical two weeks											
Unmatched	2171.864	2349.893	-178.029	80.252	-2.22**	Unmatched	2027.809	2349.893	-322.083	82.420	-3.91***
Matched	2171.864	2372.392	-200.528	86.848	-2.31**	Matched	2027.809	2388.579	-360.769	87.060	-4.14***
Total non-food expenditures in a typical two weeks											
Unmatched	4276.909	4384.091	-107.182	175.167	-0.61	Unmatched	4226.201	4384.091	-157.890	171.532	-0.92
Matched	4276.909	4374.928	-98.019	187.052	-0.52	Matched	4226.201	4396.328	-170.127	183.302	-0.93
Expenditures on fish in a typical two weeks											
Unmatched	729.401	766.635	-37.233	29.346	-1.27	Unmatched	698.251	766.635	-68.384	32.321	-2.12**
Matched	729.401	788.665	-59.264	32.166	-1.84*	Matched	698.251	796.541	-98.290	34.205	-2.87***
Expenditures on meat and eggs in a typical two weeks											
Unmatched	637.532	677.444	-39.912	43.118	-0.93	Unmatched	573.778	677.444	-103.666	37.175	-2.79***
Matched	637.532	697.366	-59.833	45.001	-1.33	Matched	573.778	702.675	-128.897	39.557	-3.26***
Expenditures on milk and dairy foods in a typical two weeks											
Unmatched	519.398	585.548	-66.150	30.271	-2.19**	Unmatched	506.338	585.548	-79.210	30.823	-2.57**
Matched	519.398	582.229	-62.831	32.180	-1.95*	Matched	506.338	580.580	-74.242	33.606	-2.21**
Expenditures on prepared food (including bread) in a typical two weeks											
Unmatched	341.030	353.351	-12.320	21.865	-0.56	Unmatched	331.966	353.351	-21.385	23.633	-0.90
Matched	341.030	363.773	-22.743	23.092	-0.98	Matched	331.966	366.149	-34.183	26.182	-1.31
Expenditures on fruits in a typical two weeks											
Unmatched	191.903	271.966	-80.062	15.961	-5.02***	Unmatched	175.923	271.966	-96.043	17.930	-5.36***
Matched	191.903	258.293	-66.389	18.205	-3.65***	Matched	175.923	259.646	-83.723	18.236	-4.59***

Table B.4a
Expenditures – Propensity Score Matching

	General Treatment						Direct Beneficiaries				
Matching	Treatment Mean	Comparison Mean	Difference	S.E.	T-stat	Matching	Treatment Mean	Comparison Mean	Difference	S.E.	T-stat
Expenditures on tobacco and alcohol in a typical two weeks											
Unmatched	192.017	270.521	-78.504	37.891	-2.07**	Unmatched	189.660	270.521	-80.861	44.531	-1.82*
Matched	192.017	267.711	-75.694	44.468	-1.70*	Matched	189.660	270.602	-80.942	47.143	-1.72*
Expenditures on transportation in a typical two weeks											
Unmatched	1291.570	1304.730	-13.159	62.375	-0.21	Unmatched	1256.983	1304.730	-47.747	67.659	-0.71
Matched	1291.570	1315.989	-24.419	67.173	-0.36	Matched	1256.983	1319.537	-62.554	72.797	-0.86
Expenditures on electricity in a typical month											
Unmatched	527.807	547.534	-19.726	67.301	-0.29	Unmatched	478.354	547.534	-69.179	34.369	-2.01**
Matched	527.807	466.021	61.786	68.126	0.91	Matched	478.354	467.861	10.493	36.995	0.28
Expenditures on water a typical month											
Unmatched	77.160	151.444	-74.283	11.312	-6.57***	Unmatched	64.171	151.444	-87.273	13.336	-6.54***
Matched	77.160	104.999	-27.838	12.873	-2.16**	Matched	64.171	110.116	-45.945	13.303	-3.45***
Expenditures on health in the last year											
Unmatched	12774.470	14737.116	-1962.646	972.920	-2.02**	Unmatched	12023.585	14737.116	-2713.530	1009.545	-2.69***
Matched	12774.470	14332.655	-1558.185	1066.901	-1.46	Matched	12023.585	14522.131	-2498.546	1039.381	-2.40**
Expenditures on clothing in the last year											
Unmatched	10245.666	10239.384	6.283	345.828	0.02	Unmatched	10184.783	10239.384	-54.601	370.609	-0.15
Matched	10245.666	10567.746	-322.080	366.833	-0.88	Matched	10184.783	10553.614	-368.832	406.190	-0.91
Expenditures on ceremonies in the last year											
Unmatched	6226.300	6122.180	104.121	526.198	0.20	Unmatched	5845.678	6122.180	-276.502	488.922	-0.57
Matched	6226.300	5920.296	306.005	565.820	0.54	Matched	5845.678	6050.435	-204.758	507.124	-0.40
Expenditures on settlement of debt in the last year											
Unmatched	25603.471	32284.723	-6681.252	2550.649	-2.62***	Unmatched	27525.383	32284.723	-4759.340	2947.680	-1.61
Matched	25603.471	32347.519	-6744.047	2939.046	-2.29**	Matched	27525.383	32561.580	-5036.197	3159.309	-1.59

Table B.4a
Expenditures – Propensity Score Matching

	General Treatment						Direct Beneficiaries				
Matching	Treatment Mean	Comparison Mean	Difference	S.E.	T-stat	Matching	Treatment Mean	Comparison Mean	Difference	S.E.	T-stat
Expenditures on education in the last year											
Unmatched	27161.864	27356.636	-194.772	2222.440	-0.09	Unmatched	29420.846	27356.636	2064.209	2643.889	0.78
Matched	27161.864	29207.868	-2046.004	2373.386	-0.86	Matched	29420.846	29553.815	-132.969	2923.134	-0.05

Note: Level of significance: *** p<0.01, ** p<0.05, * p<0.1

Table B.4b
Expenditures– Propensity Score Matching

	Intense Treatment						Direct versus Indirect Treatment				
Matching	Treatment Mean	Comparison Mean	Difference	S.E.	T-stat	Matching	Treatment Mean	Comparison Mean	Difference	S.E.	T-stat
Total expenditures in a typical two weeks											
Unmatched	5662.035	6733.984	-1071.949	298.982	-3.59***	Unmatched	6254.010	6835.906	-581.896	355.232	-1.64
ATT	5662.035	6730.692	-1068.657	280.654	-3.81***	ATT	6254.010	7007.052	-753.042	442.820	-1.70*
Total food expenditures in a typical two weeks											
Unmatched	1794.820	2349.893	-555.072	114.388	-4.85***	Unmatched	2027.809	2453.311	-425.501	120.405	-3.53***
ATT	1794.820	2411.315	-616.494	96.756	-6.37***	ATT	2027.809	2461.210	-433.401	143.502	-3.02***
Total non-food expenditures in a typical two weeks											
Unmatched	3867.214	4384.091	-516.877	240.001	-2.15**	Unmatched	4226.201	4382.595	-156.394	282.167	-0.55
Matched	3867.214	4319.377	-452.163	237.671	-1.90*	Matched	4226.201	4545.841	-319.641	342.991	-0.93
Expenditures on fish in a typical two weeks											
Unmatched	667.310	766.635	-99.325	45.674	-2.17**	Unmatched	698.251	788.419	-90.168	41.153	-2.19**
Matched	667.310	794.288	-126.978	41.462	-3.06***	Matched	698.251	786.146	-87.895	45.074	-1.95*
Expenditures on meat and eggs in a typical two weeks											
Unmatched	489.111	677.444	-188.333	49.065	-3.84***	Unmatched	573.778	755.978	-182.200	73.040	-2.49**
Matched	489.111	704.768	-215.658	37.375	-5.77***	Matched	573.778	785.566	-211.787	93.054	-2.28**

Table B.4b
Expenditures– Propensity Score Matching

	Intense Treatment						Direct versus Indirect Treatment				
Matching	Treatment Mean	Comparison Mean	Difference	S.E.	T-stat	Matching	Treatment Mean	Comparison Mean	Difference	S.E.	T-stat
Expenditures on milk and dairy foods in a typical two weeks											
Unmatched	464.049	585.548	-121.500	39.665	-3.06***	Unmatched	506.338	543.418	-37.080	49.989	-0.74
Matched	464.049	596.611	-132.562	34.679	-3.82***	Matched	506.338	525.756	-19.418	57.019	-0.34
Expenditures on prepared food (including bread) in a typical two weeks											
Unmatched	300.108	353.351	-53.243	28.531	-1.87*	Unmatched	331.966	358.290	-26.324	36.299	-0.73
Matched	300.108	376.101	-75.993	29.223	-2.60***	Matched	331.966	348.914	-16.948	37.544	-0.45
Expenditures on fruits in a typical two weeks											
Unmatched	166.905	271.966	-105.061	29.073	-3.61***	Unmatched	175.923	218.811	-42.888	18.714	-2.29**
Matched	166.905	273.343	-106.438	20.873	-5.10***	Matched	175.923	225.671	-49.748	21.979	-2.26**
Expenditures on tobacco and alcohol in a typical two weeks											
Unmatched	168.981	270.521	-101.540	72.300	-1.40	Unmatched	189.660	196.025	-6.365	42.107	-0.15
Matched	168.981	268.720	-99.739	55.290	-1.80*	Matched	189.660	212.690	-23.030	44.507	-0.52
Expenditures on transportation in a typical two weeks											
Unmatched	1213.290	1304.730	-91.439	94.062	-0.97	Unmatched	1256.983	1359.428	-102.445	94.177	-1.09
Matched	1213.290	1285.203	-71.913	97.155	-0.74	Matched	1256.983	1391.835	-134.853	101.580	-1.33
Expenditures on electricity in a typical month											
Unmatched	413.144	547.534	-134.389	46.638	-2.88***	Unmatched	478.354	614.771	-136.417	132.120	-1.03
Matched	413.144	486.845	-73.701	38.449	-1.92*	ATT	478.354	672.384	-194.029	176.858	-1.10
Expenditures on water a typical month											
Unmatched	56.090	151.444	-95.354	20.535	-4.64***	Unmatched	64.171	102.279	-38.108	9.891	-3.85***
Matched	56.090	122.104	-66.013	14.854	-4.44***	ATT	64.171	99.972	-35.801	11.039	-3.24***
Expenditures on health in the last year											
Unmatched	12285.760	14737.116	-2451.356	1543.298	-1.59	Unmatched	12023.585	14259.102	-2235.516	1347.041	-1.66*
Matched	12285.760	14374.044	-2088.285	1402.058	-1.49	Matched	12023.585	14607.049	-2583.463	1673.380	-1.54

Table B.4b
Expenditures– Propensity Score Matching

	Intense Treatment						Direct versus Indirect Treatment				
Matching	Treatment Mean	Comparison Mean	Difference	S.E.	T-stat	Matching	Treatment Mean	Comparison Mean	Difference	S.E.	T-stat
Expenditures on clothing in the last year											
Unmatched	10588.424	10239.384	349.041	523.784	0.67	Unmatched	10184.783	10385.372	-200.589	560.024	-0.36
Matched	10588.424	10453.537	134.887	651.641	0.21	Matched	10184.783	10597.074	-412.291	595.850	-0.69
Expenditures on ceremonies in the last year											
Unmatched	4897.452	6122.180	-1224.728	714.801	-1.71*	Unmatched	5845.678	6984.569	-1138.892	810.479	-1.41
Matched	4897.452	6080.055	-1182.602	541.484	-2.18**	Matched	5845.678	7093.562	-1247.884	1068.675	-1.17
Expenditures on settlement of debt in the last year											
Unmatched	25272.615	32284.723	-7012.108	4538.502	-1.55	Unmatched	27525.383	22345.058	5180.326	3036.029	1.71*
Matched	25272.615	32228.431	-6955.815	4180.671	-1.66*	Matched	27525.383	23277.200	4248.183	3153.808	1.35
Expenditures on education in the last year											
Unmatched	28647.328	27356.636	1290.692	3217.762	0.40	Unmatched	29420.846	23040.426	6380.420	3392.762	1.88*
Matched	28647.328	28819.961	-172.633	3422.318	-0.05	Matched	29420.846	23608.475	5812.371	2927.038	1.99**

Note: Level of significance: *** p<0.01, ** p<0.05, * p<0.1

Table B.5a
Assets and livestock – Propensity Score Matching

General Treatment							Direct Beneficiaries						
Matching	Treatment Mean	Treated N	Control Mean	Control N	Difference	T-stat	Matching	Treatment Mean	Treated N	Control Mean	Control N	Difference	T-stat
Principal components of 2013 assets													
Unmatched	-0.097		0.118		-0.215	-2.83***	Unmatched	-0.189		0.118		-0.307	-3.61***
Matched	-0.097	1,290	-0.023	1,256	-0.074	-0.89	Matched	-0.189	849	-0.023	1,256	-0.166	-1.83*
Change in principal components of assets													
Unmatched	0.035		-0.028		0.063	1.06	Unmatched	-0.035		-0.028		-0.007	-0.11
Matched	0.035	1,290	0.166	1,256	-0.130	-1.99**	Matched	-0.035	849	0.172	1,256	-0.207	-2.92***
Principal components of 2013 livestock													
Unmatched	0.011		-0.011		0.022	0.51	Unmatched	0.000		-0.011		0.011	0.24
Matched	0.011	1,292	0.009	1,258	0.002	0.05	Matched	0.000	850	0.008	1,258	-0.008	-0.16
Change in principal components of livestock													
Unmatched	-0.044		0.042		-0.086	-1.37	Unmatched	-0.079		0.042		-0.121	-1.75*
Matched	-0.044	1,292	-0.023	1,258	-0.021	-0.31	Matched	-0.079	850	-0.045	1,258	-0.034	-0.44
Number of cattle owned in 2013													
Unmatched	0.830		0.366		0.464	5.84***	Unmatched	0.908		0.366		0.542	6.05***
Matched	0.830	1,292	0.490	1,258	0.341	4.03***	Matched	0.908	850	0.499	1,258	0.409	4.11***
Change in cattle owned													
Unmatched	-3.106		-4.446		1.340	1.42	Unmatched	-3.183		-4.446		1.263	1.23
Matched	-3.096	384	-4.364	175	1.268	1.24	Matched	-3.188	277	-4.541	175	1.353	1.23

Note: Level of significance: *** p<0.01, ** p<0.05, * p<0.1

Table B.5b
Assets and livestock – Propensity Score Matching

Intense Treatment							Direct versus Indirect Treatment						
Matching	Treatment Mean	Treated N	Control Mean	Control N	Difference	T-stat	Matching	Treatment Mean	Treated N	Control Mean	Control N	Difference	T-stat
Principal components of 2013 assets													
Unmatched	-0.571		0.118		-0.689	-5.81***	Unmatched	-0.189		0.086		-0.274	-2.53**
Matched	-0.571	333	-0.090	1,256	-0.481	-4.16***	Matched	-0.189	849	0.095	440	-0.284	-2.50**
Change in principal components of assets													
Unmatched	-0.274		-0.028		-0.247	-2.63***	Unmatched	-0.035		0.174		-0.210	-2.49**
Matched	-0.274	333	0.153	1,256	-0.428	-4.85***	Matched	-0.035	849	0.250	440	-0.285	-3.20***
Principal components of 2013 livestock													
Unmatched	-0.058		-0.011		-0.047	-0.93	Unmatched	0.000		0.033		-0.033	-0.45
Matched	-0.058	334	0.026	1,258	-0.084	-2.60***	Matched	0.000	850	0.004	441	-0.004	-0.05
Change in principal components of livestock													
Unmatched	0.015		0.042		-0.027	-0.34	Unmatched	-0.079		0.023		-0.102	-0.98
Matched	0.015	334	0.100	1,258	-0.085	-1.37	Matched	-0.079	850	-0.043	441	-0.036	-0.35
Number of cattle owned in 2013													
Unmatched	0.961		0.366		0.595	5.28***	Unmatched	0.908		0.683		0.226	1.74*
Matched	0.961	334	0.418	1,258	0.543	4.29***	Matched	0.908	850	0.704	441	0.204	1.63
Change in cattle owned													
Unmatched	-2.605		-4.446		1.841	1.42	Unmatched	-3.183		-2.907		-0.275	-0.24
Matched	-2.605	124	-3.662	175	1.057	0.77	Matched	-3.183	279	-3.466	108	0.283	0.26

Note: Level of significance*:* *** p<0.01, ** p<0.05, * p<0.1