INTERNATIONAL FUND FOR AGRICULTURAL DEVELOPMENT
GLOBAL ENVIRONMENT FACILITY
Special Climate Change Fund

Improving Productivity and Adaptation Capacities in the Mountain Zones of Morocco (IPAC-MAM)

For Official Use Only

Project design report

December 2014

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Currency equivalents

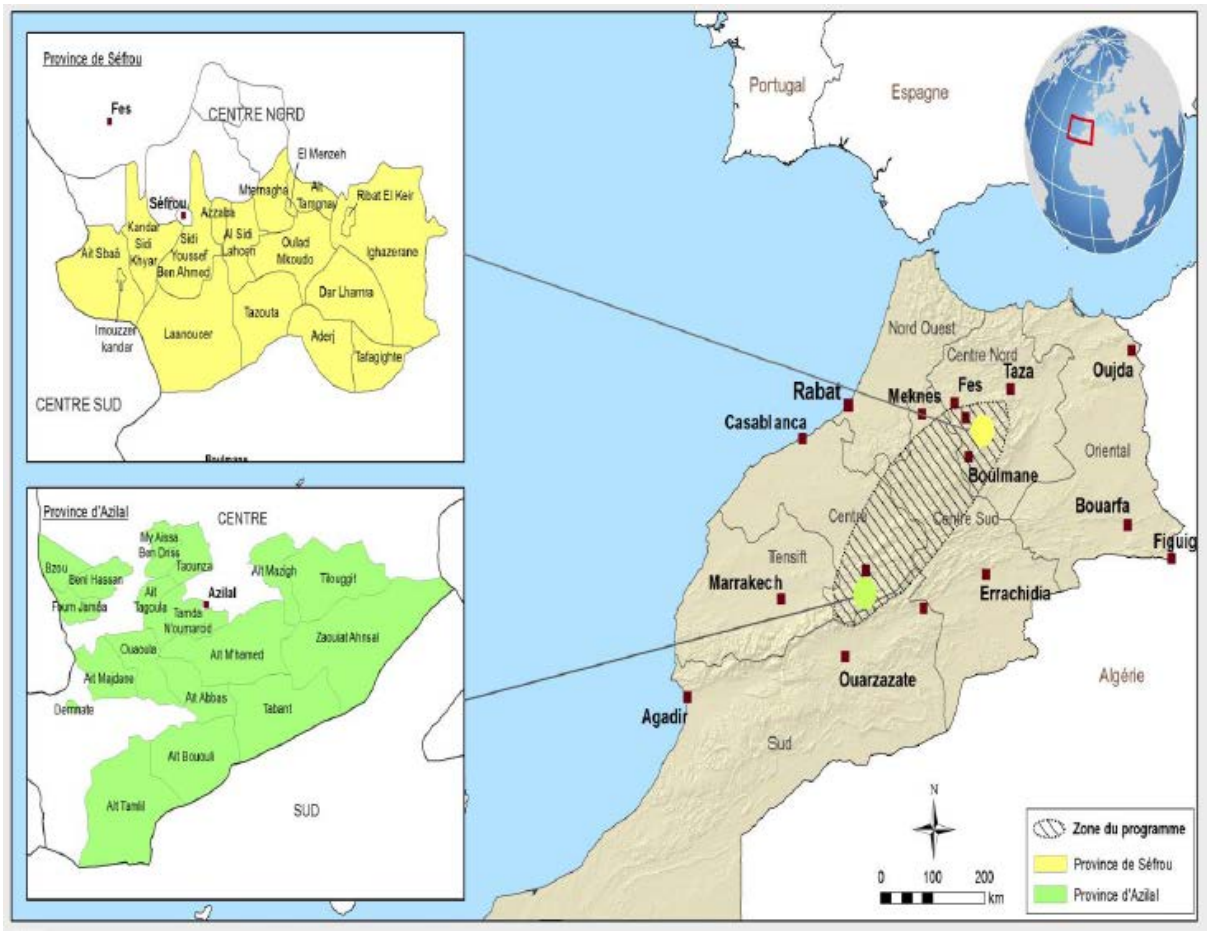
Monetary unit	=	Moroccan dirham (MAD)
US$1.00	=	MAD 8.19 MAD (November 2
EUR 1.00	=	MAD 11.2365
US$1.00	=	EUR 0.7357
EUR 1.00	=	US$1.3592

Weights and measures

1 kilogram (kg)	=	1,000 grams (g)
1,000 kg	=	2,204 pounds
1 kilometre (km)	=	0.62 mile
1 metre	=	1.09 yards
1 square metre	=	10.76 square feet
1 acre	=	0.405 hectare (ha)
1 ha	=	2.47 acres

Kingdom of Morocco

IFAD Intervention Areas in the Provinces of Sefrou and Azilal



Abbreviations and acronyms

ADA	Agricultural Development Agency
ANOC	National Sheep and Goat Association
APEFEL	Association of Producers and Exporters of Fruits and Vegetables
ASAP	Adaptation for Smallholder Agriculture Programme
ASPEM	Association of Producers and Exporters of Horticulture Products
AWP	Annual Work Plan
CA	Conservation Agriculture
CAP	Climate-resilient Adaptation Plans
CB	Capacity Building
CBD	UN Convention on Biological Diversity
CC	Climate Change
CCA	Provincial Director of Agriculture
CCD	UN Convention to Combat Desertification
CDM	Clean Development Mechanism
CNCC	National Committee on CC
CNSTCC	National Scientific and Technical Committee on Climate Change
COP	Conference of Parties
COSOP	Country Strategic Opportunities Programme
DGCS	Directorate General for Local Collectivities
DIAEA	Irrigation and Land Use Management Directorate
DPA	Provincial director of agriculture
DRA	Regional agriculture directorate
EIT	Efficient Irrigation Technologies
FAO	Food and Agriculture Organization
FDA	Agricultural Development Fund
FFS	Farmers Field School
FNC	First National Communication to the UNFCCC
FODEP	National Environment, Industrial and Remedial Fund
GDP	Gross Domestic Product
GIS	Geographic Informative System
GIZ	German Agency for Technical Cooperation
ha	Hectare
HCEFLCD	High Commission for Water, Forests and Combating Desertification
HCP	High Commissioner for Planning
IFAD	International Fund for Agricultural Development
INDH	National Human Development Initiative
INRA	National Agricultural Research Institute
IPAC-MAM	Increasing productivity and adaptive capacities in mountain areas of Morocco
IPCC	Intergovernmental Panel on Climate Change
M	Million
MAD	Moroccan dirham
MAP	Medicinal and Aromatic Plants
MAPM	Ministry of Agriculture and Ocean Fisheries
MASEN	Moroccan Agency for Solar Energy
MCA	Millennium Challenge Account
M&O	Monitoring and Evaluation
NCSA	National Capacity Self-Assessment
NIMAP	National Institute of Medicinal and Aromatic Plants
NR	Natural Resources
NRM	Natural Resources Management
OA	Organic Agriculture
ODCO	Cooperation Development Office
ONCA	National Agriculture Advisory Office
ONEM	National Environmental Observatory of Morocco
ONSSA	National Food Safety and Security Office
OREDD	Regional Environmental and Sustainable Development Observatories
ORMVA	Regional Office for Agriculture Development
PCCU	Project Central Coordination Unit

PDRZM	Rural Development Programme in the Mountain Zones
PICCPMV	Integration of Climate Change Adaptation Measures in the implementation of the Green Morocco Plan
PIM	Project Implementation Manual
PIR	Project Implementation Review
PMU	Provincial management unit
PMV	Green Morocco Plan
PNLCRC	National Plan to Mitigate Global Warming
PTLCRC	Territorial Plans to Combat CC
RB	Results-based
R&D	Research and Development
SCCF	Special Climate Change Fund
SMANE	Environmental Enhancement Strategy
SNC	Second National Communication of Morocco to the UNFCCC
SNE	National Environmental Strategy
SRF	Strategic Result Framework
SVA	Agriculture Extension Services
t	Tons
UNCAM	National Union of Moroccan Farming Cooperatives
UNDP	UN Development Programme
UNFCCC	United Nations Framework Convention on Climate Change
UNIDO	United Nations Industrial Development Organization
USAID	United States Agency for International Development
USD	United States Dollar
VC	Value Chain
WB	World Bank
WFP	World Food Programme
WUA	Water Users Association
yr	Year

Summary

1. Morocco is suffering the effects of climate change and becoming more and more vulnerable to environmental disturbances such as water stress, fragile plant cover and desertification.[1] The impact of climate change will be felt in increasingly scarce water resources, aggravated desertification, lower yields, the disappearance of certain crops and a reduction in biodiversity. Although the country has already experienced several episodes of drought, the prognostics for climate change, above all by the Intergovernmental Panel on Climate Change (IPCC), paint an even more pessimistic scenario.[2]

2. The pressures already being exerted on Morocco's limited natural resources are likely to be exacerbated by the future impact of climate change. Water and agriculture, the country's most important sectors, bear the brunt of a highly variable and at times extreme climate. The most vulnerable areas are the mountain zones, coastal areas, forests and arid lands. The mountain zones are fragile ecosystems under threat from erosion and desertification. Climate variability here translates into more and more frequent and severe periods of drought and a significant reduction in rainfall. Climate phenomena such as floods and hailstorms damage crops and often erode the productive capital of smallholders and livestock breeders, who make the bulk of the rural communities in mountain zones.

3. The Green Morocco Plan (PMV) launched in 2008 as the country's agricultural development strategy, is designed to: (i) lend the agricultural sector a harmonious, balanced development dynamic that takes into account its specificities; and (ii) build on progress already made while maximizing existing potential. The PMV rests on two major pillars: modern agriculture (pillar I) and solidarity-based agriculture (pillar II). The plan provides for solidarity support for smallholder agriculture under pillar II with the following main objectives: (i) solidarity-based modernization of smallholder agriculture to combat poverty; and (ii) integration of these thrusts within an integrated strategy of rural development and development of alternate income sources.

4. The IPAC-MAM project has been designed as a component of the Rural Development Programme in the Mountain Zones (PDRZM), an IFAD-supported initiative with an overall budget of USD 35.01 million. The objective of the programme, which applies the PMV pillar II approach, is to help strengthen target populations in the mountain zones to raise their income and – mainly through IPAC-MAM – build resilience to the impact of climate change. The GEF component, valued at USD 6.51 million, will complement the activities of PDRZM in the light of the expected impact of climate change.

5. IPAC-MAM will target two areas (Azrou province in the northern part of the Middle Atlas and Azilal province in the central High Atlas) that are considered priority regions for climate change adaptation by the PMV. The project will adopt a crop diversification adaptation approach, involving the PICCPMV (Integration of Climate Change Adaptation Measures in the implementation of the *Green Morocco Plan*) priority value chains for the central mountain regions – fruit tree production intercropped with legumes and vegetables – in addition to the sustainable use of the natural ecosystems – honey and PAM production.

6. The criteria for the selection of the target areas were set in consultation with the Ministry of Agriculture and Ocean Fisheries (MAPM) during the identification mission. Five criteria were identified: (i) vulnerability to the effects of climate change; (ii) poverty and vulnerability rates; (iii) existence of potential for development in the form of socio-economic, infrastructure and climate assets; (iv) institutional capacity to implement activities; and (v) number and type of existing programmes and projects in the province.

7. The direct beneficiaries of the IPAC-MAM are the same as those targeted by the PDRZM (IFAD) programme – unions, cooperatives and groups targeted under pillar II of the PMV. Beneficiaries in the two provinces are estimated as follows: approximately 144,000 direct beneficiaries (24,000 households) and 240,000 indirect beneficiaries (39,000 households), totalling 385,000 direct and indirect beneficiaries (63,000 households). Following IFAD's policy and Governmental recommendations, the project will pay special attention to enable women to access agriculture production means, and join professional organizations - especially decision-making bodies.

8. Although rainfed cereals predominate in Morocco's central mountain watersheds, they are not well adapted to the environmental conditions of superficial soils, steep and rugged

[1] http://www.fao.org/nr/climpag/pub/FAO_WorldBank_Study_CC_Morocco_2008.pdf
[2] GIEC, 2013

topography, and extreme climate conditions. The PMV strategy has prioritized the promotion of fruit tree production in mountain areas by progressively converting cereal lands into diversified cropping systems, which are much more cost effective and better adapted to the mountain agro-ecosystems. Because of their ability to provide economic and environmental benefits, the IPCC considers agroforestry to be one of the best "no-regrets" measures in making rural communities adapt and become resilient to the impacts of climate change. Agroforestry creates opportunities for diversification of the agriculture systems – intercropping, honey production, bio-energy production from tree pruning waste, and livestock integration in agriculture – by reducing the mono-cropping dependence risk, exploiting new market opportunities and existing niches. The focus will be on fruit tree production, which represents the value chain with greater potential for agriculture production in the mountain areas. The selected crops are: carob, almond, walnut, cherry, apple, and plum.

9. The overall objective of the IPAC-MAM project is "*to reduce the overall climate vulnerability of rural communities living in risk-prone mountain watersheds of Central Morocco, through the sustainable use of natural resources and the diversification of the local economy".* The specific objective is "*to strengthen the resilience and income capacity of beneficiaries in target communes in the provinces of Sefrou and Azilal, by adapting and upgrading value chains through reducing post-harvest losses, optimizing the use of inputs and natural resources, and promoting diversification in agricultural production*".

10. The project is shaped according to four main components. Component 1 "Community empowerment on adaptive planning and climate-resilient value chains" will tackle adaptive planning and capacity building in the target areas. The component will support the development of adaptive participatory plans for the sustainable use of natural resources and their implementation by the project value chain beneficiaries. Through this component, practitioners will also acquire and demonstrate the capacity to implement climate-resilient agriculture systems and technologies.

11. Component 2 "Strengthening Ecosystem Services" will focus on the maintenance and restoration of natural ecosystems in/around farmland, through environmentally sound and socially beneficial ecological restoration and risk reduction measures. This will include the introduction and application of climate-proof technologies for the efficient management of water, energy and waste in sustainable crop production, and the restoration of ecosystem services supporting agriculture production in the target areas.

12. Component 3 "Climate proofing of value chains and diversification of productive practices" will enable beneficiaries to deal directly with climate adversities by increasing productivity and the overall quality of the natural capital (soil fertility, soil organic matter, soil water content, pollination services, healthy natural vegetation cover, etc) so as to ensure a sustained production over the years of high quality products, and diversify investment. Fruit tree value chains will be improved through climate-resilient investments upstream and downstream the project areas, while adaptation measures will be applied to the honey value chain, to enhance production and quality improvement**.**

13. Component 4 "Project Management" will finance management, coordination and technical supervision of the implementation of the various activities of the fully blended PDRZM and IPAC-MAM projects. The Agricultural Development Agency (ADA) will be the implementing agency and will be assigned responsibility to manage the PDRZM baseline and the SCCF project. A Project Central Communication Unit (PCCU) will be hosted within ADA. It will provide overall coordination, monitoring and supervision of the components and activities and capitalization of achievements. The PCCU will be staffed with a manager and an M&E officer and equipped with the resources to fulfil its mandate. Provincial Management Units (PMU) will be placed under the oversight of the Provincial Director for Agriculture (DPA) of Sefrou and Azilal. The staff required for the various project structures will be provided primarily from among resources available within the various offices of MAPM involved in the project.

14. The project staff will spend a considerable amount of time in the field, to provide adequate technical support and monitor the implementation of the training and demonstration activities. Additionally, IPAC-MAM will hire international and national technical expertise to support the project surveys, capacity building and field implementation work.

15. The project will be coordinated by a Steering Committee with representatives from MAPM (ADA) and IFAD. The project governance bodies and teams will ensure coordination with the

various initiatives being promoted by various ministries and departments and being funded by the Government or externally.

16. The workplan will be carried out over the five-year period (2015-2019) in accordance with the following stages: Phase 1: mobilization, fine-tuning of working hypotheses, confirmation of professional organizations and activities planned (months 1 to 6); Phase 2: feasibility studies, market studies, evaluations, participatory natural resources management plans at local level (months 7 to 12); Phase 3: implementation of specific assisted actions and investments, organization of farmers field schools and direct transfer of best practices (months 13 to 48); Phase 4: continuation of activities to transfer best practices and horizontal and institutional awareness-raising campaign (month 48 to 60).

17. The IPAC-MAM project was developed in accordance with SCCF eligibility criteria and respects the principle of national ownership, having been developed in consultation with national stakeholders, and taking into account all relevant recent studies and reports available on Morocco's climate change adaptation needs.

Part I – Situation Analysis

A. Geographical and environmental context

1. Morocco is located in the northwest of Africa between the parallels 20.5º N and 36º N, with a total land area of 71,085 million ha. Land use can be summarized as 5.8 million ha of forests (8%), 9.2 million ha of agriculture land (13%) and 46 million ha of pastures, rangelands and deserts.

2. The Moroccan climate varies from Mediterranean sub-humid in the north and the central mountains, Mediterranean semi-arid to arid in the centre, to Saharan desert climate in the south. The Mediterranean climate type is characterized by dry and hot summers (4 to 6 months), and by short and cold winters. The average annual rainfall reaches more than 1,000 mm in mountain areas (Rif and Atlas ranges), and less than 300 mm in the Moulouya, Tensift, and Souss-Massa basins, Anti-Atlas and the Saharan area. Year-to-year variation of annual rainfall within each region is rather high in Morocco, ranging from a minimum of 23% (Oujda in the northeast) up to 113% (Dakhla in the south). Across all regions, seasonal monthly rainfall appears to be concentrated in the period of September-May, with the months of November and December being the wettest, followed by October and January, and February.

3. Morocco has a remarkable diversity of landforms: from high mountain peaks to high plateaus, lowland plains, coastal areas and desert dune systems. Four mountain ranges - from north to south: the Rif, the Middle Atlas, the High Atlas and the Anti-Atlas - represent 15% of the total country area and 70% of the water surface flow generated from precipitations. The Atlas ranges include the highest elevation (Toubkal in the High Atlas, with 4,165 m) and more than 400 summits approaching 3,000 m. The highest point in the Rif range is Tidirhine, with 2,456 m. The mountain regions of Morocco offer a great wealth of renewable natural resources in the form of water, soil, flora and fauna. In addition, the mountain areas represent Morocco's best water reservoir. Soil in these areas is among the country's most eroded, despite its diversity and wealth. Flora and fauna encompass a large number of native species but are subject to a steady and increasing process of degradation.

4. Lowland plains extend over large areas of the territory: along the Atlantic coast (Gharb, Chaouia, Doukkala, Souss), the Mediterranean coast (Martil Lau, Triffa), and inland areas (Tadla and Haouz, Moulouya). Plateaus occupy most of the territory at different altitudinal ranges, from 200-400 m near the Atlantic coast, to 500-900 m west of the Middle and High Atlas, up to the 1,500m plateaus in Zaian, the Middle Atlas and the Oriental region. Beyond the Atlas, the desert rocky and sandy lowlands and plateaus occupy large areas.

5. Morocco has the largest permanent rivers in the Maghreb. Four major river basins have their catchment areas in the Middle and High Atlas: The Sebou basin (approx. 40,000 km2), the Oum Erbia basin (approx. 35,000 km2), the Bou Regreg basin (approx. 10,000 km2) and the Moulouya basin (approx. 74,000 km2) that drains both the Middle and the High Atlas. However, the uneven distribution of precipitation causes the irregular flow of the river courses. Thus, flooding is the rule in the lowland plains. Groundwater is abundant over most of the country, but sometimes the high concentration of salt in the aquifers makes them unsuitable for consumption and use.

B. Economic Context

6. Morocco is a middle-income country with an estimated population of 32.3 million in 2012, 50% of whom are women. Average demographic growth is in net decline at 1.05%. Rural people account for close to 42% of the total population.[3]

7. Economic growth in Morocco is highly volatile largely due to climate-driven variations in agricultural production, and has rarely exceeded 5%. Between 2007 and 2013, growth averaged 4.5%. Inflation rose by 2.3% between January and July 2013. Unemployment stands at 9% overall.[4]

   <u>The agriculture sector</u>

[3] RGPH 2004.
[4] Economic and financial report 2013

8. The agriculture sector in Morocco continues to be crucial to macroeconomic balance and the country's economic and social development, given its comparative weight with respect to issues pertaining to employment, food security, poverty alleviation, etc. Agriculture contributes 14% of gross domestic product (GDP)[5] and 23% of exports by volume, and employs 43% of the active population, about 4 million people. In rural areas, agriculture is main employer, providing 80% of income for 14 million rural people. Agricultural performance is reflected in the coverage of food needs by domestic production: meat, 80%, fruits and vegetables, 100%; milk, 82%; cereals, 62%, sugar, 47%, butter, 31%; edible oils, 21%.

9. Moroccan agriculture is mostly rainfed, characterized by a mixed and integrated crop/livestock system that represents the main source of income for the majority of rural households. Most arable land and rangelands are located in areas receiving less than 400 mm, where cereals and small ruminants – mainly sheep – are integral components of an extensive dryland production system[6]. Seven major agro-ecological zones are defined, based on four criteria: (i) natural-resource base; (ii) dominant livelihoods (main staple and cash income sources, as well as the balance between crops, livestock, forestry, fishing and off-farm activities); (iii) the degree of crop-livestock integration; and (iv) the scale of operation (Table 1)[7].

Table 1. Major Farming Systems in Morocco

Farming System	Principal livelihoods	Major features
Irrigated	Fruits, vegetables, cash crops	The system contains both large and small-scale irrigation schemes.
Irrigated mixed	Cereals, legumes, sheep, off-farm work	There are two subsystems: (a) rainfed cereal and legumes plus tree crops (fruits and olives) on terraces; (b) livestock, mainly sheep, on communal managed lands. Poverty is extensive, as markets are often distant, infrastructure is poorly developed and the degradation of natural resources is a serious problem.
Rainfed mixed	Tree crops, cereals, legumes, off-farm work	Supplementary irrigation is used for winter wheat and on summer cash crops
Dryland mixed	Cereals, sheep, off-farm work	The risk of drought is high and considerable food insecurity exists. Livestock, including cattle and small ruminants, interact strongly with the cropping and fodder system. Poverty is extensive among small farmers.
Pastoral	Sheep, goats, barley, off-farm work	
Sparse (Arid)	Camels, sheep, off-farm work	

10. Agriculture in Morocco is characterized by both traditional and commercial sectors. The traditional sector consists of small farms in rainfed areas involved predominantly in cereal, legume, and livestock production. The commercial sector operates mainly in irrigated areas. The average size of a farm is 5.7 ha, with about 70% of farms under 5 ha.

11. The agriculture sector suffers from a significant volatility driven by the general structure of the production, dominated by cereal crops – mainly wheat, durum wheat, barley and maize

[5] Of which 4 per cent pertains to agro-industry.

[6] Dahan, R. Et al. (2012) A review of available knowledge on land degradation in Morocco. Oasis Country Report 2. ICARDA-USAID.

[7] ISCRA, 1994. In: Dahan, R. Et al. (2012) A review of available knowledge on land degradation in Morocco. Oasis Country Report 2. ICARDA-USAID.

– which account for 55% of total value-added of crop production and occupy 65% of the agriculture area. Cereal productivity, mainly rainfed, experience significant annual variations due to its dependence on precipitation, hence the observed fluctuations characterizing the evolution of agriculture value-added. Export crops, mainly citrus and vegetables, occupy a very small share of production, yet their added value is substantially high, as they are usually more labour-, chemical-, and water-intensive compared with cereals.

12. Rural land use is dominated by extensive livestock raising, rainfed cereals, tree cultivation and market gardening. The consequences of larger herds and agricultural intensification are settlement of herders, cultivation of pasture with excessive use of fertilizers and pesticides, encroachment upon forest areas and strong pressures on the water table.[8] The degradation of forests is of increasing concern despite the conservation measures taken by the Government. Climate projections call for higher average temperatures, lower precipitation, greater climate variability and a growing deficit in water resources.

C. Social context

13. The mountain zones cover approximately 19 million ha, and account for an estimated 30% of the total population, with a density[9] of 40 inhabitants/km^2. Mountain communities live essentially from agriculture, livestock and forest products. Women represent close to 57% of all agricultural labour.

14. About 75% of poor people living in rural areas derive their income from agriculture. Despite the government's efforts, the poverty rate in the rural areas is still higher than among urban dwellers. The incidence of rural poverty varies by region, remaining the mountain zones remain among the poorest areas in the country, in some cases exceeding 1.5 times the national average[10]. In the project target areas the poverty rate reaches 43% in the province of Sefrou and 40% in the province of Azilal.

15. The main problems related to the high poverty levels in mountain areas are: (i) the high rate of illiteracy; (ii) the lack of access to rural financial services; (iii) the lack of access to markets; (iv) insufficient vocational training supporting the labour market; (v) local governance problems; (vi) insufficient presence of professional organizations; (vii) insufficient, inappropriate and unfair gender integration; (viii) weak presence of the agro-industrial sector; (ix) environmental constraints due to extreme climate conditions exacerbated by climate change (e.g. hail, floods, torrential rainfall, heat waves), steep slopes with poor soils, and erosion/deforestation problems.

D. Institutional Context, National Policies and Legislation

16. The development of dynamic and durable farming systems requires a conducive policy environment. Several agencies and institutions are responsible for the protection of the environment and combating desertification in Morocco. At the national level, the tasks are shared by the *High Commission for Water, Forest and Desertification Control*, and the Ministries of *Land use management*, *Water and Environment*, *Equipment and Transport* (National Directorate for Meteorology), *Agriculture and Maritime Fisheries*, *Energy*, and *Habitat and Urban Planning*. Morocco also has several councils related to general environmental conservation activities such as the Superior Council for Water and Climate.

17. There is growing acceptance among concerned authorities of the need to re-orientate development towards the elimination of poverty, based upon sustainable resource use. Five broad strategic initiatives have been proposed:

• Sustainable resource management: natural resources need to be conserved, through improved watershed management in hill and mountain areas, soil conservation in sloping lands and improved range management in pastoral areas. Components include the strengthening of local resource-user groups, better management practices, and improved long-term policies.
• Improved irrigation management: increased efficiency in irrigation and water management is essential to support the intensification and diversification of production and to reduce resource depletion. Components include: schemes based on both surface and underground water technology, and adjustments to water charges and other regulatory measures.

[8] Tramblay, Y et al 2012
[9] Average density nationwide is estimated at 37 ha/km^2.
[10] Among Morocco's poorest provinces, part or all are located in mountain zones, and some of these post rural poverty rates in excess of one and one half the national average.

• Re-oriented agricultural services: the re-orientation of agricultural research systems to fully involve farmers will underpin intensification in the irrigated and rainfed mixed systems and enterprise diversification. Components include: extension services based on public and private service providers, and greater support for rural agribusinesses to create off -farm employment.
• Revitalized agricultural education systems: new approaches to science and higher education learning systems are particularly important in the training of agriculturalists who will work in both public and private sectors. Components include: the adoption of the significant advances in interdisciplinary learning and systemic thinking, which have played an important role in agricultural education elsewhere in the world.
• Rationalized agricultural policies: the challenge to Moroccan agriculture is not only to enhance production to meet the increased food demands of the expanding population, but also the judicious use of soils so that their productivity is sustained in the future. This is the main objective of the new Green Morocco Plan (PMV).

18. In response to the increasing degradation of natural resources under climate, anthropogenic and socio-economic pressures, Morocco has launched a number of strategies, plans and measures – to check certain types of degradation and to ensure the sustainability of resources. These include rational water management programmes, sustainable land management strategies, plans to combat desertification, biodiversity protection measures, and policies promoting energy effectiveness and the use of renewable energies.

19. In recognition of the inextricable links between environmental and agricultural policies, Morocco developed the Green Morocco Plan (PMV),[11] which takes into account the key role played by economic stakeholders and, inter alia, smallholders in the mountain zones. Launched in 2008, the PMV aims to modernize the small and medium farm holdings, to make the agriculture a dynamic, harmonious and balanced development sector that takes into account their specificities, and to face the new challenges of the global food system and global warming trends, while preserving the social and economic balances.

20. The PMV strategy rests on two major pillars: modern agriculture (pillar I) and solidarity-based agriculture (pillar II).[12] The plan provides for solidarity-based support for smallholder agriculture under pillar II with the following main objectives: (i) solidarity-based modernization of smallholder agriculture to combat poverty; and (ii) integration of these thrusts within an integrated strategy of rural development and development of alternate income sources. The strategy covers between 600,000 and 800,000 farmers, and is expected to improve living conditions for three million rural people. The PMV strategy provides for the achievement of its objectives, the preservation of natural resources to ensure sustainable agriculture and the inclusion of the Climate Change dimension at the level of the PMV project design.

21. Morocco has adopted a specific strategy of development for the mountain zones with the following objectives: (i) mitigating the degradation of natural resources and biodiversity; (ii) narrowing the social and economic gap between the mountain zones and other parts of the country; and (iii) combating poverty.

22. The National Initiative for Human Development (INDH) launched in 2008 is an innovative step towards a comprehensive development of the country. It is a five-year plan for sustainable socioeconomic and political development through different projects, which aim at building infrastructure and providing employment and social services, particularly in rural areas (403 rural communities characterized by high rate of poverty >30%). The 2020 Strategy of Rural Development and the plan of action for its implementation are integrated within the framework of the orientations and principles of the INDH. The long-term goal is to promote a pattern of development, which fulfils the needs of the population while ensuring that the environmental resource base is maintained for future generations. In order to achieve this goal, a comprehensive approach integrating rural development and environmental protection is adopted. This implies working with local communities, building capacities, launching model projects and influencing the policy frameworks. Such an approach requires working from the local, through the regional and up to the national level.

23. Morocco signed the United Nations Framework Convention on Climate Change (UNFCCC) in 1992 and ratified it in 1995. Morocco is also signatory party of the major international protocols and conventions, in particular those relating to the Mediterranean region and

[11] http://www.agriculture.gov.ma/pages/la-strategie
[12] http://www.agriculture.gov.ma/pages/pilier-ii

coastal regions. The Moroccan government has adopted an adaptation policy based on implementing a legal and regulatory framework and building climate change issues into the planning and implementation of development programmes, and has formalized its commitments to protect the environment and combat the effects of climate change, passing legislation on environmental protection, carrying out the Initial National Communication on climate change in 2001, and introducing the National Plan to Mitigate Global Warming (PNLCRC) in 2009 and the Second National Communication in 2010.

24. The PNLCRC was developed to coordinate actions to be taken by the various ministries for both mitigation and adaptation, as well as providing for territorial plans to combat climate change (PTLCRC) to complement such actions and tailor them to territorial specificities and sensitivities. This plan includes a number of governmental actions covering mitigation, adaptation and governance measures.

25. From an institutional point of view, the national strategy called for the creation of the National Committee on Climate Change (CNCC) and National Scientific and Technical Committee on Climate Change (CNSTCC), underscoring the importance of involving all stakeholders. These include administrations and institutions, local elected officers and collectivities, economic operators, researchers and civil society actors. However, there is no equivalent regional or provincial body at the local level responsible for climate change issues. The CNCC is chaired by the Department for the Environment, who is the national focal point for UNFCCC. The CNCC main role has been to draft the first (FNC) and second (SNC) national communications to UNFCCC in 2001 and 2009.

26. In November 2009 a National Plan Against Global Warming was presented at Copenhagen COP, including summaries of current emissions and projections of climate impacts. The SNC, published in April 2010, gives disaggregated geographic and climate data for the country, summarizing CC projections. It outlines Morocco's policies on CC and the institutions that have been put in place to undertake research and project implementation.

27. Morocco's national strategy for energy was published in 2009 and aims to have 15% renewable power generation and 12% energy efficiency savings by 2020. In January 2010, the law concerning renewable power generation was liberalised to allow anyone to generate power for its own use. The Government of Morocco has established the Moroccan Agency for Solar Energy (MASEN) to implement its solar power programme.

28. Other short-, medium- and long-term environmental strategies have been put in place by the Department of Environment to operationalize the National Environment and Sustainable Development Charter: the Environmental Enhancement Strategy (SMANE), National Environmental Strategy (SNE) and National Sustainable Development Strategy (SNDD). In addition, the National Environmental Observatory of Morocco (ONEM) and the Regional Environmental and Sustainable Development Observatories (OREDD) were created under a proximity approach to implement environmental strategies and prepare periodic regional integrated evaluation reports on the status of the environment.

29. Further measures relate to financing, under the National Environment, Industrial Remediation Fund (FODEP), Water Treatment and Wastewater Purification Fund, Energy Development Fund, Structural Fund to Combat Flooding and Climate Investment Fund, set up to act as leverage to manage adaptation to the effects of climate change and ensure the deployment and transfer of low-carbon technologies, in addition to the Agricultural Development Fund (FDA) created in 1986[13].

PART II. Threats and Root-Cause Analysis

A. Anthropogenic problems

30. Rural areas in Morocco are characterized by insufficient productivity due to: (i) degradation of natural resources; (ii) low levels of education; (iii) insufficient socioeconomic infrastructure and inadequate support services; (iv) limited involvement of the rural population, especially women, in the development process; (v) poor use of the Government's human and financial

[13] SNC (2010) Second National Communication of Morocco to the United Nations Framework Convention on Climate Change.

resources; (vi) absence of sufficient rural financial services for small farmers and the rural poor.

Environmental degradation

31. In Morocco, natural resources are seriously affected by increasing degradation. Soil erosion is a result of several factors, such as increased population pressure over limited natural resources, overexploitation of forestry assets, removal of natural vegetation from the slope lands, overgrazing, cultivation of vulnerable lands in steep mountain slopes, arid and desert regions, and inappropriate general land management (mainly deep ploughing). The rural poor heavily depend on forest resources, creating extra stress on ecosystems when rangelands and croplands are unable to meet and sustain their livelihoods.

32. Soil erosion is a major environmental and economic problem that threatens the sustainability of agriculture lands, water reservoirs and natural resources in many areas of the country. Almost all Moroccan lands face water erosion and more than 2 million hectares of agriculture lands are water eroded. Average soil erosion varies from 2.1 to 20 t/ha/year, but exceeds these rates in the northern and north-western basins (e.g. the erosion rate in the Rif mountains is one of the most severe ones in the world, between 30 to 70 t/ha/year[14]). The majority of watersheds in the country is characterized by high specific damage exceeding 2,000 t/km2/yr. The storage capacity loss in the Moroccan dams is 2% per year (50 million m3), whereas in the Mediterranean countries it is evaluated 0.5 to 1% in average.

33. It is estimated that areas in process of land degradation affect the livelihood and food security of about 1.5 million households in Morocco. These households tend to further extend their agricultural production and livestock systems to other marginal and fragile lands, thus seriously further degrading the natural resource base[15]. An economic analysis has estimated the global cost of lost productivity as a result of land degradation at between USD 91 and 178 million per year (cropland and rangeland degradation). The total cost of land degradation in Morocco represents about 1.7% of the GDP.

34. The Moroccan forest ecosystems suffer a severe degradation process, resulting from a combination of excessive wood harvesting, forest fires, crop encroachment and excessive harvesting of fuel wood. Forest loss is estimated at approximately 31,000 ha/yr (22,000 ha due to overharvesting; 4,500 ha due to land clearance; 3,000 due to fire; and 1,000 due to urbanization). Similarly, approximately 8.3 million ha of rangelands are heavily degraded, and about 65,000 ha/yr are cleared. The total loss of fodder production ranges from 26 to 44 million units in the steppes and from 32 to 54 million units in the silvopastoral areas.

35. Overexploitation of the water table also threatens irrigated lands. Inappropriate water management also lead to salinity (500,000 ha mainly located in the command areas are threatened by salinity). Vast areas of irrigated land suffer pollution, including overuse of fertilizers, pesticides and herbicides, and inappropriate soil amendments.

Institutional and policy problems

36. The Moroccan institutional system is characterized by an overabundance of administrative actors where many agencies and authorities are involved in reforming natural resource management. The little synergy among them is the main obstacle for collaboration, coordination and integration of proposed measures and management approaches.

37. The excessive centralization of decision-making processes is often identified as a major institutional constraint. In addition, the design of NR development programmes has followed a top down and hierarchical approach with little or no involvement of beneficiaries, and serious problems of coordination between various stakeholders or project partners.

38. The Moroccan legal framework reveals scarcity of incentive measures to boost NR conservation and sustainable management. Governmental services have little capacity and flexibility to integrate population needs at the lowest local level, limiting the scope of the NR development programmes and the equitable distribution of their benefits among all users. Funding mechanisms represent a major constraint due to a number of limitations, such as irrelevance of the loan system, inadequate public funding, absence of mechanism for fundraising, funding discontinuity, and lack of stability and rigidity of funding.

[14] MADRPM, 1991

[15] Dahan, R. Et al. (2012) A review of available knowledge on land degradation in Morocco. Oasis Country Report 2. ICARDA-USAID.

39. In general, NRM remains understaffed. The few available technicians are not fully optimized due to insufficient capacity building and knowhow, unavailability of adapted technological packages, unclear definition of their mandates, and fair compensation for their efforts.

Value chain development problems

40. Small farmers, who constitute the majority in Morocco (70% of farms are less than 2 ha), have low technical and managerial skills, lack organizational systems, and do not have the financial resources to modernize their system of production and marketing. Agro-industries are rarely involved in upstream agricultural production, and suffer from irregular supply of raw materials, both in quantitative and qualitative terms.

41. The marketing of agricultural products is poorly organized. The marketing circuits are often traditional with high post-harvesting losses and an increase in product prices up to three times. These weaknesses can be summarized as follows: (i) inadequate post-harvest technologies; (ii) high number of intermediaries; (iii) low integration between producers and markets, and between producers and processors; (iv) inadequate transport means (namely, refrigeration); (v) lack of or insufficient post-harvest infrastructure and technologies, such as sorting, grading, storage, and packaging; (vi) low quality assurance system. The improvement of marketing channels through the development and implementation of post-harvest technologies will clearly increase the value added in the mountain value chains, for the benefit of vulnerable populations such as women, youth and small farmers in general.

B. Climate change

42. Morocco suffers the effects of climate change and is becoming increasingly vulnerable to environmental disturbances such as land degradation and desertification (e.g. higher runoff erosion due to more frequent and intense floods and heavy precipitation events; forest dieback and vegetation desiccation processes due to heat weaves and water scarcity), biodiversity loss, and agriculture productivity decline. Food security is essentially based on rainfed agriculture - 83% of the cultivated areas in the country - that is very sensitive to the climatic variability and extreme weather events that characterize the Moroccan climate. The importance of agriculture as a source of income (15-20% of GDP) and employment (40%), the modest technological progress achieved in this sector, and low use of climate risk management instruments makes the country particularly vulnerable to climate change[16].

43. Over the past decades, Morocco experienced several changes in the annual climate cycle with the exacerbation of extreme weather events – heat weaves, drought and heavy rains. Numerous extraordinarily intense rainfalls have caused floods that resulted in infrastructure damage and loss of life in many cities and villages (e.g. rainfall exceeding 150 mm in less than 24 hours in many weather stations in 2008 and 2009). According to the Moroccan Meteorological Office[17], the average annual water supply from precipitation experienced a decrease of about 15% (between 3% and 30% depending on the regions) nationally during the period 1971-2006, with a random succession of dry years and wet years[18]. The hydrological years 1982-83, 1983-84, and 1994-95 were years of the most severe drought that Morocco has experienced between 1971-2000, with a reduction in water supply to the river basins between 38% and 80% from north to south. Annual precipitation has significantly decreased in the Atlas mountains and Oriental Plateaus, especially as far as the winter snow rainfall is concerned, which is very much determinant for the water supply and regulation throughout the following seasons. The intra-annual precipitation regime has recorded a slight increase of rainfall in the beginning of the rainy season due to very heavy precipitation events, and a decline in the rest of the season, especially in spring (significant reduction trend of about 45% nationally).

44. Over the same period (1971-2000) the average annual temperature showed a significant increase of about 0.16ºC per decade. The frequency of periods, the intensity and the duration of drought have increased over the past three decades (from 1 yr drought for each 5 years period to 1 yr drought for each 2 years period[19]), with an increase in its temporal

[16] Balaghi, R., M. Jlibene & H. Benaouda (2010) Projet d'intégration du changement climatique dans la mise en oeuvre du Plan Maroc Vert (PICCPMV). Rapport de faisabilité du PICCPMV. INRA/DFC

[17] Benassi, M (2008) Drought and climate change in Morocco. Analysis of precipitation field and water supply. In: López-Francos, A. (ed.). Drought management: scientific and technological innovations. CIHEAM, 2008. Zaragoza.

[18] In: Balaghi, R., M. Jlibene & H. Benaouda (2010) Projet d'intégration du changement climatique dans la mise en oeuvre du Plan Maroc Vert (PICCPMV). Rapport de faisabilité du PICCPMV. INRA/DFC

[19] INRA. 2002. Caractérisation du climat et stratégies de lutte contre les effets de la sécheresse au Maroc. Note interne pour le Ministère de l'Agriculture. Département d'Agronomie, INRA Maroc.

persistence, especially in spring. A study conducted in semiarid areas showed that the length of the growing period was reduced from around 180 days in 1960s to 110-130 days for the period 1995-2000[20].

45. The Second National Communication (SNC) to the UNFCCC (2010) informed that the northern and central watersheds (Bou Regreg, Oum-Er-Rbia, Sebou, Loukkos Al-Hoceima, and Moulouya) would be the most affected by precipitation reduction in both scenarios A2 (20% to 30% less by 2050) and B2 (10% to 20% by 2050). SNC projects the highest increase of the average annual temperature in the Oum-Er-Rbia, Sebou, Moulouya and Draa Ziz watersheds of up to 5ºC by 2080, and between 3ºC to 4ºC (scenario A2) and between 1ºC to 3 ºC (scenario B2) by 2050. Evapotranspiration will specially increase in the Draa Ziz watershed (up to 20% in scenario A2 by 2050), and in the central and northern mountain watersheds (up to 15% by 2050 in Oum-Er-Rbia, Sebou, Moulouya, Loukkos, Al-Hoceima). The intensity and duration of drought periods are expected to increase in most regions.[21] Sectors that are strategic to the country's development – water and agriculture – bear the brunt of the effects of climate change.

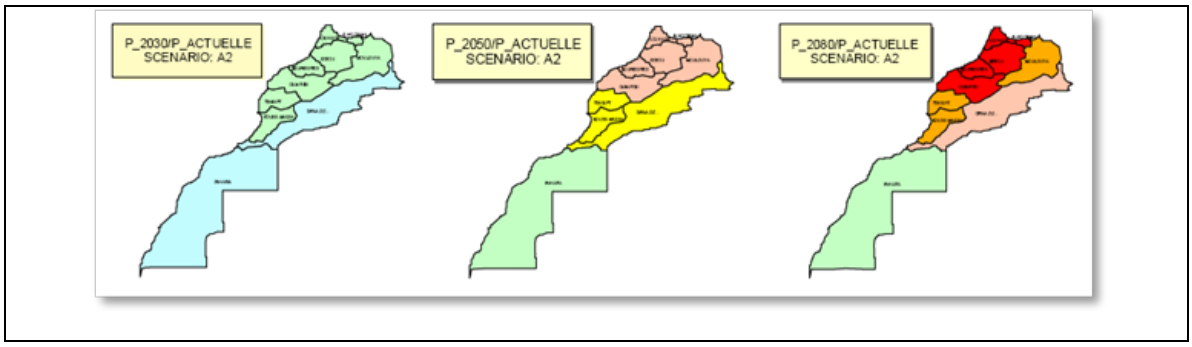
46. The natural vulnerability of Morocco's water sector is characterized by recurring drought and variable precipitation, aggravated by the current approach to water resource management, major water losses in agriculture and distribution systems for household and industrial use, overuse of groundwater resources, pollution and diminished reservoir capacity due to silting. The impact of climate change on water resources is reflected mainly in changes in precipitation[22] in terms of timing and intensity, leading to an overall average decline in water resources and a quantitative and qualitative change in water resources that can currently be mobilized, as indicated in the SNC.

47. The predicted changes in climate will have a significant impact on the water cycle and the availability of water resources in Morocco, which could lead to the following impacts:

- The renewable water resources that were estimated at 29 billion m3 by 2020 may not exceed 25.5 billion m3. From this estimate, the usable water resources may be 17 billion m3 instead of 20 billion (13.6 for surface water and 3.4 for groundwater);
- Surface and groundwater flow will suffer a drop of about 10-15% by 2020 compared to 2000;
- Water availability for human consumption would be 682m3/yr/per capita instead of 775 m3/yr/per capita in the case of absence of climate change.

48. The assessment of future precipitation changes in Morocco, according ARPEGE-Climate, shows a decrease in rainfall throughout the country during the winter season (DJF) and limited to the western part of the Atlas Mountains, which represents an important region from the hydrological and agricultural point of view[23]. This PP decrease is accompanied by a decrease in the number of wet days and the number of heavy precipitation events, and an increase in drought persistence.

Figure 1. Predicted changes in annual precipitation in Morocco (scenarios A2 and B2)



[20] Benaouda, H. 2001. Evolution de la durée de la période végétative des céréales dans la région de Khouribga. Rapport annuel du Centre Aridoculture de l'INRA Settat, Settat Maroc.
[21] J. Schilling et al. 2012
[22] Klose A. 2009
[23] Driouech, F. et al (2010) Weather regimes – Moroccan precipitation link in a regional climate change simulation. Global and Planetary Change 72: 1-10.

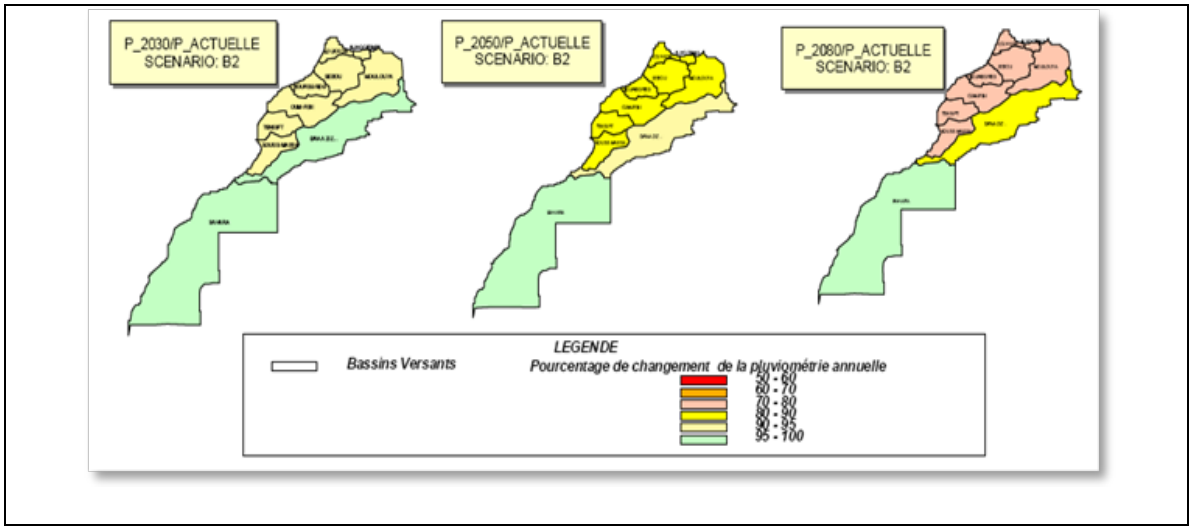
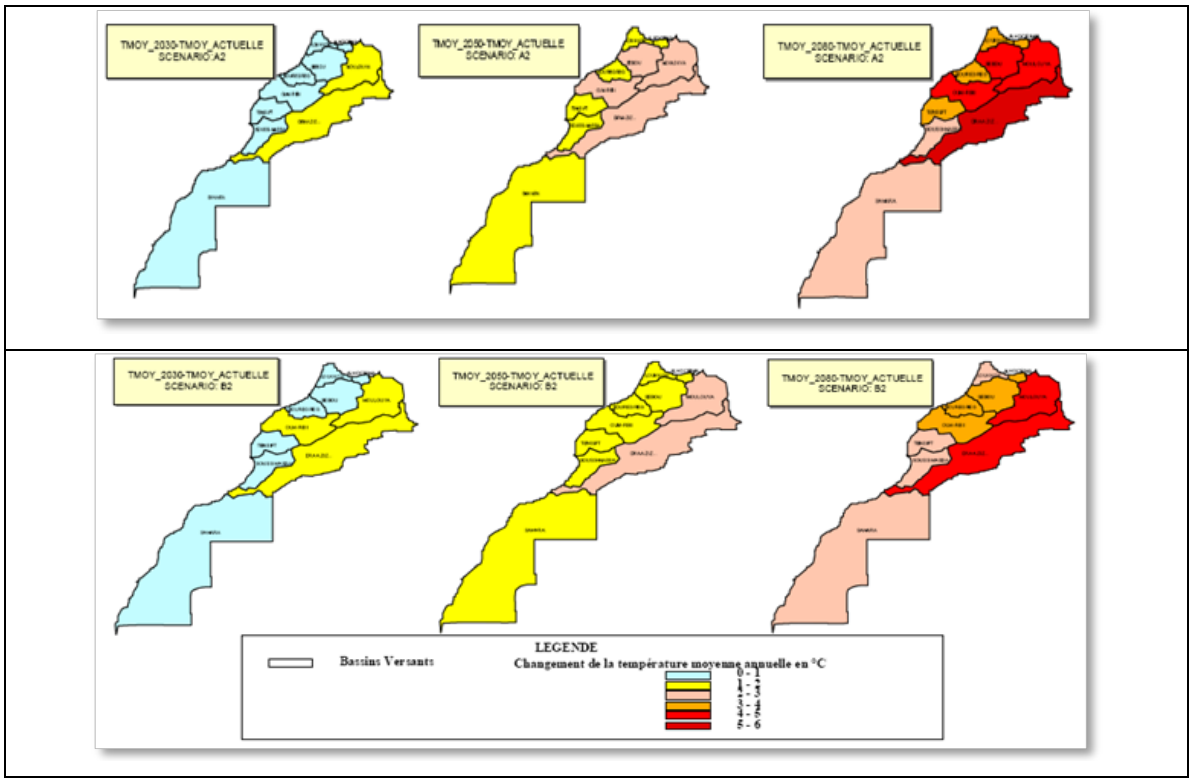


Figure 2. Predicted changes in annual average temperature in Morocco (scenarios A2 and B2)



CC impacts on the agriculture sector

49. There is a strong consensus among policy makers that the growing hydrologic constraints, owing among other things to climate change and its impacts on precipitation patterns, will be one of the major challenges in subsequent decades due to increased scarcity of water resources and demand driven by demographic pressure for human consumption, agriculture production and energy.

50. For the worst case scenario under SRES and assuming no adaptation, the agriculture sector will be hardly hit due to the direct impact on yield, with a crop production reduction of 15-20%, a predicted GDP reduction between 3-15%, and GDP reduction between 1-6% for the

food processing sector by 2050[24]. Imports are predicted to increase more than 30% while exports decrease by 11%. Private consumption is expected to fall substantially following the increase in prices and the negative impact on household income.

51. Based on the yield projection by 2050 (SRES A2 and B2 scenarios) the Moroccan crops can be divided into three categories[25]: (i) most negatively affected crops with yields reductions on average by -7% to -26 % for wheat, -6% to -17% for barley, and -8% to -20% for olives; (ii) crops with mixed impacts on yields, ranging from -7% to +3% for forage crops, from -3% to +7% for citrus, from -7% to +0.6% for other fruits, and from -6% to +5% for other crops; (iii) crops with positive effect on yields, ranging from 2-7% increase in tomatoes, and 0.5-6% increase in other vegetables. In line with numerous impact studies, it is suggested that irrigated crops will experience positive impacts due to climate-induced CO2 fertilization effects, provided that the predictions in water reduction will not constrain irrigation needs. There is a wide range of variability regarding projected yield impacts across and within SRES scenarios, but also across the Moroccan regions.

52. The increase in average winter temperatures will cause significant loss of winter chill hours that are necessary for the flowers of fruits and nuts to bloom, and are required for certain crops to achieve high yields. An inadequate number of chill hours can cause late or irregular blooming, which decreases fruit quality and reduces economic yield. Higher winter temperatures will also result in reduced snowpack accumulation, which reduces irrigation supplies to agriculture.

53. The combined impact of increasing and more variable temperatures, and variable and lower rainfall will increase the probability of abnormally low yields for perennial fruit tree crops such as almonds and walnuts. While there may be some positive impacts and opportunities associated with new temperature regimes, such as the ability to cultivate fruit crops in higher areas, all negative impacts ultimately stand to reduce crop quality, such as decreased size and yields[26]. Some fruit tree species may be at disadvantage due to its susceptibility to water deficits if supplemental irrigation is not provided. This could be particularly important for establishment and growth of regeneration because researchers findings suggest seedlings may be more intolerant of drought than mature trees[27]. Phenological models indicate that increasing spring temperatures may advance bud break thus increasing spring frost hazard[28]. An increase in summer drought or heat stress may also increase spring frost hazard due to a reduction in accumulated C and stored N during the previous growing season. Areas that are currently cold for walnut and other fruit tree species growth may become suitable sites (upward shift) depending on the rate of temperature increase and frequency and severity of extreme weather events.

CC Adaptation measures in the agriculture sector

54. Since the early 80s, the Moroccan agriculture sector has begun to adapt to climate change, thanks to a national effort in Research and Development (R&D), which has yielded positive although not sufficient results. The complexity of climate change and drought phenomena in the Moroccan agriculture imposes the development of an integrated approach based on the genetic improvement (choice of suitable species and genotypes), efficient water management, integrated pest management, soil conservation and fertilization technologies and agronomic packages adapted to each situation[29].

55. More than 75 varieties of cereals have been released by INRA in Morocco with 80% of them after 1983. Over the last 20 years, the adoption of new varieties by farmers has allowed 35% and 50% increase of grain yield of bread wheat and barley respectively, with an increase of 2 to 4 quintals per hectare at the national level, although this period was characterized by many dry years. The adoption of new varieties has also increased the water use efficiency from 8 to 17 kg of grains/mm of water use. For legume crops, the most important achievement was the adoption of adapted varieties of chickpea that allowed the

[24] Ouraich, I. & W.E. Tyner (2014) Climate change impacts on Moroccan agriculture and the whole economy. An analysis of the impacts of the Plan Maroc Vert in Morocco. WIDER Working Paper 2014/083. Wider.unu.edu

[25] Ibid.

[26] Ackerman, F & Al. (2013) Climate impacts on agriculture: a challenge to complacency? Global Development & Environment Institute Working Paper.

[27] Gauthier, D.J. (2011) Walnut (Juglans spp.) ecophysiology in response to environmental stresses and potential acclimation to climate change. Annals of Forest Science, Springer Verlag (Germany), 2011, 68 (8)

[28] Crepinsek et al, 2009 (In, Gauthier, 2011).

[29] Karrou, M. (2002) Climate change and drought mitigation: case of Morocco. INRA.

shift of the sowing period from spring to fall to take advantage of fall/winter rains. For faba bean and lentil two adapted varieties per each species have been recently released to drought prone areas. In the case of forages, the use of new varieties of medics and clovers together with the implementation of the ally-cropping system with strips of *Atriplex* and *Acacia*, was appreciated by farmers in arid and semi-arid areas.

56. INRA maintains 6,500 clones of different species of citrus, almond, fig, olive, date palm, carob, etc, in El Menzeh, Ain Taoujdate, Tassaout and Zagora, for the conservation and use of plant genetic resources of these species. A collection of varieties of fruit species and major performing rootstocks adapted to different agro-systems are available at INRA for their promotion in CC adaptation.

57. Diversification is an adaptation strategy to distribute risks and reduce production and income loss. Diversification in regard to perennial fruits means first and foremost, considering the use of different cultivars and species in the farmland plots in light of the climate variability and CC predictions. But it can also mean diversification of products (e.g., processed products can allow a producer an outlet for less-than-perfect produce), diversification into some annual crops or livestock, even diversification of the landscape (terraces, swales, windbreaks, ponds, etc).

58. In terms of adaptive agronomic practices, Moroccan researchers have demonstrated in on-farm trials the importance of the use of conservation agriculture (CA) systems and technologies (the combined use of no till/minimum till, mulching, intermediate crops, and crop rotation) to reduce soil temperatures and evaporation, increase interception of rain and its infiltration and insure the saving of water, energy and time, with an increase in productivity and soil carbon sequestration. Supplemental irrigation – application of 60 to 70 mm at critical growth stages - and early planting help avoid terminal drought stress and high temperatures and increases yields by 70 to more than 100%.

59. Orchardists in several countries are relying more on permanent cover crops, no-till, and/or mulches or compost applications (e.g. biochar from walnut shells; wood chips[30]), which add organic matter back to the soil, improving drainage and increasing the water-holding capacity of the soil. A high-organic-matter soil is also better at buffering temperatures (soils with a high organic-matter content heat and cool more slowly, reducing plant stress). Other benefits of building organic matter include providing fertility from the organic matter itself, improving fertilizer efficiency from added fertilizers (organic matter has a high cation exchange capacity; i.e., it chemically holds onto most fertilizer elements), and resisting erosion. A soil rich in organic matter teems with important soil life: both macro-organisms (like moles and worms) that help water percolate into soil and microorganisms that are important parts of the soil food web, especially fungi that help with plant nutrition and disease resistance.

60. As agricultural producers deal with increasingly challenging conditions, information, especially weather and climate information, will be in great demand. Most prognosticators predict that the future of agriculture will involve more and better computer-based information technologies to guide irrigation, planting, cultivar choices, etc. But one of the best information sources is “more feet on the ground, more eyes on the land.” Farmer-to-farmer information exchanges could occur through the Internet or through something as simple as more farmers attending field days, farm tours, and networking events.

61. In general, it can be recommended to switch the focus of agricultural production from output maximization to output stabilization[31]. The shifting of planting patterns and adjusting of planted crops is able to reduce impacts of climate change substantially, but a monitoring of irrigation practices and soil conditions will be crucial to secure future productivity. Since poorer parts of the population have less options of adaptation and will be affected more heavily, agricultural interventions should be accompanied by measures that balance social inequalities, with a special gender focus[32].

[30] Unlike other mulching materials, wood chips don’t appear to harbour rodents, and, more importantly for commercial growers, they can often be obtained from olive and fruit tree pruning. Wood chip mulch (made from branches less than 7 cm in diameter) contains less lignified wood and more available nutrients,, and soil fungi thrive in such a “woodsy” environment, providing long-term soil enrichment (Phillips, 2011).

[31] Schilling J. et al (2012) Climate change, vulnerability and adaptation in North Africa with focus on Morocco. Agriculture, Ecosystrems, and Environment (2012) 156: 12-26.

[32] Ibid.

62. A commercialization of pastoral livestock husbandry can be recommended if it is closely linked to an empowering of traditional management institutions. Additionally, our bio-economic model shows that a replacement of firewood by renewable energy supply is able to over-compensate the impacts of climate change on semi-arid rangelands. Pushing forward the development of solar energy systems, as envisioned by the Moroccan government, is therefore promising because it combines a stimulus for the domestic economy with the adaptation to climate change[33].

Part III. Baseline Analysis

63. The Ministry of Agriculture is determined to create one million jobs and double agriculture GDP through the "Green Morocco Plan" (PMV) implementation. The PMV is the new agricultural strategy adopted in Morocco in 2008, and which lays down a vision of transforming the agricultural sector by 2020 to ensure a sustainable path of productivity growth, consolidate integration with local and international markets, support job creation, and mitigate poverty impacts (especially in the rural areas). The PMV is mainly an investment programme. The PMV strategy provides for the achievement of its objectives, the preservation of natural resources to ensure sustainable agriculture through the following: (i) the inclusion of the Climate Change dimension at the level of the PMV project design; (ii) the conversion of nearly one million hectares of cereals to fruit tree plantations that are likely to protect farm land; (iii) the experimentation of conservation agriculture for a much wider use; (iv) the spreading of efficient irrigation systems to save water (from 154,000 currently to 692,000 ha); (v) supporting the development of renewable energy use in agriculture (solar, wind and biogas).

64. The PMV strategy aims to make agriculture the main driver of growth over the next 10 to 15 years, through the creation of 1.5 million additional jobs, the improvement 2 to 3 times in farm income for 3 million rural people, the increase in value of exports from 8 to 44 billion MAD for competitive sectors (citrus, olives, fruits and vegetables), and the implementation of 1,506 projects. The PMV is built on the principle of aggregation as a tool for agricultural development, which lies in the creation of a win-win partnership between the productive upstream and the commercial and/or industrial downstream. Moreover, the PMV aims to ensure the development of Moroccan agriculture in its entirety, both the modern agriculture, localised in irrigated and favourable land areas (20% of cultivated land), and the traditional and subsistence agriculture localised in the unfavourable areas (mountains and oases) that occupy 80% of the useful agricultural area to lands.

65. Given the wide diversity of national agriculture, the Green Morocco Plan adopted two approaches:

66. "Pillar I", whose projects are aimed at developing highly productive modern agriculture with high added value (milk, red and white meat and cereals in favourable lands), particularly in areas with high agricultural potential (irrigated or non-irrigated favourable areas). Pillar I Strategy results in the realisation of 961 aggregation projects and targeting 562,000 farmers at an overall investment of 75 billion Dirhams.

67. "Pillar II" aims to increase the production of plant and animal industries in disadvantaged areas (unfavourable non-irrigated areas, mountain or oasis) with a view to improve the agricultural income of farmers, taking into consideration the preservation of natural resources. Pillar II projects are intended to induce a profound transformation at the systems level from current production, which is mainly dominated by cereal crops, towards high added value products, particularly fruit trees (olives, almonds, figs, etc). The objective is to develop 400,000 ha spread over 200,000 farms. The organization of this type of project requires the creation of 30 to 40 groups of 100 farmers per group, and to reach a total project area of 6,000 to 7,000 ha. Pillar II intensification projects aim to improve the existing gains in animal industries (such as National ovine and goat Association) and the plant sectors, enabling farmers to have better techniques and significantly improve their productivity and enhance their production. Pillar II diversification projects consist of supporting the promotion of special products or land to create additional farm income with additional productions (saffron, honey, herbs, etc)

68. Pillar II envisages the realization of 545 social projects for 855,000 farmers with an investment of MAD 20 billion. The projects are supported by the Moroccan financial sector

[33] Ibid.

(banks, micro-credit companies) and international donors, as part of long-term partnerships. Their implementation will build on the social fabric of operators (cooperatives, associations, GIE, professional associations, NGOs). The beneficiaries should be organized into cooperatives or associations to serve as the sole representative of beneficiaries in the different phases of negotiation and implementation of project components.

69. Aggregation is a cornerstone of the PMV, which represents an innovative model of organizing farmers around private-sector actors or professional organizations with strong management capacities. The result is a win-win partnership between productive upstream and commercial and industrial downstream that allows for overcoming the constraints of fragmented land tenure structures while ensuring that aggregated farms benefit from modern production techniques, financing and market access.

70. The World Bank, with GEF funding, provided support for the implementation of a four-year project on "The Integration of Climate Change Adaptation Measures in the implementation of the *Green Morocco Plan*" (PICCPMV) that has identified priority projects under Pillar II to help integrate CC adaptation measures. The PICCPMV approach is to identify in an integrated way the agricultural technologies with the greatest potential for reducing CC vulnerability, applicable to the most vulnerable and important value chains, and to the most vulnerable regions with high agricultural potential.

71. The PICCPMV priority value chains were identified based in their vulnerability to climate change (relative reduction in the productivity of sectors in 2050 compared to the current period, as the climate scenario A2) and their relative importance in terms of current crop production size in each administrative region (average of the past 10 years, according to statistics from MAPM). The priority value chains are rainfed cereals, (such as oat, barley, wheat and corn), followed in second place by fruit trees, (such as almond and olive tree), and lately by legumes (faba bean, chick pea, lentil, and vetch).

72. PICCPMV has selected and described three priority adaptation technologies: (i) genetic technologies (e.g. the selection of species and varieties resistant to drought; the use of certified seeds with no parasites); (ii) water saving technologies (e.g. changes in the sowing season; conservation agriculture systems and technologies; efficient irrigation technologies; on-farm water harvesting techniques); (iii) integrated crop management approaches, which combine the previously mentioned technologies with a set of techniques of good agricultural practices (e.g. fertilization, integrated pest management, weeding, etc). In particular, conservation agriculture[34], among other practices promoted by the PMV, has demonstrated opportunities for adaptation to climate change. This is especially true in arid countries such as Morocco, which depend heavily on a combination of rainfed crops and irrigation systems for agriculture, as the predominant economic sector. Research has shown that arid countries such as Morocco can also benefit from conservation agriculture to address land management constraints – severe erosion, poor soil fertility and water scarcity – that may be exacerbated by climate change.[35]

73. Several erosion control measures are implemented by the Fruit Tree Productivity Project, implemented in the framework of the Millennium Challenge Account (MCA) Morocco Program (2008-2013). These include dense plantings of fruit trees with micro-catchments along the contour, installation of graded terraces on slopes between 5 and 30% steepness, and cover or perennial intercropping on slopes steeper than 30%. In addition, farmers who intercrop small grains and legumes on slopes flatter than 30% will be encouraged to plough along the contour and to install contour filter strips of grass or perennial legume crops along the tree rows. These measures are predicted (using the Universal Soil Loss Equation – USLE) to reduce soil loss by 83-93%.

74. Since it was launched in 1986, the FDA has pursued the objective of promoting private investment in the agriculture sector and orienting it, through the subsidies and bonuses targeted, towards activities that take better advantage of national potential. As such, the FDA has served as a fundamental tool in implementing government policy and leveraging investment – thus contributing to overall growth in the economy and higher farmer incomes. The FDA approach calls for supporting virtuous processes that are consistent with a

[34] Conservation agriculture consist of a set of management principles (minimise tillage; retention of adequate levels of crop residues and soil surface cover; use of crop rotation) that assures a more sustainable agriculture production while improving soil conditions and soil water availability. In the last 10 years, CA has expanded worldwide at an average rate of 6 million ha (from 45 million ha in 1999 to more than 116 million ha in 2009) involving annual and perennial crops as well, such as olive, vineyards and fruit orchards.

[35] Kassam, A. et al. 2012

sustainable agricultural policy and sensitive to the respectful and intelligent use of natural resources. Most interventions relate to optimizing inputs such as water,[36] equipment,[37] seed and plantations[38] and diversifying downstream value addition.[39]

75. In the framework of its rural poverty alleviation objectives, IFAD so far has supported 13 projects in Morocco, with a total contribution of USD 194 million in the form of loans. Additionally, over the past two decades, Morocco has also benefited from 25 IFAD grants, from which three are currently in force. IFAD funded projects have focused on increasing agriculture production in mountainous zones, rangelands with poor productivity, and rainfed agriculture zones (e.g. the Agriculture Value Chain (VC) Development Programme in the Mountain Zones of Al-Haouz Province; the Agriculture VC Development Programme in the Mountain Zones of Taza Province; the Rural Development Project in the Mountain Zones of Errachidia Province; the Rural Development Project in the Eastern Middle Atlas Mountains).

76. Since 2009, IFAD's policy in Morocco is part of the Human Development Initiative (NHRI) and the PMV Pillar II, which constitute the main national policy frameworks supporting poverty alleviation. Along with these strategies, IFAD developed, in collaboration with the Moroccan public authorities, partners, international institutions and representatives of the civil society, a result-based Country Strategic Opportunities Programme (RB-COSOP) for its operations in Morocco for the period 2009-2014. Considering the relevance and the alignment of the COSOP strategic objectives vis-à-vis the national poverty reduction, human development, agriculture and rural development strategies, the Moroccan government has confirmed the extension of current COSOP over a period of six years, until 2020.

77. The Rural Development Programme in the Mountain Zones (PDRZM) is an IFAD-supported initiative fully aligned with the PMV-Pillar II (Agriculture Solidarity). The PDRZM is scheduled over a period of 15 years divided into 3 phases of five years each. Current PDRZM phase (2015-2019) has an IFAD financial contribution of USD 28.0 million, from which USD 26 M in the form of soft-loan, and 2.5 M in the form of two grants.

78. The Programme overall objective of the program is to contribute to poverty reduction and improve the living conditions of rural populations in mountain areas. The specific objective is to strengthen the income and livelihoods of the target mountain populations in the provinces of Azilal and Sefrou, through upgrading of value chains based on sustainable management of natural resources and diversification of the local economy.

79. The PDRZM strategy is based on the partnership with the private sector for the development of the whole value chain in order to improve access to profitable markets. The programme has adopted the PMV “aggregation” approach that represents an innovative model of organization of farmers in the framework of professional organizations with strong managerial capacity in order to capture the maximum value throughout the value chain. The program will encourage the establishment of women's organizations and will support their representation in existing organizations.

80. The PDRZM covers the provinces of Azilal and Séfrou, where the mountainous area accounts for 80% of the total area of the two provinces. The Program will target 32 rural communes based on their high rates of poverty and land degradation that affect the productive capital of mountain farmers. The target groups are small and medium farmers - maximum 3 ha irrigated, 20 ha rainfed, and/or 50 head of sheep and goats - beekeepers - less than 30 hives - and "landless", young people and women with the skills to carry out small projects for SMEs and income generating activities. Beneficiaries of PDRZM Phase 1 (2015-2019) are estimated at around 385,000 inhabitants (64,000 households), with 180,500 direct beneficiaries (30,000 households) and 205,000 indirect (34,000 households), which represent about 45% of the total population of the two provinces.

81. The PDRZM programme includes two components:

82. Component I (*Development and enhancement of agricultural sectors*) will focus on improving upstream production techniques (fruit trees, honey, and vegetables), reducing downstream post-harvest losses, and improving the storage, packaging and marketing of products. For the livestock sector, the Programme will strengthen the capacity of herder groups in animal health, breeding, disease prevention, among other issues, while women's

[36] http://www.agriculture.gov.ma/sites/default/files/irrigation-et-amenagements-fonciers.pdf
[37] http://www.agriculture.gov.ma/sites/default/files/equipements-des-exploitations.pdf
[38] http://www.agriculture.gov.ma/sites/default/files/siam2014doc/fr/Semences-certifiees-et-plantations.pdf
[39] http://www.agriculture.gov.ma/sites/default/files/siam2014doc/fr/Unites-de-valorisation.pdf

groups will be supported in the marketing of milk as part of a partnership with a private aggregator (central dairy/Danone).

83. Component II (*Sustainable management of natural resources and diversification*) will focus on the sustainable management of water and energy. The associations of agricultural water users Associations (WUAs) and small producers organizations will be strengthened to make them able to manage resources satisfactorily.

84. The PDRZM will be under the administrative control of the Ministry of Agriculture and Marine Fisheries (MAPM) through the Agricultural Development Agency (ADA). It will be coordinated by a central program coordination unit (CPCU), housed at the ADA and relayed in the field by a management unit in each province (PMU). The Provincial Director of Agriculture (CCA) in each province will assume the role of Program Director and Deputy Officer for the implementation of activities. The DRA will ensure the coordination and monitoring at the regional level.

Part IV. Stakeholder Analysis, Project Area and Target Group

A. Stakeholder Analysis

85. The design and implementation of agriculture and rural development policies involves several national and sub-national institutions. The Ministry of Agriculture and Maritime Fisheries and its decentralized structures, are responsible for the overall coordination of the national agriculture sector. The divisions of Irrigation, Spatial Planning and Development of Production Chains provide technical support. Other ministries involved are the M. of Equipment (National Programme of Rural Roads), the M. of Education, etc.

86. At the sub-national level: the Regional Departments of Agriculture (RDA), the Regional Offices for Agriculture Development, the Provincial Agriculture Directorates (PAD), and 122 Work Centres (for non-irrigated areas) and 170 Agriculture Development Centres (ADC) (for irrigated areas) that are the closest structures to farmers.

87. The Ministry of Agriculture has been restructured to facilitate the implementation of the “Green Morocco Plan” (PMV), with the creation of new entities: (i) the Agriculture Development Agency (ADA) with the role of proposing action plans for high value added agriculture sectors through economic viable projects improving farmers’ income; (ii) the Agriculture Development Fund (ADF) that encourages private investments in agriculture through the provision of financial assistance in the form of grants and incentives (e.g. for hydro-agriculture planning, farm equipment, products valorization, etc). Subsidies are higher in the case of cooperatives with respect to individual farmers in an attempt to foster aggregation and better organization of producers. The ADF has created a cell at each Provincial Department of Agriculture (PDA) and each Regional Office of Agriculture Development (ORMVA), which serves as one shop and contact with farmers, in granting financial aid; (iii) the National Agriculture Advisory Office (ONCA).

88. The research-training-education system is composed of several organizations such as the Hassan II Institute of Agronomy and Veterinary Medicine (IAV Hassan II), Meknes National School for Agriculture (ENAM), the National School for Forestry Engineering (ENFI), the National Institute of Agronomic Research (INRA); etc.

89. Other relevant public and private actors are: Chambers of Agriculture; Private enterprises, such as suppliers of agriculture inputs; the National Office for Food Safety; the Moroccan agriculture cooperatives that are grouped in the National Union of Moroccan Farming Cooperatives (UNCAM); the Moroccan Association for Seeds and Seedlings; the Association of Producers and Exporters of Horticultural Products (ASPEM); the Moroccan Association of Producers and Exporters of Fruits and Vegetables (APEFEL); the Moroccan inter-professional federation of beekeeping.

90. The main international financial institutions operating in Morocco include the World Bank (WB), the Islamic Development Bank (IDB), the African Development Bank (AfDB), the European Investment Bank (EIB), the European Bank for Reconstruction and Development, USAID, the EU and several member states, among others. Various UN agencies are active in Morocco, such as UNDP, WFP, UNFPA, FAO, WHO, UNICEF.

B. Target Areas

91. The project areas for the SCCF intervention consist of twelve mountain communes (see Table 2) in the provinces of Sefrou (northern part of the Middle Atlas) and Azilal (north-central part of the High Atlas). These provinces are part of two PMV priority regions - Tadla-Azilal and Fez-Boulemane - (see Table 3) that were selected by the Ministry of Agriculture for the implementation of climate change adaptation projects in the framework of the PICCPMV[40] programme. The PICCPMV prioritizes the fruit trees value chain for the implementation of adaptation measures, followed by cereal crops and legumes. The PICCPMV also prioritizes the adoption of integrated agriculture management approaches, which not only involves complementary adaptive agronomic technologies[41], but also the diversification of crops and sustainable use and restoration of the natural capital[42] that provide key environmental services leading to a more resilient agriculture production, and help diversify the on-farm responses to climate change and variability leading to more resilient rural livelihoods.

92. The selection criteria for identifying target areas within these provinces were defined in consultation with MAPM and in line with the PMV Pillar II principles[43]: (i) environmental vulnerability, including both the effects of climate change and land degradation risks; (ii) high poverty rate, targeting the most disadvantaged and vulnerable population groups, with a gender-based approach to promote the integration of women and young people and gender parity; (iii) the existence of development potential in the form of physical, human, social, financial, and environmental assets; (iv) institutional capacity for implementation; and (v) the number and type of programmes and projects already in existence in the province.

Table 2. Target communes for the IPAC-MAM Project

Provinces	**Azilal**	**Sefrou**
Communes	MoulayAissa	Adrej
	Ben Driss Taounza	Ait Tmegnay
	Ait Ouaarda	Ait Sbaa[44]
	Tabant	Tazouta
	Ait Mhamed	Ighezrant
		Tafghight
		Dar El Hamra

The province of Sefrou

93. The agriculture area in the province of Sefrou is estimated at about 94,000 ha. The two main value chains are cereals (61%) and fruit trees (21%), followed by legumes (6.8%), and other crops. In the mountain areas, two agronomic systems predominate: (i) intensive mono-culture involving fruit trees (cherries, apples and pears) and market gardening (potatoes and onions) in the rural communes with uniform topography and available water resources; (ii) extensive rainfed characterized by cereals, sometimes associated with fruit trees (olives, almonds, walnuts), and with marginal market gardening and legumes for auto-

[40] The Integration of Climate Change Adaptation Measures in the implementation of the *Green Morocco Plan*

[41] The combined use of conservation agriculture systems and technologies (e.g. no till/minimum till, permanent soil cover with crop residues, crop rotation), organic agriculture principles, soil and water conservation, efficient irrigation, integrated pest management, etc.

[42] Mainly through: (i) intercropping systems, combining legumes and vegetables with fruit tree crops; (ii) the use of several crop species and ecotypes from the same crop type; (iii) the restoration and sustainable management of the natural vegetation for honey and medicinal and aromatic plants (MAP) production.

[43] Pillar II projects are based on the following principles: (i) the project must be completed in consultation with the affected population and meeting the requirements for the agricultural sector proposed by the project; (ii) the territory proposed for Pillar II projects must meet criteria established in advance to justify the technical feasibility of installing the project (rainfall, well levels, soil type, etc.); (iii) a Pillar II project may involve one or more rural communities; the number of municipalities within the same project must be chosen so as to streamline the implementation of project components and to particularly optimize the use of recycling units; (iv) Pillar II projects must integrate all the actions to be implemented in the project area, with a view to maximize the value of the sector chosen (actions of small and medium hydraulic, recycling, support for professional associations, etc.), and taking into consideration the necessity to ensure, sustainability objectives and achievements of the project, by the beneficiary population; (v) the beneficiaries should be organized into cooperatives or associations to serve as the sole representative of beneficiaries in the different phases of negotiation and implementation of project components.

[44] The commune of Ait Sbaa is not contiguous with the territory of the other communes included in the province of Sefrou. Given the dynamic nature of existing cooperatives there, project work in the commune will be used as a farmer field school to test best practices.

consumption and fodder for livestock. This system characterizes the rural communes with irregular topography, poor soils and scarce water resources.

94. In the province of Sefrou, agriculture land is distributed from 500m to 1,500 m of altitude, especially in the north-, northwest- and west-facing slopes receiving greater quantities of rain. Fruit tree orchards predominate between 1,000-1,500 m (fruit trees occupy 38.5% of the total areas against 27% of annual crops) while are less represented between 500-1,000 m (61.5% of fruit tree against 72.7% of annual crops). The majority of the cultivate land has gentle slopes suitable for mechanization practices. However, annual and fruit tree crops are still fairly well represented on steep slopes (up to 30%) with higher risk of erosion, which makes it urgent to adopt soil conservation agronomic practices. Severe water erosion (68%) is especially visible in the altitudinal zone between 500-1,000 m, where most agriculture land occurs. However, only 2.2% of erosion affects fruit tree orchards, being most present in degraded forest cover and scrubland (65.3%) and annual crops (22.5%).

Figure 3. Map of target communes in the province of Sefrou

The province of Azilal

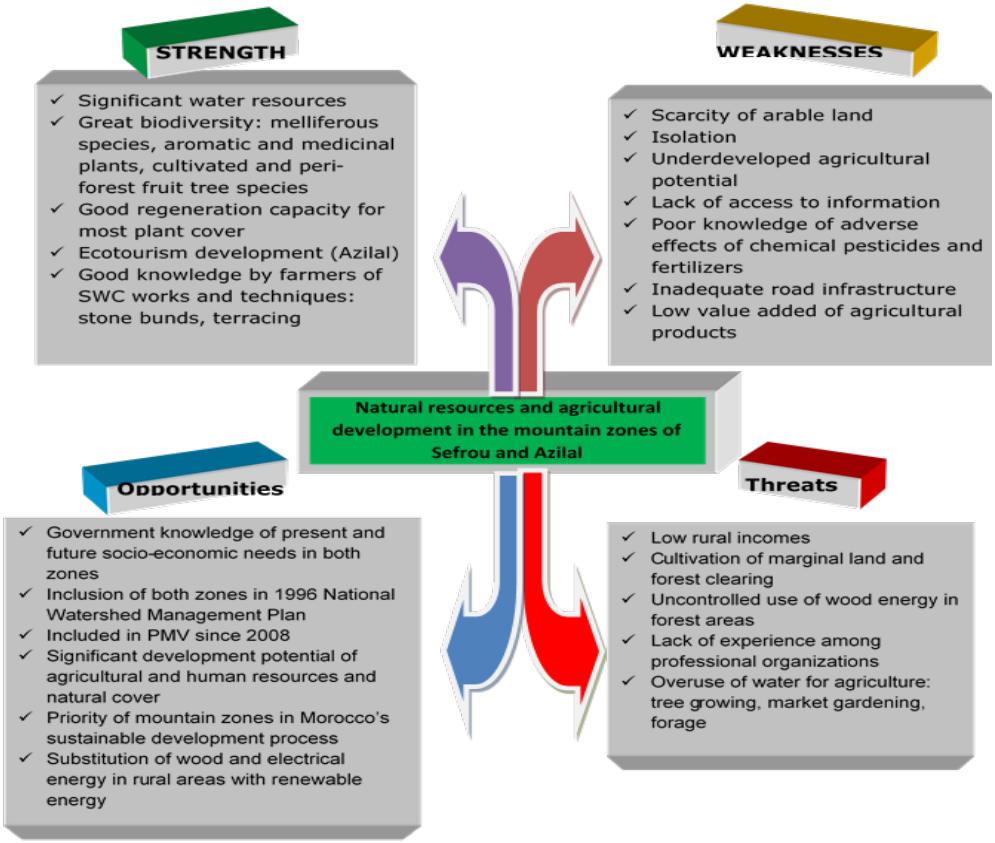
95. The agriculture surface in the province of Azilal is estimated at about 163,100 ha, or 17% of the territory. Cereals (barley and wheat) predominate (77%), followed by fruit trees (19%), and at a much lower rate fodder crops (1.8%), legumes (1.6%) and market gardening (0.6%).

Figure 4. Map of target communes in the province of Azilal

96. Agriculture land extends from 400 to 2,500 m of altitude, mainly in the south- and southwest-facing slopes, possibly to take advantage of favourable microclimatic conditions. Fruit tree orchards are almost the only crop between 1,000 and 1,500 (28% of the total area), while annual crops become predominant between 1,500 and 2,000 m (42.4% of the area is cultivated with annual crops and 29.8% with fruit trees). Al higher altitudes agriculture land decreases rapidly (9.4% of the area is cultivated with annual crops and 3.3% with fruit trees), presumably due to unsuitable climate conditions. Agriculture land occupies steep slopes (15% up to 70%), making it urgent to adopt soil protection measures (e.g. terracing) and soil conservation agronomic practices. Soil erosion predominates in the steep slopes of the altitudinal zone between 1,500-2,000 m (54%) where most agriculture land is located, and characterizes 30% of the altitudinal zone between 2,000-2,500 m with much lower percentage of cultivated land. Widespread erosion mainly affects bare areas (54.9%) and degraded forest cover and scrubland (38.2%). Only 0.4% of erosion affects fruit tree orchards.

97. A strengths, weaknesses, opportunities and threats (SWOT) analysis of the mountain zones from a climate change perspective in the provinces of Sefrou and Azilal could be as follows:

Figure 5. SWOT analysis of mountain zones



98. The provinces of Sefrou and Azilal are exposed to climate fluctuations. As they are largely agricultural, they are particularly vulnerable to variations in the form of heat waves, frosts and hailstorms and generally exposed to the risk of drought. Given their level of socioeconomic development, their overall vulnerability to natural and climate challenges is expected to rise (see annex C – evaluation of climate change vulnerability in the provinces of Azilal and Sefrou). Identification was based on the fact that this overall vulnerability is contingent upon several criteria: the national and international context, geography, climate data and socioeconomic characteristics.

99. Sefrou and Azilal belong to two river basins (Sebou basin and Oum-Er-Rbia basin, respectively) that are prioritized in the national watershed management plan. Watersheds in Azilal are more vulnerable and require more urgent management action than those in Sefrou. This is attributable to Azilal's steeper topography and higher precipitation in the form of rain and snow, compared to Sefrou. Moreover, the pressures of sheep and goat herding, accentuated by the settlement of herders who were formerly transhumant, are greater in

Azilal than in Sefrou. Thus, in both regions and relative to the diversity of their ecosystems, biomass off-take in the form of pasturage forage units is in some places well above the biomass produced by ecosystems, which amplifies degradation. In addition, clearing to expand crops and farmland exacerbates the degradation of ecosystems in both zones. As in the other examples, the situation is more severe in Azilal owing to the scarcity of farmland in steep-sided valleys.

C. Target groups

100. Smallholders and their families are among those who bear the brunt[45] of the effects of the projected adverse variations in climate.[46] Increased poverty – 38% of the rural population compared to 28% countrywide – and a lower quality of life will exacerbate the trend towards rural exodus, with serious consequences on the country's stability and immediate impact on all aspects of Moroccan society[47].

101. Within the framework defined by PMV pillar II, the project will help administrations, associations, cooperatives and local groups adopting natural resources management to restore and improve local ecosystems, by developing the sectors included in PMV pillar II in the two provinces under consideration. The direct beneficiaries of the IPAC-MAM (GEF) project are therefore the same as those targeted by the PDRZM (IFAD) project: unions, cooperatives and groups targeted by PMV pillar II.

102. The beneficiaries are among those identified during the implementation of PMV pillar II projects[48]. These organizations were identified primarily by using the PMV selection or eligibility criteria and were evaluated on a preliminary basis during field visits by experts from IFAD and GEF. The purpose of the PMV procedure is to standardize and formalize the preparation, validation and implementation of projects in connection with the pillar. Of particular importance in this procedure is the evaluation of beneficiaries through their professional organizations and their mandates, internal organizational capacity, composition, size, number of members, management competencies, and development vision and plans. By identifying projects that are pillar II candidates, the procedure allows for accurately determining how, prior to detailed project design, beneficiaries are organized into an associative structure. In addition, this allows for verification that the organization's members meeting in general assembly are informed of the content of the project design and ensure that they are fully supportive of implementation. The procedure also ensures that the general assembly has delegated authority to the president to enter into partnership contracts for project implementation.

103. In accordance with the PMV, the choice of aggregation as the privileged mode of implementing the project was dictated by the five reasons outlined below:

(i) Employ aggregation as an attractive and competitive solution for expanding the agricultural perimeter given the limited supply of land in rural areas.

(ii) Optimize the relationship between the market, the productive upstream and the entire value chain by means of the aggregator's competencies in market knowledge and the logistic link to competitive cost between production and the destination market.

(iii) Generalize best practices by means of training teams mobilized by the aggregator, on one hand, and production units owned and managed by the aggregator that serve as demonstration platforms, on the other.

(iv) Enable smallholders to access financing in the form of direct farmer financing options offered by banks on the basis of aggregation contracts and/or advances and inputs granted by the aggregator to aggregated members.

(v) Ensure that risks are shared by the aggregator and aggregated members, as the production risk is mainly taken on by members, whereas the marketing risk is mainly taken on by the aggregator.

[45] 75% of rural inhabitants depend on agriculture. Mountain communities, representing 30% of all rural people, are one and one half times more vulnerable than other rural communities. IFAD, 2013.
[46] The most recent major drought led to a drastic drop in agricultural GDP. http://www.ccmaroc.ma/maroc/pnrc-doc/Agr_foret.pdf
[47] http://elibrary.worldbank.org/doi/pdf/10.1596/9780821397718_CH02
[48] Procedures manual for implementation of PMV pillar II projects, MAPM .

104. The programme will target various socioeconomic groups[49] with the following typology: (i) type and legal status of beneficiaries: smallholders, small-scale herders, small-scale beekeepers, rural women and men micro-entrepreneurs, small entrepreneurs, promoters of economic initiatives, poor and vulnerable populations; (ii) location in rural areas, production hubs and trade zones; and (iii) position within value chains of producers, traders, processor artisans and service providers.

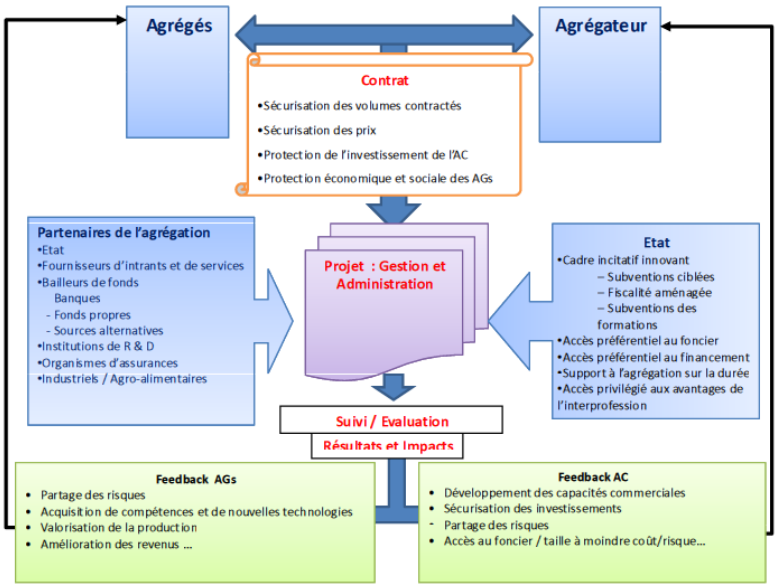
105. The typology of the target groups within the two provinces is as follows:

(i) Small and medium-sized farmers with up to 3 ha of irrigated land or 20 ha of rainfed land;

(ii) Beekeepers with knowhow but owning either no hives or fewer than 30 hives, in groups of 15 or more members;

(iii) Landless people, young people and women with the qualifications to carry out small projects as SMEs and income-generating activities.

Figure 6. PMV aggregation system[50]



106. The total number of beneficiaries in the two provinces is estimated at about 180,500 direct beneficiaries (50% women), or 24,000 households, and 240,000 indirect beneficiaries or 39,000 households, for a total of 385,000 direct and indirect beneficiaries or 63,000 households, i.e. 45% of the total population in the two provinces.

Gender strategy

107. In the two target provinces, women are very active in the agricultural sector. Women work as a family supporter or as a wageworker, often paid significantly less than men, in particular in Azilal (up to half the wages that men receive). However, women rarely adhere to socio-professional organizations, and even if they are part of them, they do not participate in decision-making. This often pushes them to create their own organizations.

108. Following IFAD's policy and Governmental recommendations, the project will promote parity between women and men, and pay special attention to enable women to access agriculture production means, and join professional organizations, and especially of the decision-making

[49] General population and housing census (RGPH). Kingdom of Morocco, High Commission for Planning http://www.hcp.ma/downloads/Demographie-Caracteristiques-demographiques-et-socio-economiques-RGPH-2004_t13063.html.

[50] Source: MAPM - PMV 2009. Translation: Aggregated members / Aggregator / Contract: Secure contracted volumes / Secure prices / Protect aggregator's investment / Protect members' socio-economic position / Aggregation partners: Government / Input and services suppliers / Donors: Banks / Own funds / Alternative sources / R&D institutions / Insurance agencies / Industrial and agrifood / Project: Management and administration / Government: Innovative enabling environment: Targeted subsidies / Tax revision / Training subsidies / Preferential land access / Preferential financing access / Long-term support for aggregation / Privileged access to interprofessional benefits / Monitoring and evaluation / Results and impact / Member feedback: Share risks / Acquire competencies and new technologies / Add value to products / Improve incomes / Aggregator feedback: Develop commercial capacities / Secure investments / Share risks / Access to land / scale at lower cost and risk.

bodies. The project will develop an operational strategy and will organize awareness workshops and training on gender mainstreaming in rural development, targeting lead members of the organizations and institutions involved in the implementation and execution of the program.

109. In order to strengthen the financial capacity of women, the program will support the development of income-generating activities accompanied by a detailed training programme on institutional development issues, literacy, cooperative management, business skills, etc. Specifically, the project will provide support for the creation of women cooperatives to run manufacturing units for several fruit tree products and derivates (e.g. apple juice, apple vinegar; packaging of walnuts and cherries; walnut oil production; carob gum production; etc), and for the production and marketing of medicinal and aromatic plants, etc.

110. Building on the growing recognition among policymakers that CC may compound existing development challenges unless the environmental and social implications are addressed in a coherent and synergistic way, the project will tackle the entire "productive family" capitalizing on a "smart, adaptive, gender-oriented, and environmentally friendly" (SAGE) approach to seize the opportunity that climate change offers to transform the existing gender imbalances. SAGE approach calls for more than a simple integration of gender dimensions into development but rather looking at current development challenges through a new lens that examines the different but connected dimensions of gender inequality and gender difference in the context of climate change, and to provide clear points of entry for developing gender-aware, transformative, and innovative responses.

111. CC adaptation strategies employed by women and men differ significantly, and are shaped by existing divisions of labour and differential control over resources: women tend to focus more on practical and innovative improvements such as seeking alternative water supplies, protecting local assets, planting new crop varieties or supplementing traditional incomes through the diversification of activities, all in all using resources more efficiently, and environmentally friendly than men. The project will point out gender responses that are already emerging at the communities, drawing on existing good practices and examples that could be scaled up and replicated to enable more effective, relevant, equitable and empowering practices. The proposed innovation and adaptation technologies by the GEF interventions will build on local experiences, will improve the conservation and efficient use natural resources while increasing sustained productivity, will increase production diversification and income-generating opportunities, will help reduce workload and input costs, with a major positive impact in reducing barriers to promoting female participation in climate change adaptation.

Part V – Project Strategy

A. Project Rational

112. In Morocco, agriculture has always been considered a key development sector that plays a central role in economic and social terms. All national development plans undertaken by the state since independence, have given significant importance to the modernization of the agriculture sector and the prevention of the recurrent effects of climatic risks.

113. The gradual depletion of natural resources such as aquifers, biodiversity, and soil fertility and quality, and the increase in climate-related risks as a result of climate change, are making conventional production systems – business as usual – more and more fragile and expensive. Specialization in mal-adapted mono-cropping cereal production exposes investments and capital to the increasingly frequent risks of hail, drought and frost.

114. Climate change projections in Morocco show gradually increasing aridity because of reduced rainfall, higher temperatures and higher evapotranspiration. Increased aridity will thus have negative effects on agriculture yields, especially from 2030 onwards. Although irrigated crops yields could increase in spite of climate change, the reduced availability of water could be insufficient to satisfy crop water needs. Higher rates of evapotranspiration will also increase salinization of irrigated farmland that will considerably aggravate the negative impacts of climate change.

115. In the watersheds of the Atlas mountains in central Morocco (Sebou, OumEr-Rbia, Moulouya), climate projections to the year 2050 call for an increase in temperatures between 1-2°C (scenario B2) and 2-3ºC (scenario A2), a decrease in precipitation between

20% (scenario B2) and 30% (scenario A2), and an increase in potential evapotranspiration between 8.3% (scenario B2) and 8.5% (scenario A2), compared to the reference period 1960-1990[51]. Snowfall will decrease, which will cause increased runoff, reduced soil water infiltration, and lower water availability during the growing season in spring/summer. The consequently increase in water stress for crop production will reduce rainfed production (e.g. by about 10% to 16% for wheat, by about 7% to 14% for barley, by about 38% for legumes and 25% for tuber crops) in the central mountain watersheds, which represents the largest reduction of all watersheds. Models also agreed that winter chill is likely to decline, which may require shifting to low-chill cultivars at lower altitudes, and will favour the introduction of fruit tree crops at higher altitudes.

116. Adaptation to climate change is seen as a priority in the agriculture sector policies. The "Green Morocco Plan" (PMV) has launched a programme (PICCPMV) incorporating CC adaptation needs, which has identified priority agriculture regions and priority value chains for each region. PICCPMV has proposed suitable adaptation measures and technologies for each value chain, matching the proposals included in the SNC/UNFCCC.

117. Although rainfed cereals predominate in the central mountain watersheds, they are not well adapted to the environmental conditions of superficial soils, steep and rugged topography, and extreme climate conditions. The PICCPMV strategy has prioritized the promotion of fruit tree production in mountain areas by progressively converting cereal lands into diversified cropping systems, which are much more cost effective and better adapted to the mountain agro-ecosystems.

118. Because of their ability to provide economic and environmental benefits, the IPCC considers agro-forestry to be one of the best "no-regrets" measures in making rural communities adapt and become resilient to the impacts of climate change. The important elements of agroforestry systems that can play a significant role in the adaptation to CC in the Atlas mountains - such as drought-tolerant cultivars and fruit tree crops, such as carob, almond, olive, fig, walnut – include: (i) changes in the microclimate moderating the effects of solar radiation, high/low temperatures, wind, and heavy precipitation on the soil and the plant evapotranspiration; (ii) protection and soil erosion prevention through the provision of permanent cover and root system; (iii) improved soil fertility through the maintenance of the soil organic layer and its physical properties and aeration, the extraction of nutrients from deep soil horizons, and the promotion of more closed nutrient cycling; (iv) increased soil water infiltration and hydrological regulation; (v) increased soil and vegetation carbon sequestration and reduced carbon emissions.

119. In addition, agroforestry creates opportunities for diversification of the agriculture systems – intercropping, honey production, bio-energy production from tree pruning waste, and livestock integration in agriculture – by reducing the mono-cropping dependence risk, exploiting new market opportunities and existing market niches. Agroforestry provides: (i) higher combined yields of fruit tree, crop and livestock products do to increased and efficient use of scarce resources especially moisture; (ii) higher on-farm processing opportunities and other farm-based income generating activities; (iii) higher employment opportunities, often promoting gender equity; (iv) higher nutrition opportunities for rural households.

120. The IPAC-MAM project has targeted two areas (Azrou province in the northern part of the Middle Atlas and Azilal province in the central High Atlas) that are considered priority regions for climate change adaptation by the PICCPMV. Following PICCPMV recommendations, the IPAC-MAM will adopt a crop diversification adaptation approach, involving the PICCPMV priority value chains for the central mountain regions – fruit tree production intercropped with legumes and vegetables – in addition to the sustainable use of the natural ecosystems – honey and PAM production. The SCCF will also contribute to the land degradation reduction priorities for the central mountain watersheds, included in the National Action Programme to Combat Desertification and the National Plan for Watershed Management, which propose fruit tree plantation as one of the main soil conservation and erosion prevention measures.

121. In order to cope with the expected impacts of climate change, the SCCF will focus on the following set of adaptation measures and technologies promoted by the SNC and PICCPMV:

122. In terms of agriculture production: (i) a careful selection of crop types and cultivars (e.g. low-chill cultivars of fruit tree species) that are adapted to the particular conditions of each site, based on available climate change projections and climate analogue analysis[52]; (ii) the

[51] SNC UNFCCC, 2010

[52] The premise of this strategy is that most climatic settings that are projected for a given location can already be found at present, though

adjustment of agronomic calendars to current/predicted changes in climate, and the replacement of conventional agriculture practices with conservation agriculture systems and technologies, integrating organic agriculture principles, integrated pest management and agriculture waste management practices, to reduce the risk of pests and diseases, minimize pollution, and improve soil fertility, soil organic matter, and soil water retention; (iii) the use of efficient irrigation technologies (EIT), namely drip irrigation in fruit tree production and vegetables; (iv) the use of soil water harvesting techniques, such as micro-catchments, graded terraces and shelterbelts; (v) the promotion of fruit tree species and varieties at the expense of rainfed cereals, as the cropping system better suited to climate change predictions and that best prevents soil erosion; (vi) the diversification of crops – mixed fruit trees, legumes and vegetables – and crop varieties – planting several varieties of fruit tree species in the same farmland - to reduce farmers' dependency on mono-cultures that are more sensitive to climate risks, distribute risks among several crop types and varieties, and increase income opportunities and jobs for the less favourable population such as women and young unemployed; (vii) promote and restore sustainable management practices of the natural ecosystems in the targeted watersheds, with special focus on grasslands and scrubland for livestock, medicinal/aromatic plants and honey production.

123. In particular, conservation agriculture, among other practices promoted by the PMV, has a high adaptability to climate change because of the higher water balance due to a more effective rainfall infiltration, soil moisture-holding capacity[53], and lower evapotranspiration, therefore reducing surface runoff and soil erosion. Compared to conventional systems, CA has been found to maintain or increase yields, reduce production cost and labour requirements, improve soil fertility and reduce erosion[54]. These incentives make CA a viable alternative in the Atlas mountains under a CC aridification trend, where it could help address the challenges of water scarcity and degradation of the natural resources. The project will provide technical support for the design and development of site-specific and value-chain-specific CA systems through a comprehensive assessment of the ecological and socio-economic conditions under which CA would be adapted for smallholder farming in the project areas of Azilal and Sefrou.

124. Drip irrigation can help farmers by improving the efficiency of water use and achieving a more even application of water to fruit-tree orchards and vegetable crops, thereby promoting steady crop growth. In areas subject to climate aridification, pressurised irrigation reduces demand for water, reduces water evaporation losses. The drip technology uses even less water than other micro-pressurized irrigation and is not affected by wind, which represent a major problem in the project areas. Furthermore, fertiliser application is more efficient since these can be supplied through the pipes. Drip irrigation will also represent an important tool to prevent salinization problems arising from the excessive use of irrigation water (e.g. drip irrigation effects in reducing root-zone soil salinity and drainage), as has been demonstrated in numerous agriculture development projects in arid, semi-arid and sub-humid zones worldwide.

125. Following PMV recommendations, the IPAC-MAM will also adopt a crop diversification adaptation approach, involving the PICCPMV priority value chains for the central mountain regions – fruit tree production intercropped with legumes and vegetables – in addition to the sustainable use of the natural ecosystems – honey and PAM production. The SCCF will also contribute to the land degradation reduction priorities for the central mountain watersheds,

in a different location. For example, the climate projected for a particular targeted growing region for 2050 (according to a given climate model and GHG emissions scenario) can currently be found at a different location. These analogue locations can inform adaptation planning at the targeted growing region. Tree cultivars that are grown successfully at the analogue location may be candidates for planting in the target region today, and new cultivars slated for introduction into the target region should possibly be tested at the analogue site rather than the target site, to ensure that they are viable in a warmer climate. Lastly, observations of tree phenology and productivity across target and a suite of analogue sites (for different climate models and GHG emissions scenarios) can help develop models that actually are suitable for climate change projections.

[53] Ibid.

[54] CA is mainly defined by three linked principles, which have to coincide in time and space and have to be applied permanently to develop synergies: (i) Continuous minimum mechanical soil disturbance through minimal/no-tillage and direct seeding; (ii) Permanent organic soil cover (between 30% and 100%) through mulching from crop residues, other organic mulch materials or living crops, including cover crops., to supply sufficient organic carbon to maintain and enhance soil organic matter levels, reduce evapotranspiration and increase soil water infiltration; (iii) Diversification of crop species grown in sequences and/or associations; this refers to rotations and sequences of annual crops, mixed-, inter- or relay cropping, cover crops in perennial orchard or plantation crops, including legumes for their nitrogen effect as well as for their flowering in support of pollinator populations.

included in the National Action Programme to Combat Desertification and the National Plan for Watershed Management, which propose fruit tree plantation as one of the main soil conservation and erosion prevention measures. In order to cope with the expected impacts of climate change, the SCCF will focus on sets of adaptation measures and technologies promoted by the SNC and PICCPMV, in both terms of agriculture production and post-harvesting technologies.

126. In terms of post-harvesting technologies: (i) the promotion of storing equipment, such as cold storage rooms, to reduce the perishability of fruits and vegetables; (ii) the promotion of processing equipment (e.g. husking, drying, crushing and packaging units; oil processing unit; gum production unit) for the diversification of products of the same crop; (iii) the use of sustainable energy to support crop production and processing (e.g. the use of solar energy for water pumping in irrigation, and for honey production; the use of bioenergy in the form of briquettes produced with oil pressing waste, fruit tree pruning remnants and fruit peels, to hit the processing units, and reduce pressure on the natural vegetation for firewood collection).

127. The SCCF project will also support the development of participatory CC adaptation plans (CAPs) for the selected value chains in the targeted communes, involving all stakeholders, and taking into consideration both traditional knowledge and scientific innovation regarding management practices and technologies to cope with climate risks. The participatory adaptation plans will be informed by available climate change modelling for crop-specific impact assessments, to identify the most vulnerable production and post-harvesting stages within each value chain, define indicators and identify ad-hoc adaptation measures. The project will support the installation of meteorological stations and the development of a climate-risk monitoring and information system to provide farmers with timely, accurate weather forecast.

128. SCCF will have a major focus on awareness raising and capacity building, to transfer knowhow and build the skills that will enable stakeholders to adopt and implement climate change adaptation measures and technologies. The project will specifically target the most vulnerable groups – women and unemployed youth – who will benefit from the agriculture diversification measures and from job creation opportunities linked to the establishment of small business, such as processing and packaging units, bio-energy and solar energy production units, tree nurseries, etc. Following the PMV “aggregation” approach, the project will support the organization, institutional development and training of farmers around professional organizations, such as water users’ associations, cooperatives and micro-enterprises with strong management capacities and linkages with all value chain actors and the market.

129. The shift from conventional agriculture to CC adaptation agronomic practices and technologies entails a knowledge-intensive and complex technical change. The fine-tuning of adaptation practices and technologies requires continuous adjustments, knowledge generation, and sharing among stakeholders. For this reason, the project will support a mixture of effective training and practical experience through demonstration plots, involving practitioners (farmers, researchers, civil servants, etc) to test, learn and adapt new agronomic principles to the local context.

130. The shift towards adaptive management practices and technologies is facilitated by the existence of pioneer farmers who demonstrated the agronomic, environmental, financial, and livelihood benefits of these practices by adopting them on their land. Therefore, the project will adopt the Farmers Field Schools (FFS) approach, which has proven successful in agriculture development projects supported by IFAD in Morocco and elsewhere. With support and investment from the project, on-farm demonstration plots will become “learning-by-doing” fora where poor-asset small farmers from neighbouring areas will find an ideal place to interchange ideas and experiences, and learn new production systems and techniques that can be successful replicated.

B. Approach and consistency with SCCF requirements

131. The IPAC-MAM project was developed in accordance with SCCF eligibility criteria and respects the principle of national ownership, having been developed in consultation with national stakeholders, and taking into account all relevant recent studies and reports available on Morocco’s climate change adaptation needs. In addition, the project was designed to fully address the CC adaptation priorities for the agriculture sector identified by the Government in several governmental reports (SNC, PMV, PICCPMV) and has been

developed in such a way as to ensure sustainability and replicability beyond project completion.

132. The Integration of Climate Change Adaptation Measures in the implementation of the *Green Morocco Plan* (PICCPMV) has prioritized 13 regions, based on both CC vulnerability and high agriculture potential criteria (Table 3). The two regions targeted by the IPAC-MAM GEF project are among the PMV priorities: (i) Tadla-Azilal is the forth priority region, and has been selected for the implementation of one of the nine projects proposed by the PICCPMV for the integration of adaptation measures; (ii) Fez-Boulemane (which includes the province of Sefrou) is the eighth priority region; this region was somehow penalized by the analysis, because the region also includes Saharan bio-climate zone. The use of more homogeneous administrative boundaries, such as those of the province instead of the region, could have provided better results in terms of agriculture potential and CC vulnerability.

Table 3. PICCPMV Priority regions based on both CC vulnerability and agriculture potential criteria.

Administrative region	CC Vulnerability	Agriculture Potential	Order of priority
Chaouia - Ouardigha	80	422	1
Grand Casablanca	79	408	2
Rabat – Salé – Zemmour - Zaër	37	524	3
Tadla - Azilal	33	523	4
Doukkala - Abda	51	334	5
Gharb – Chrarda – Beni Hssen	23	607	6
Marrakech – Tensift – Al Haouz	32	352	7
Fès - Boulemane	16	358	8
Oriental	14	275	9
Meknès - Tafilalet	12	313	10
Tanger - tetouan	4	814	11
Taza – Al Hoceima - Taounate	3	489	12
Sous – Massa – Drâa	3	254	13

133. In the mountain regions (including Tadla-Azilal and Fès-Boulemane) the PICCPMV adaptation project is focusing on fruit tree production, which is considered the value chain that will become priority in the region under a climate change scenario. The adaptation measures promoted are related to micro-catchment rainwater harvesting technologies, efficient micro-pressurized irrigation and integrated crop management (no till/minimum till, mulching, inter-cropping, integrated pest and weed management, fertilization, etc).

134. The IPAC-MAM project takes an essentially climate-resilient approach to agriculture in rural and mountain zones. Agriculture and the factors of production are seen under a new dual perspective:

(i) Introducing and promoting the concept of ecosystem-based adaptation to build resilience of the agro-ecological, socio-cultural and economic systems and strengthen the interacting mechanisms between them, as a way to restore the environmental services for agriculture, increase the adaptive capacity of the rural poor, and enhance food security;

(ii) Extending timelines to the medium- and long-term to ensure that all VC actors are well organized, with the necessary skills and linkages among them, so that production, processing and marketing processes are sustainable, stable and more resilient to external factors.

135. The approach taken by the IPAC-MAM project, on the other hand, explores sustainable means to maintain high levels of productivity while keeping constant or even reducing the use of inputs in the form of economic and natural resources, through rural planning, training, and investments in climate change adaptation measures and technologies. Technology and innovation will be used in the project to maximize productivity through the cost-benefit relationship, taking into account not only the economic capital but also the natural, human, social and physical capitals under an adaptive agriculture approach.

136. In maximizing productivity, a crucial role will be given to the effectiveness of inputs – energy and others – and the use of evidence-based knowledge to improve production by applying soil and water conservation principles (conservation agriculture, organic agriculture), to convert agriculture waste into new products and services, and reduce post-harvest losses. Another important aspect will consist in the diversification within the targeted value chains by developing and creating – without further impact on the natural capital – spinoff agricultural services and new income-generating opportunities. Promoting unique local products that are more accessible to smallholders with their specificity guaranteed by the natural heritage (biodiversity) and cultural heritage (identity) still present in the mountain zones of Morocco[55] will also be part of the IPAC-MAM project.

137. Another institutional instrument that is closely linked to the IPAC-MAM project is the Agricultural Development Fund (FDA). MAPM officials responsible for the FDA confirmed their full support for the project approach during the identification mission. IFAD is interested in continuing to pursue, with IPAC-MAM, an experience already proven under PICCPMV around identifying best practices for adapting to climate change through test pilots, evidence-based verification, modelling, and creating dedicated FDA subsidy instruments.

C. SCCF Added Value Compared to the Baseline

138. The IPAC-MAM project is fully blended with the PDRZM baseline project, in order to integrate CC adaptation measures in the development of the targeted value chains, and enhance the resilience to climate change of the agro-ecosystems and the rural population in the project areas.

139. During the five years of implementation (2015-2019), the PDRZM project will cover the rural mountain zones located in the provinces of Sefrou and Azilal. Consequently, the investment made by the SCCF project will provide additional support to help mainstream climate change adaptation measures into the IFAD baseline and the contributions to be made by the Government of Morocco and professional organizations of beneficiaries. This will expand the impact of the project and enhance the long-term sustainability of the results. Activities under the IPAC-MAM project will be complementary and synergistic to those under PDRZM.

140. PDRZM will focus on fruit tree production, which represents the value chain with greater potential for agriculture production in the mountain areas. IPAC-MAM contribution to promote CC adaptation technologies in the production and post-harvesting of the selected fruit tree crops will be focused on the following issues:

- Carob: this species is better adapted to climate change predictions due to its high ecological plasticity and resistance to drought and water stress. The SCCF project will support the plantation of new carob trees in the upstream areas of Azilal watershed, supporting the adoption of adaptive agronomic practices, while maintaining the natural character of the existent stands. The project will also support investments in post-harvesting technologies, such as husking/packaging unit and gum production unit, to diversify production and income generation, and create new job opportunities, with special focus on women cooperatives.

- Almond: PDRZM will support almond cultivation at the expense of marginal cereal land in the upstream areas of Azilal watershed, taking advantage of the high adaptability to climate change predictions, and the major role in soil conservation and erosion control of this species. The SCCF project will promote adaptive agronomic practices, including the selection and combined use of suitable varieties and drought-tolerant rootstocks selected by INRA to help minimize climate risks while improving the productivity and quality of almonds. Micro-catchments following contour lines will be promoted to increase soil water harvesting. The baseline project will also support investments for post-harvesting equipment in the downstream communities.

- Walnut: in the upstream areas of Azilal watershed, the SCCF project will support the analysis of changes in area suitability for walnut cultivation and potential upward shift trends, the selection of walnut cultivars better adapted to the predicted climate conditions (e.g. lower chilling requirements), and the adoption of adaptive management practices to preserve the natural character of the existent walnut orchards, and improve the quality and yields of the existent and new plantations. Downstream, the project will also support investments in post-harvesting equipment, such as oil processing units and

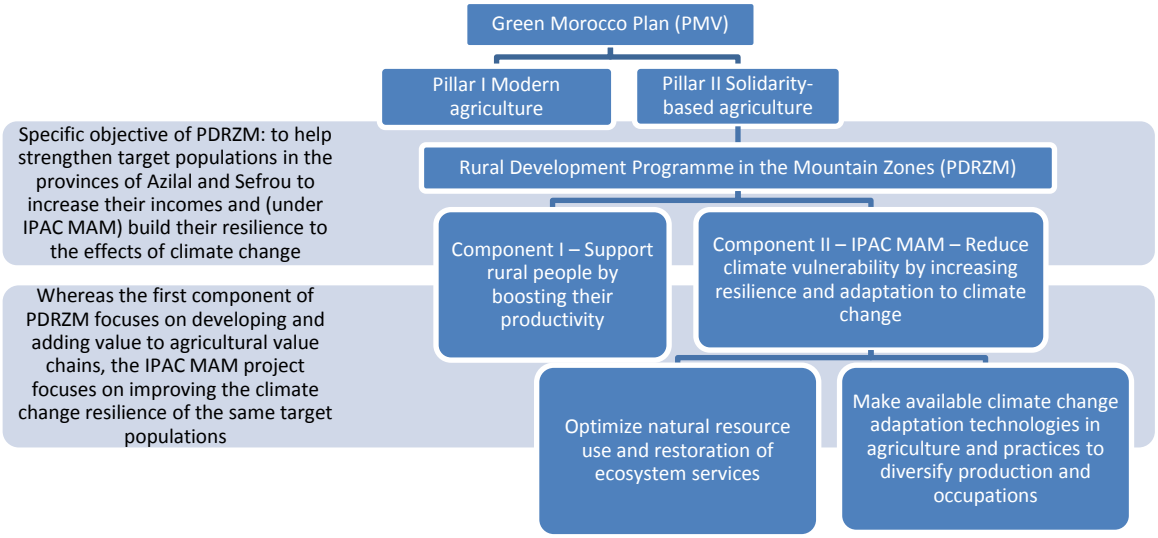
[55] Hamimaz R. 2009.

a husking/drying unit, to reduce perishability, diversify production and income generation, and create new job opportunities, with special focus on women cooperatives.

- Cherry: the SCCF project will support the selection and combined use of a larger number of varieties (early and late-maturing cherries) to reduce climate-related risks, and the identification of adaptive agronomic practices (efficient micro-pressurized irrigation, pruning, integrated pest management, soil conservation, etc) in the upstream production areas in Sefrou. The baseline project will also support the development and implementation of an effective marketing strategy addressing both the national and international markets.
- Apple and Plum: in the upstream areas of the Sefrou and Azilal watersheds, the baseline project will support the conversion of marginal cereal land into apple plantations, with an additional SCCF contribution in the understanding of changes in area suitability for apple cultivation and potential upward shift trends, and the selection and implementation of adaptive production measures related to the efficient use of water for irrigation, and changes in the cropping calendar and the agronomic practices, including integrated pest management. IPAC-MAM will also support post-harvesting investments (downstream areas of both watersheds) on cold storage equipment and processing units (apple juice, apple vinegar) and suitable dehydrator technologies to increase the quality of dried plum production, to help reduce the perishability of the products, diversify production and income opportunities, and create jobs for the less favourable groups (women cooperatives).

141. IPAC-MAM will also support the selection and adoption by the PDRZM baseline project of suitable CC adaptation technologies on efficient micro-pressurized irrigation and integrated agronomic systems (e.g. conservation agriculture, integrated pest management). The selected adaptation technologies will be applied to diversified cropping systems, where fruit tree production will be combined with the production of vegetables and legumes, promoting the traditional knowhow about local varieties better adapted to climate constraints.

Figure 7. Linkages between the PMV, PDRZM and IPAC-MAM



142. The IPAC-MAM project adds value to PDRZM by increasing climate resilience of the selected agricultural value chains through a circular economy perspective whereby: (i) family units and producers' organizations are trained and equipped to implement CC adaptation measures; (ii) agriculture production is improved and sustained over the years based on CC adaptation planning, and the use of climate-resilient crop varieties, agronomic systems and technologies; (iii) the sustainable use of natural ecosystems and farmland has improved environmental services and help diversify local income opportunities through a wide set of products, by-products and derivatives; (iv) the adoption of post-harvesting climate-proof technologies and marketing strategies has increased the market value of products, by-products and derivatives, or serve as a primary resource for other complementary value chains. With respect to the PMV and PDRZM, the IPAC-MAM project will encourage them to:

(i) Evolve the approach of the production units identified – cooperatives, unions and associations – from a linear, cradle to grave perspective to a circular, cradle to cradle perspective;

(ii) Develop the adaptive capacity of family units, as integrated production units, by improving their productive potential – women's work, employing young people as additional resources, etc – based on the sustainable use of natural resources;

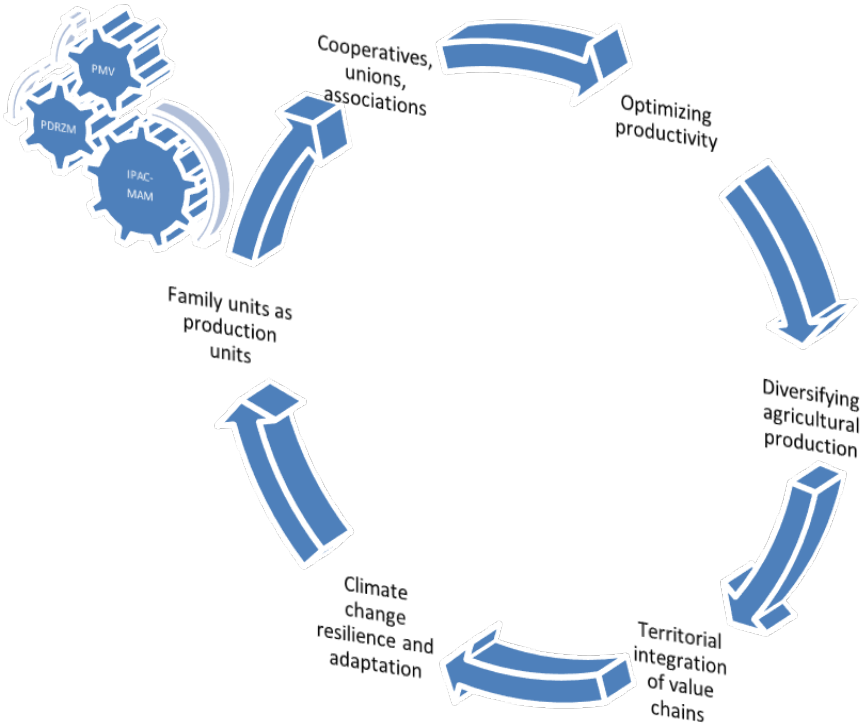
(iii) Use a combination of asset-based indicators (natural, social, human, financial and physical capital) for the evaluation and assessment of the virtuous effects of the circular economy, and the importance of maintaining and/or restoring natural capital;

(iv) Focus on value chain components and linkages rather than simply a quantitative increase in agricultural production;

(v) Raise awareness around the difference between production and products, whereby product is understood as a value whose qualities are effectively recognized and appreciated by the local, national and/or international market;

(vi) Demonstrate how adaptation practices to optimize, diversify and innovate in agricultural production can make production units more profitable, to improve wealth distribution in rural areas and increase resilience to the effects of climate change of agricultural production.

Figure 8. The circular economy: value addition and enhancement of the ecological, socio-economic and cultural resilience under the IPAC-MAM project



143. In a first phase, the climate resilience of the baseline components and outcomes will be analyzed as part of a participatory adaptation planning process, in order to select and fine-tuning – within the various production areas – of a series of synergistic and correlated actions, building on the adaptation measures and technologies prioritized by PICCPMV in the target areas and for the target value chains. These highly innovative actions will contribute to the SNC and PMV objectives in the target regions, by supporting resilient rural communities and agro-ecosystems to the effects of climate change.

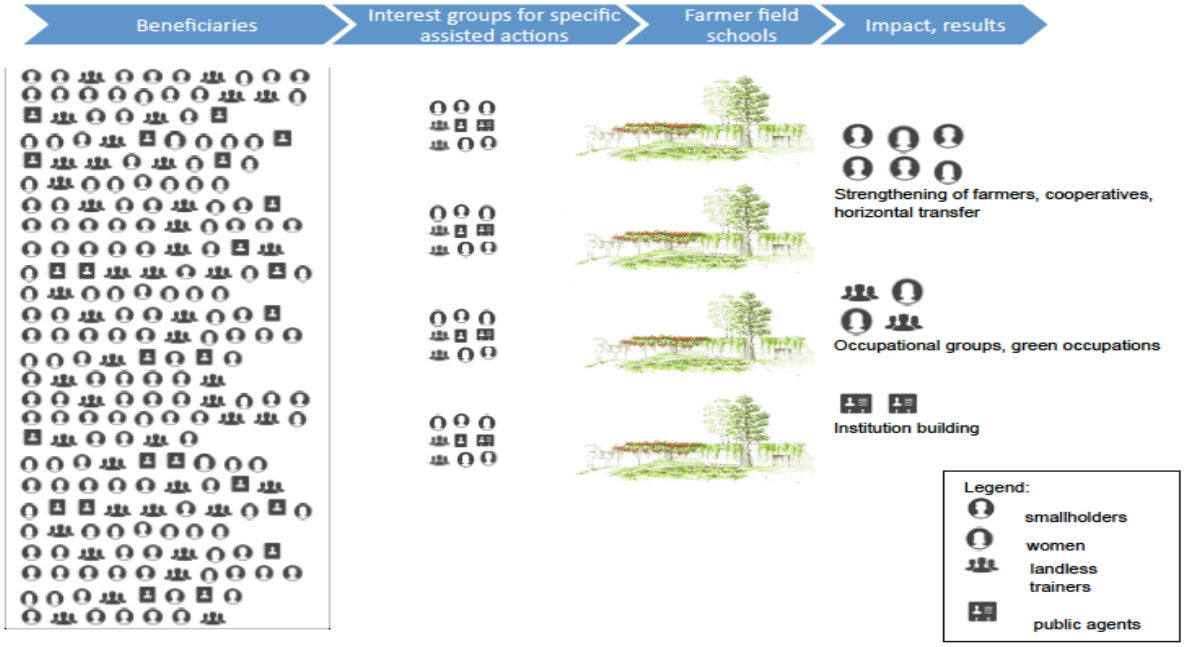
144. Innovation consists of a ripple-effect strategy to transfer good practices on CC adaptation supporting value chain and rural development already consolidated elsewhere but as yet not in widespread use in the project regions. The adaptation actions identified in the participatory planning phase, rather than being simply transferred, will always need to be readapted to the climatic, geomorphological, social and cultural characteristics of the project

intervention areas. Market conditions and cost-effectiveness will also contribute to determining the features of the solutions planned.

145. Following the participatory adaptation-planning phase, a second step will consist of testing and refining specific assisted CC adaptation actions. The objective is to prove in practice that it is possible to obtain the dual benefit of higher productivity with the maximum qualitative results, and reduced vulnerability to the impact of climate change among the targeted mountain population. The SCCF project will financially support the set up of small, simple and innovative actions eligible to funding to test the adaptation measures of Community interest, targeting adaptive production/post-harvesting systems and the sustainable use of natural resources. The supported actions will range from optimizing and rationalizing crop production inputs, through water management, diversification, technical training, to the creation of green agricultural services and occupations. Lessons learned from pilot projects will be transferred to the baseline and PMV investments in order to upscale suitable CC adaptation measures within the target provinces and elsewhere in other PICCPMV priority mountain regions.

146. All of these demonstration activities will take place through farmer field schools, as core participatory events in which individual producers, cooperatives, associations and unions, together with the institutions concerned, will learn and share their experiences.

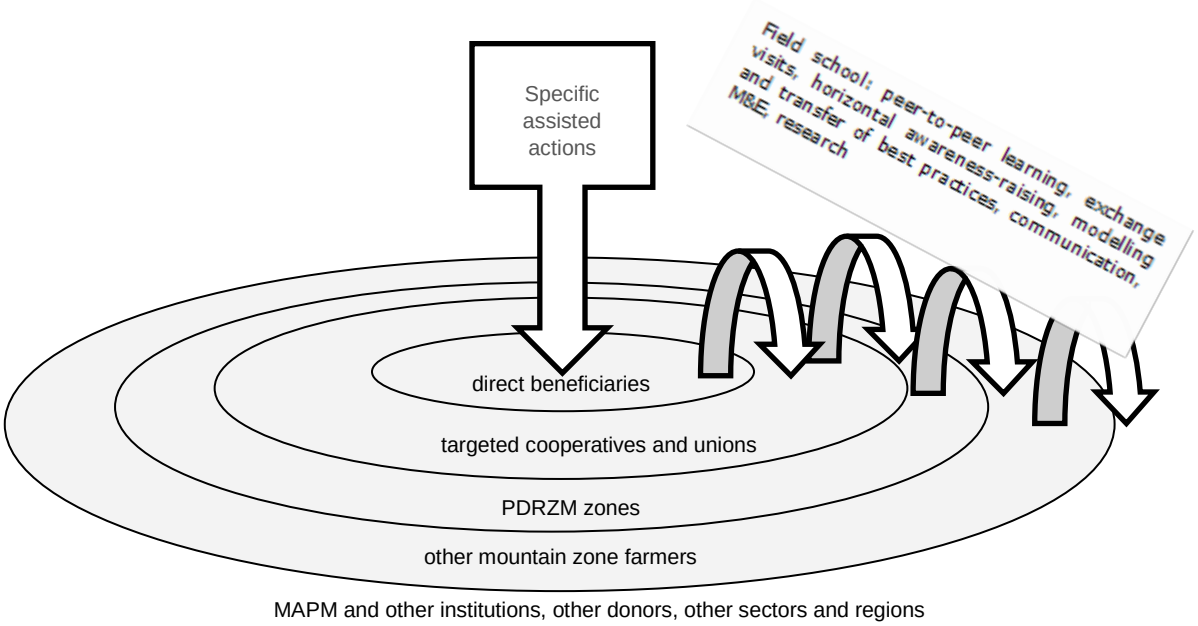
Figure 9. Function of farmer field school in IPAC-MAM



147. A particularly key role will be devoted to horizontal awareness-raising through exchanges and visits between cooperatives and farmers in the two regions. Peer to peer learning in situ and direct exposure to practical and verifiable experiences, accompanied by documentation and specialized technical assistance provided by the United Nations Industrial Development Organization (UNIDO),[56] represent the best approach to ensure that the largest possible number of farmers effectively take the best practices on board.

[56]In Morocco, UNIDO has been responsible for the Participatory Project against Desertification and for Reducing Poverty in Arid and Semi-arid Ecosystems in the High Plateaus of Eastern Morocco (GEF-LCD). The project was rated satisfactory by a recent midterm evaluation (April 2013).

Figure 10. The ripple effect approach under IPAC-MAM



148. Communication and awareness-raising activities in connection with specific assisted activities tested under the second component of PDRZM also call for other fields and channels such as: (i) institutional communication with the national institutions concerned, not only within MAPM but also with other interested ministries and local authorities; (ii) technical and scientific communication in collaboration with UNIDO with national and international universities and research institutes; (iii) technical and scientific communication with head and branch offices of the major international development and cooperation agencies that may be interested, such as the Food and Agriculture Organization of the United Nations (FAO), the United Nations Development Programme (UNDP), the French development agency (AFD) and the German cooperation agency (GIZ).

Table 4. Added value of SCCF IPAC-MAM interventions in comparison to the baseline

	PDRZM Baseline Project	**Additional benefits of GEF Intervention**
Component 1: Enhancement of agriculture value chains	• PDRZM will support priority value chains for mountain areas (fruit trees, vegetables, honey) and address critical constraints along the VC in primary production, post-harvesting and marketing, processing, storage, • Target farmers and agri-businesses have access to key financial and extension services. • The number of producers organized in cooperatives and producers associations increase by 30%. • Value chain products meet market standards and post-harvesting losses are reduced by at least 70%. • 80% of communities are less isolated and municipalities provide maintenance of road infrastructures. • The tactic objective is to *increase the aggregate value* created within each value chains as the basis for increased profits for farmers and agri-businesses alike and to thereby create the incentives for wider replication and upscaling.	• The support to small farmers for climate-proof value chain technologies shall increase yields of higher quality production, reduce perishability, and increase diversification of products and by-products, opening new market opportunities. • Expected up to 30-50% yield increases, and higher quality goods with increased market sales. • Produce diversification contribute to at least 20% income increase by men & women cooperatives. • Reduction in machinery, fuel and labour requirements for CA will increase profits and available time, mainly for poor-asset women and youth, to diversify income opportunities through multipurpose shelterbelts producing MAP and honey. • Public servants, individual farmers, farmer organizations, cooperatives, and small agri-business members will be trained on suitable CC adaptation planning processes, management systems and technologies for developing climate-resilient VCs.
Component 2: Sustainable management	• Conversion of 1,675 ha of marginal land (mainly rainfed cereal) into new fruit plantations to prevent soil erosion and increase production.	• Participatory adaptation plans are developed in 12 mountain Communes, identifying suitable adaptation measures for agriculture production and NRM at the watershed level.

of natural resources	• Water Users Associations recover at least 70% of royalties related to irrigation water management. • 80% of milk production is sold by producers' organizations and women's income increases. • The profit margin of apiculture cooperatives increases at least 20%.	• The support to small farmers for climate-proof efficient irrigation, CA/OA systems and technologies, and better adapted crop varieties, shall increase soil water content and reduce at least 30% of water requirements for crops in the converted farmlands. Soil organic matter, soil texture and soil fertility shall significantly improve leading to higher and more stable crop yields under climate variability in drought affected years. • Suitable crop varieties, EIT technologies making use of solar energy for water pumping, CA/OA systems and technologies, and IPM systems are successfully tested and disseminated over 22 FFS, and replicated in 4,750 ha. • Climate-resilient production technologies shall increase soil water content and reduce at least 30% of water requirements for crops in the converted farmlands. Soil organic matter, soil texture and soil fertility shall significantly improve leading to higher and more stable crop yields under climate variability in drought affected years. • The SCCF will support the use of ecological restoration measures to prevent environmental risks, improve environmental services, and generate complementary income opportunities from wood and non-wood forest products and pastures (e.g. increase of household benefits from MAP and beekeeping). • Soil erosion shall decrease between 60-90% in farmland under CA and benefiting from vegetation restoration measures (grasslands and vegetation shelterbelts). • Water quality shall improve in farmland under CA due to 20-50% lower use of fertilizers and pesticides. • Reduced emissions due to 60-70% lower fuel use, 20-50% lower fertilizer and pesticides use, 0.2-0.7 t/ha/y sequestered carbon and no CO2 release as a result of no burning of residues.
COMPONENT 3: Project Management	• The baseline will cover the establishment of the central ADA/CPCU and the provincial PMU that will be responsible for the overall programme coordination and implementation. The main M&E functions will be undertaken through the baseline M&E system.	• The SCCF will integrate CC expertise in the programme management and monitoring. • The SCCF will cover the additional costs for a CC Adaptation Specialist to ensure the overall implementation of the SCCF activities and effective integration in the baseline. Experts and service providers will be hired to provide technical support and guidance for the implementation of the different project components, and help integrate CC issues in the baseline interventions and M&E system.

D. Country eligibility, ownership and driveness

Country eligibility

149. Morocco ratified the UN Framework Convention on Climate Change (UNFCCC) in 1995. The sustained and regular presence of Morocco on the international scene was marked by the organization of the Seventh Conference of Parties (COP7), which was held in Marrakech in 2001. Morocco assumed the chairmanship during that year.

150. Morocco ratified the Montreal Protocol relating to the Protection of the Ozone Layer in 1992, as well as the Vienna Convention, together with its London and Copenhagen amendments in 1995. In January 2002, Morocco ratified the Kyoto Protocol to become the first Arab country party to the protocol. A national committee was thereafter formed to develop project proposals and initiatives for the Clean Development Mechanism (CDM) of the Kyoto protocol.

151. Morocco ratified the Convention to Combat Desertification (CCD) on October 6, 1996 and participated in all the negotiation sessions. In the framework of this Convention, Morocco completed the elaboration of its national action program against desertification in 2001.

152. After the ratification of the Convention on Biodiversity (CBD) on August 21, 1995, Morocco elaborated a National Study on Biodiversity that presented a fairly exhaustive inventory of the national flora and fauna, which served as the basis of a multiplicity of actions undertaken, notably, the elaboration of the Strategy and National Action Plan for the Conservation and Sustainable Use of Biological Diversity. In 1995, Morocco ratified the Basel Convention relative to the Control of Trans-border Movements of Hazardous Wastes and their Elimination, as well as the protocol pertaining to it, relative to the Prevention of Pollution in the Mediterranean Sea.

Country driveness

153. Launched in 2004, the National Capacity Self-Assessment (NCSA) Project was aimed to identify national priorities and needs in terms of capacity enhancement in the area of Global Environment, notably, in what concerns Biodiversity, Climate Change, and Desertification Control for the purpose of catalysing sustained actions both at the national and local levels. Throughout its duration, the NCSA project in Morocco has ensured a highly participatory process. The main outputs of the NCSA process in Morocco are 3 thematic reports related to the CCD, CBD and UNFCCC developed in July 2005, a cross-cutting analysis based on the thematic report developed in August 2005, and a strategy and action plan developed in July 2006 These reports are mere stages in an ongoing reflection process which administrations and the managers involved in the implementation of the Conventions must share and uptake for a concrete action.

154. The NCSA project is a catalyser which should help deciders to undertake reforms designed to enhance the capacities of the entities wherewith they are entrusted. The capacities that call for enhancement are not confined to the sole direct actors of the Conventions and to the specific management entities, but rather extend farther afield to cover all the actors operating on the larger administrative and political context. Among the essential priorities identified and recommended by the NCSA, the enhancement of the capacities of local actors (communities and authorities) so that they may better translate national commitments to the three conventions into concrete local actions has been emphasised. It is this strong recommendation that constitutes the basis of the present project.

155. Since the ratification of the UNFCCC, Morocco has implemented several specific projects with the support of United Nations, which aim to improve knowledge and build the country's institutional and systemic capacities. Among them are the following: (i) A regional capacity-building project, implemented between 1996 and 2003, which permitted the setting up of the National Committee on Climatic Change in 1996 and contributed to the creation of the CIEDE in 1998; (ii) A capacity-building project in the area of Clean Development Mechanism which was carried out between 2003 and 2005.

156. Morocco's strategy to combat climate change is guided by two principles: (i) implementing a policy to mitigate the effects of climate change by reducing greenhouse gas emissions; and (ii) anticipating an adaptation policy prepared by the entire population and economic actors to address such effects.

157. Morocco, like many other countries, has undertaken to put in place adaptation and mitigation strategies that are consistent with its sustainable development strategy and the international process to combat global warming by limiting greenhouse gas emissions. The incorporation of CC adaptation and mitigation objectives into the PMV through the PICCPMV programme demonstrates the priority given by the Government to the mitigation of the impacts of climate change in the agriculture sector.

158. The approach selected by the PMV calls for involving local stakeholders and production systems and organizations, agricultural cooperatives and unions above all, in order to influence the behaviours of individual farmers and herders and enhance their adaptive capacity. The aim is to promote an enabling environment to increase productivity per hectare by introducing adapted and rationalized technologies and practices compatible with the sustainable use of natural resources. It is hoped that this will bring an increase in agricultural profits and a diversification of income through the provision of MAP, honey and other products, together with a reduced anthropogenic impact on natural resources and restored environmental services supporting agriculture production.

E. Project objectives and components

159. The **overall objective** of the IPAC-MAM project is "*to reduce the overall climate vulnerability of rural communities living in risk-prone mountain watersheds of Central Morocco, through the sustainable use of natural resources and the diversification of the local economy".*

160. The **specific objective** of the IPAC-MAM project is "*to strengthen the resilience and income capacity of beneficiaries in target communes in the provinces of Sefrou and Azilal, by adapting and upgrading value chains through reducing post-harvest losses, optimizing the use of inputs and natural resources, and promoting diversification in agricultural production*".

161. **Component 1 – Community empowerment on adaptive planning and climate-resilient value chains (GEF Contribution: USD 1,203,600)**

162. IPAC-MAM will be instrumental in supporting the mainstreaming of climate change adaptation knowledge in decision-making, rural planning and value chain development processes, promoting broader awareness and know-how on climate change adaptation needs among rural communities.

163. This project component will build the capacity of individual farmers, farmer organizations, water user organizations, agriculture cooperatives, civil servants and other local stakeholders to produce and implement climate-resilient Adaptation Plans (CAPs) that articulate their development needs by strengthening upstream/downstream linkages at the watershed level, through sustainable VC development options that incorporate CC adaptation needs.

164. As a result of the community empowerment effort carried out through SCCF, at least 70% of the farm holdings and agribusinesses set up through the baseline intervention will operate on the basis of climate resilient adaptation plans, while at least 80% of the beneficiaries in each commune will become more resilient to climate change.

165. ***Outcome 1.1 – Adaptive participatory management plans for the sustainable use of natural resources are developed and implemented by the project value chain beneficiaries (GEF: USD 372,900)***

166. Participatory CC adaptation planning is the main instrument to analyse the root-causes of natural resources degradation and identifying suitable CC adaptation and risk reduction measures, especially at the watershed level (upstream/downstream linkages between land uses and ecological processes). It is therefore essential that value chain investments are planned and implemented according to the environmental and socio-economic context and to the predicted CC impacts of each territory.

167. The project team will lead a participatory diagnosis to capture and understand key information about each targeted commune and the problems they are facing – including climate risks - with the support from local/international experts and the PMU field teams. The assessment will imply:

- The collection of CC downscaling information about CC impacts on selected value chains to support decision-making on the selection of suitable crop varieties, the adjustment of crop production and post-harvesting calendars, the selection of technologies and management systems, etc.
- The collection of socio-economic (with gender and age disaggregation) and environmental data sets, through village-level questionnaires (answered by key informants in the villages), and household-level questionnaires. Key informants questionnaires will consider separately men, women and young population, aiming to identify specific needs, challenges, expectations and aspirations for the most vulnerable groups (women and youth unemployed). The assessment will look at issues such as: (i) farmers' crop/livestock production preferences and management systems; (ii) amount of land that is irrigated/rainfed, and for what crops; (iii) yields and income rates from different crops and livestock; (iv) available extension services; (v) production, processing and marketing mechanisms; (vi) environmental issues and risk reduction measures; and (vii) constraints and needs to improve livelihoods (knowledge, technologies, financial assistance, land tenure, legislation, etc).
- A participatory exercise will be implemented involving the community members, extension agents, representatives from local NGO, farmers' organizations, local enterprises or cooperatives, representatives from civil servant institutions and key research organizations, to map resources, outline how the different land areas are used, and locate hotspot areas

that are vulnerable to environmental risks and/or suffering land degradation problems. Mapping will make use of GIS technology to geo-reference all sites and better monitor the impact of project interventions.

- A desk assessment of statistics, research/study reports, and past and existing development and environmental programmes and initiatives including the target areas.

168. Results from the participatory diagnosis will feed the process to develop community C-resilient adaptation plans (CAPs) that incorporate adaptation strategies and measures into NRM and value chain development, and will constitute the baseline against which changes resulting from project interventions will be compared.

169. The project team will ensure a fully participatory process for the development and implementation of the CAPs, involving separate meetings of women, youth and adult men, and ensuring that proposals of the poorest are included. The CAPs will be comprehensive, with both communal and household-based activities including climate-resilient infrastructure and equipment investments (e.g. efficient irrigation systems, renewable energy for production, processing and waste management), as well as CC adaptation activities related to agriculture and livestock value chains, microfinance support, community capacity building, and women's development.

170. The CAP mapping exercise will integrate traditional community knowledge and new information generated through strategic documents, studies, vulnerability and adaptation assessments, hotspot maps, etc. The risk that CAPs fail to capture and prioritise measures for climate change adaptation and vulnerability reduction due to low awareness of the communities on these topics will be mitigated by the project team, whose task will be to ensure that capacity on CC adaptation, climate-risk reduction and sustainable NRM is built in the communities at this stage of the participatory process.

171. The right balance between local wishes and experiences, technical and agronomic competencies, and political and strategic guidelines from the PDA and other MAPM agencies represents the value added to this concerted planning work, in order to determine priorities to be set in the territories concerned.

172. The results from the IPAC-MAM participatory planning processes (CAPs) will become a decision-making tool for the baseline (PDRZM) interventions, in terms of selection of crop types and varieties, as well as production and processing systems and technologies. Results from the participatory adaptation planning will complement the communal development plans being prepared by the Directorate General for Local Collectivities (DGCS), the Social Development Agency (ADS) and the National Human Development Initiative (INDH) since 2010.

173. Results from the CAPs will help mainstream CC resilience into value chain development in the target provinces of Sefrou and Azilal, becoming a key instrument for the design of projects that are PMV Pillar II candidates and for guiding Pillar II beneficiaries in the necessary investments to be financed under PMV.

174. ***Outcome 1.2 – Agriculture practitioners acquire and demonstrate the capacity to implement climate-resilient agriculture systems and technologies in the target areas (GEF: USD 830,700)***

175. According to the PICCPMV, fruit trees are the priority value chain for CC adaptation in the mountain zones. Moreover, both the National Action Programme to Combat Desertification and the National Plan for Watershed Management recommend fruit tree plantation as one of the main soil erosion control measures in mountain areas. The average agronomic quality of the soil, rugged terrain and rigorous climate do not favour cereal crops, which provide low yields, exacerbate soil erosion and reduce the capacity of land to face climate-related risks – hence the need to convert farmland planted with cereals into sustainably managed fruit tree plantations.

176. A number of maladaptive and suboptimal practices are currently jeopardizing both tree production yields and the natural capital stock in the selected ecosystems. Additionally, current and predicted changes in climate also negatively affect the regularity, quality, and quantity of the annual production yields. The approach advocated by the IPAC-MAM project aims at improving local knowhow on climate-resilient farming practices and reducing adaptation deficit of rural farmers. Actions to promote soil conservation and the rational use and consumption of fertilizers, water and energy under the project will be aimed at making activities and production environmentally sound and cost-effective. In particular:

(i) Overusing chemicals such as pesticides and fertilizers is an ill-advised practice with adverse effects on the agricultural economy and the environmental services on which agriculture production depends. In addition, the excessive use of fertilizers and pesticides over the long-term compromise reputation for product quality. An improvement in the competencies acquired by farmers and their cooperatives to optimize production techniques on the basis of conservation agriculture and organic agriculture principles, and rationalize the use of plant pharmaceuticals is needed, in order to increase crop productivity margins while lowering environmental damages and production costs.

(ii) Irrigation water distribution systems are subject to major losses to seepage and are vulnerable to erosion and destruction. Perimeter irrigation infrastructure is deficient and needs work to improve system efficiency and increase the availability of water resources.[57]

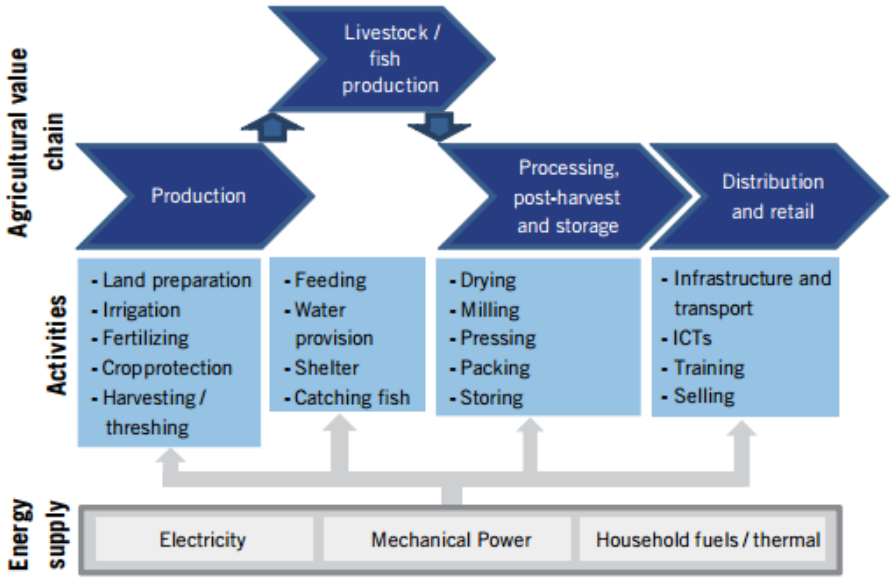
(iii) Spending on technology in the agricultural sector is one of the factors with the greatest weight throughout the value chain. The energy used for agriculture in Morocco is still essentially dependent on petroleum and petroleum by-products. This is highly polluting and also very expensive, particularly following the spike in global energy costs[58]. Soil conservation and efficient irrigation technologies also contribute to reduce significantly the energy, machinery and labour requirements, increasing profits and available time, mainly for poor-asset women and youth.

177. Climate-resilient agronomic practices, such as conservation agriculture systems and technologies incorporating organic agriculture principles, also include climate change mitigation advantages through reduced emissions due to 60-70% lower fuel use, 20-50% lower fertilizer and pesticides use, 50% reduction in machinery and labour requirement, soil C-sequestration of 0.2-0.7 t/ha/yr or more, and no CO2 release as a result of no burning of residues. A side effect of the restoration of non-crop habitats such as shelterbelts and grasslands is the enhancement of key ecosystem services, such as erosion control, pollination and pest control services, soil water regulation, income diversification, which contribute to a more resilient agriculture production.

[57] The distribution system, consisting of seguias or canals, undergoes major losses due to seepage and generally lacks facilities such as crossings, tracks and storm water drainage in ravines. This makes it vulnerable to erosion and destruction. Irrigation water is diverted using traditional structures that are often swept away by floodwaters. Also, in Sefrou, a large number of farmers, representing 40 per cent of the irrigated area, have converted to a drip irrigation system with no training in irrigation management, and continue to irrigate their plots without regard for calendar or water requirements criteria.

[58] Identification missions in both provinces, Azilal and Sefrou, confirmed the trend to use generators or electric power from the grid for agricultural activities, even when solar and carbon-free technologies were potentially accessible on the market. There is widespread use of generators and systems fueled by gas and diesel in pumps for well water intake in Sefrou, in irrigating trees, especially apple trees, and also where drip irrigation is generalized. In the province of Sefrou, tree growing is so important that surface water traditionally used for gravity irrigation is insufficient. As a result, groundwater pumping is widespread. Diesel is predominantly used as a source of energy for pumping irrigation water. This has a number of disadvantages: (i) the high cost of diesel in unit prices, which continue to rise; average cost per hectare is currently around 10,000 dirhams for plums and 10,000 dirhams for applies, representing 25 per cent to 30 per cent of the cost of inputs; (ii) efficiency losses in pumping performance using motor-driven belt pumps can be as much as 35 per cent higher than systems with no belt between the pump and the motor; (iii) these systems cause environmental and noise pollution. The use of suboptimal energy sources can in some cases be equally harmful to product quality and consumer health, where processing is not performed and managed properly. This is the case with the plum drying unit in Sefrou (Ain Tmegnay) where the fumes produced by diesel drying enter the product and compromise quality.

Figure 11. Energy inputs for agricultural value chain[59]



178. Through this outcome, the project will strengthen the capacity of various stakeholders, including individual farmers, extension agents, producer organizations, cooperative members, etc. The capacity building programme will be carried out according to the principle of "learning-by-doing", through the implementation of farm-field schools, and the adoption of a training of trainers learning system to strengthen the capacity of service providers so that they can offer sustainable quality services.

179. The project will strengthen the capacity of public administration servants to effectively guide farmers in the process of shifting from conventional agriculture to climate-resilient agronomic systems and technologies (e.g. the integration of CA and OA principles), adopting climate-proof post-harvesting technologies, and making a sustainable use of natural ecosystems for MAP production, honey production, etc. Staff from the Services for project implementation (SMOP), the agriculture extension services (SVA), the Provincial Directorate of Agriculture (DPA), and the Regional Directorates of the National Agriculture Advisory Board (DRCA/ONCA), will be trained on innovative technologies, and knowledge from cutting-edge research on adaptation in agriculture applicable to the Moroccan/project context. Such a learning programme will: (i) enlarge the pool of qualified trainers on sustainable land management practices and its CC adaptation benefits; (ii) further spread CA/OA, efficient energy systems, and sustainable NRM approaches, methods and techniques applicable to the Moroccan mountain context; (iii) increase the ability of practitioners to boost climate-resilient systems and technologies in extension programmes and tools. As part of the learning process, trainees will be required to perform participatory demonstration actions in selected farms where farmers field schools will be implemented. These practical assignments will enable trainees to put in practice the knowledge gained, and strengthen their facilitation and participatory skills.

180. The project will adopt the Farmers Field Schools (FFS) approach, which has proven successful in agriculture development projects supported by IFAD and other agencies in Morocco and elsewhere. With support and investment from the project, FFS will become “learning-by-doing” fora where poor-asset small farmers from neighbouring areas will find an ideal place to interchange ideas and experiences, and learn new production systems and techniques that can be successful replicated. The set up of a network of 22 FFS covering the different agro-climatic conditions and value chains in the mountain areas of the two target provinces – Sefrou and Azilal -will ensure a representative coverage, and will facilitate the access of poor smallholders to their nearest node of learning and practice.

181. The project will select volunteer farmers – individual farmers and cooperatives - within the target communes to allocate part of their farmland to implement the FFS learning activities. The volunteer farmers and members of cooperatives will be trained as FFS facilitators,

[59] *Source*: Practical Action 2014

working in collaboration with researchers, to guide farmers' experimental learning on testing, assessing and adapting a variety of options within their specific local conditions. The on-farm learning by doing methodology is a non-hierarchical relationship among learners and trainers. Small groups of 4-5 farmers will regularly meet in the FFS farm plot to observe results of the particular practices and treatments they are investigating. They will collect data in the field, analyze data, make action decisions, and present their decisions and field observations to the other farmers in the FFS for discussion, questioning and refinement. In this way, they will generate their own learning materials, from drawings of what they observe, that even illiterate farmers can prepare to illustrate the points they want to make.

182. The project will support FFS in developing integrated curricula where crop husbandry, animal husbandry, horticulture, and land husbandry will be considered together with climate impacts, ecological, economic, social, cultural and education factors to form a holistic approach. FFS facilitators, once they are trained on facilitation (e.g. communication, problem solving, leadership, discussion methods) and technical skills, they will take a back seat role, only offering help and guidance when asked to do so. The project will provide technical expertise from external researchers or specialists to provide backstopping support to the FFS members. Instead of lecturing farmers they will provide advice on solving specific problems and serve as a source of new ideas or information on locally unknown technologies.

183. The capacity building work in the FFS will be complemented with ad-hoc training for producers' associations, water users organizations, unions and cooperatives, addressing all relevant institutional development, organizational, management, and technical issues. Specific training targeting women and youth will enhance their participation in the targeted value chains, and provide the necessary skills to run new cooperatives and small businesses. The capacity building programme will benefit approx. 90,000 farmers - with a special focus on women and youth - and will involve the extension facilitators and researchers previously trained through the training of trainers activities. The programme will also include horizontal learning involving exchanges between the different FFS and other successful experiences in the mountain zones of Morocco. The project team will take care of the monitoring and evaluation of the learning process, through the production/use of monitoring/evaluation tools and by collecting feedback from all trainees. The quantitative and qualitative expansion of climate-resilient production and post-harvesting initiatives beyond the FFS will also be used as an indicator to evaluate the effectiveness of the CB process.

184. In setting up specific assisted operations to optimize value chains adapted to climate change, the following themes will be addressed by the capacity building programme:

(i) Understand climate change impacts on selected value chains, and learning about the use of a wider range of crop varieties better adapted to current/predicted climate and local agro-ecosystems, to help reduce climate-risks and diversify production;

(ii) Encourage farmers to learn and adopt and follow professional technical protocols and promote climate-resilient agricultural production systems and technologies (e.g. CA/OA; integrated pest management) that help raise productivity, obtain quality products, and optimize the use of inputs to lower production costs, by reducing climate-risks and improving environmental services supporting agriculture production;

(iii) Encourage farmers to learn about efficient irrigation technologies, and expand the drip irrigation system for tree plantations, as the gravity-fed irrigation technique has an adverse impact on water resources, with losses of 60%. To improve the technical performance of water use and ensure sustainability in irrigated areas in the two project areas of Azilal and Sefrou, the project will provide knowhow to improve irrigation practices with better steering and sound management; water users associations will be set up and trained to provide for better ownership and management of irrigation infrastructure. All aspects of training, capacity-building and communication in connection with water management optimization will be the responsibility of UNIDO experts, who are already collaborating with IFAD and MAPM in the implementation of agriculture development projects with successful results in the field.

(iv) Provide training and technical support to farmers to implement water harvesting technologies in the establishment of new fruit tree plantations: (i) rock removal from plots to build stone bunds in proximity to plots to minimize the erosive impact of water runoff; (ii) installing impluvium to improve rainwater collection for rainfed crops

such as almond and carob; (iii) terracing on steeply sloped land; and (iv) optimizing the use of drip feeds for apple and plum trees;

(v) Support producers' organizations and cooperatives in the adoption of new technologies to reducing post-harvest losses, optimize fresh product collection, storage and transportation, raise productivity and diversify production (raw and processed products) without increasing pressures on natural capital;

(vi) Strengthening the Meteorological services of the Country to implement an effective weather and climate monitoring system to support a better planning of the agronomic activities and provide early warning information to practitioners for a better protection of production against the risks of climate change and variability.[60] Meteo stations will be installed complementing the already existing network, to support climate risk prevention and resilience at the local level, and provide at the same time relevant information to the central system to which they will be connected. In addition to the network of meteorological stations, the baseline project (PDRZM) will implement a system to disseminate information needed by farmers directly, in collaboration with ONCA and using radio, television and SMS instant messaging.

(i) Provide training and technical support to farmers' organization, cooperatives and small enterprises regarding optimize used of renewable energy in agricultural production, post-harvesting operations and processing units to lower costs for farmers by introducing new technologies supporting CC adaptation and mitigation objectives. The project will run a series of dedicated studies in order to identify the best technologies that will allow farmers to reduce their ordinary and extraordinary costs related to irrigation pumps, cold storage units and processing units. Such technologies (e.g. solar water pumping, solar honey production units; bio-energy produced from agriculture waste to feed cold storage, drying and rehydration units) will be installed and tested in the different value chains and, through a series of training, communication and awareness activities, disseminated among all farmers in the region. Furthermore the introduction of new technologies and practices will create new business opportunities and will support the overall objective of promoting livelihood differentiation among smallholders.

185. The ultimate aim of specific assisted actions is to test and share best practices in order to elicit interest from the private sector – small and medium-sized agricultural cooperatives, unions and farmer associations – that find it feasible and advisable to adopt such solutions. Moreover, the investment should be within the scope of existing financial instruments in Morocco's agricultural sector,[61] including public subsidy and credit systems such as FDA.

186. **Component 2 – Strengthening Ecosystem Services (GEF Contribution: USD 1,196,800)**

187. The natural vegetation of the mountain regions in Sefrou and Azilal is exposed to a high risk of degradation as a result of excessive, uncontrolled biomass harvesting, overgrazing and conversion into agriculture of unsuitable lands. Climate change impacts will further reduce the capacity of the natural ecosystems to face the combined effect of human and environmental risks, and to main the environmental services needed to support sustainable agriculture production.

188. The maintenance and restoration of natural ecosystems in/around farmland through environmentally sound and socially beneficial ecological restoration and risk reduction measures offer real opportunities to enhance the resilience of the targeted socio-ecosystems, while increasing the natural capital and services they provide to rural livelihoods and the broader society. Additionally, the efficient use of water and renewable energy sources, among other benefits, will help reduce excessive pressure on the natural resources (e.g. wood consumption for energy; overuse of underground and superficial water), therefore contributing to the maintenance and recovery of the environmental services on which agriculture production depends.

[60] Babqiqi, A., M. Messouli (2013) Simulation of climate and its implication on agriculture in Morocco using Statistical Down Scaling. International Journal of Latest Research in Science and Technology, Vol. 2 Issue 5.

[61] Poverty, Access to Credit and the Determinants of Participation in a New Microcredit Program in Rural Areas of Morocco. Esther Duflo, Abdul Latif Jameel Poverty Action Lab (J-PAL)/Massachusetts Institute of Technology (MIT), Bruno Crépon, J-PAL/Economics and Statistical Research Centre (CREST), William Parienté, J-PAL/Paris School of Economics (PSE), Florencia Devoto, J-PAL, 2008.

189. Through this component, the SCCF project will strengthen the capacity and participation of local institutions and communities in ecological restoration actions that: (i) have a positive impact on the whole landscape and broader range of land uses, not just the individual sites; (ii) provide balanced environmental, social, and economic benefits that best meets social demands and environmental needs; (iv) demonstrate a model for the sustainable use and economic benefit of restored lands that is suitable to the local context and needs.

190. This component will also strengthen the capacity and participation of project beneficiaries and all concerned stakeholders in the use of efficient technologies to overcome water constraints and reduce economic costs and environmental pressures derived from energy consumption and agriculture waste.

191. **Outcome 2.1. Climate-proof technologies for the efficient management of water, energy and waste in sustainable crop production are applied (GEF: USD 953,400)**

192. Energy expenditure in the agricultural sector represents one of the major constraints in terms of production costs throughout the value chains. The optimization of energy use in agricultural production is twofold: i) reducing costs for small farmers, farmer associations and agribusinesses; ii) introducing CC adaptation technologies for sustainable NRM. The SCCF project will carry out preliminary studies about the technical and economic feasibility of climate-proof technologies on energy efficiency that will support decision-making in the selection of investments in the framework of IPAC-MAM and the baseline interventions (PDRZM and PMV):

- Design and construction of an optimized energy system for cooling and processing units to upgrade the production of apple by-products and derivatives (apple juice, vinegar);
- Design and construction of an optimized energy system for drying and rehydration plums to upgrade the production of plum by-products and derivates (jam, dry plums, etc);
- The conversion to solar energy for honey production centres and its derivatives;
- Design and construction of an optimized energy system for the processing of carob derivates;
- The adoption of solar energy technologies for water pumping supporting efficient micro-pressurized irrigation systems.

193. The use of solar energy for water pumping will be linked to spreading of drip irrigation technologies in the existing and newly planted fruit tree orchards in Sefrou and Azilal. These interventions will be supported by:

- technical assistance in the handling and management of the renewable energy facilities, to maintain a high degree of efficiency and to help beneficiaries to use them correctly;
- training of beneficiaries to transfer knowhow to direct users;
- the creation of "business-teams" of young people and women involved in the formation of on-site small enterprises for the provision of service regarding the installation and maintenance of the new equipment;
- exchanges of experiences and know-how among beneficiaries from different regions and value chains, so that they can learn from each other about successful results in energy efficiency.

194. The conversion of farmland plots into efficient irrigation systems will imply the installation of the intake structure, pumping station, conveyance and distribution systems that will be financed by the PDRZM baseline interventions. IPAC-MAM will co-finance the on-farm drip irrigation equipment (pipes, flow control devices, filters, fertigation equipment, water emitters, soil moisture measures, etc). The project will support the institutional development and training of WUAs to enhance ownership and management of the irrigation infrastructure. A number of farm totalling 5 ha will be allocated as FFS to test the newly adopted equipment and provide support to capacity building actions. Exchange visits for the transfer of experiences and knowhow will be organize among beneficiaries from different regions to assess and evaluate the irrigation benefits and promote self-horizontal learning of the technologies introduced.

195. The SCCF project will also provide technical support to assess options for developing viable sustainable bioenergy production units, mainly based on agriculture waste. Agriculture

waste, namely fruit tree pruning and fruit processing waste, is often misused or burned, becoming an environmental problem - pollution, fire risk, and CO2 emissions – that will be exacerbated by climate change. The project aims to transform waste from a problem to an important bioenergy resource such as the production of briquettes for hitting and cooking in rural mountain communities. The use of agriculture waste will also reduce pressure on the natural ecosystems therefore contributing to the maintenance and recovery of the environmental services on which agriculture production depends.

196. IPAC-MAM will hire international expertise to analyse the viability of implementing small bioenergy production units according to sustainability and climate resilience criteria, taking agriculture biomass as the main input source. The analysis will follow three main steps: (i) estimate the potential of agriculture biomass in the study area; (ii) analyse the technologies for producing energy from biomass and define the most appropriate scenarios for implementing energy production systems; and (iii) analyse the sustainability of implementing energy production systems in the tow regions, which includes the environmental, social and economic impacts, benefits and costs of biomass harvesting, transportation and energy conversion. The use of agriculture biomass for energy will be compatible with other uses of agriculture waste for soil permanent cover and livestock fodder. The analysis results will be piloted through baseline investments (PDRZM and PMV) in one area in each region to demonstrate knowhow and raise awareness among project beneficiaries.

197. Results from the SCCF project will be used by the baseline for conducting studies on subsidies, financial products microcredit directed towards investments in the energy efficiency, water efficiency and waste management sectors in Morocco, both from the public and private sectors. Results from the studies will constitute an integral part of information packages to be disseminated to the project beneficiaries.

198. ***Outcome 2.2*** **– Ecosystem services supporting agriculture production are restored in the target areas** ***(GEF: USD 243,400)***

199. The restoration of vegetation cover and natural productivity contributes to a higher climate resilience of rural communities, farmland and agro-landscape ecosystems. The restoration of non-crop habitats in between and near farmland plots – mainly natural vegetation shelterbelts such as aromatic shrubs alternated with trees, and grassland strips in tree orchards – increases key environmental services for agriculture production[62]. The restoration of vegetation shelterbelts along the boundaries of farmland plots creates a favourable microclimate for crops, increases soil fertility and water infiltration, prevents the negative effects of strong winds (e.g. higher evapotranspiration and wind erosion, water evaporation and mobilization of soil particles), and reduces runoff erosion risk. Moreover, the restoration of vegetation shelterbelts has a positive effect on micro-pressurized irrigation, reducing evaporation caused by heat and the wind.

200. The sustainable management of natural ecosystems actively contribute to restoring biodiversity and combating soil erosion and desertification. For instance, cultivating and sustainably harvesting medicinal and aromatic plants (MAP) in support to beekeeping and as a way to improve the environmental services on which fruit tree growing and horticulture depend, are all areas which, although traditionally present in the project regions, are clearly underdeveloped today and therefore insufficiently widespread despite their economic, social and environmental potential. Introducing an approach based on conservation agriculture[63] and organic agriculture focusing on strengthening the so-called minor value chains diverts

[62] Natural vegetation in agriculture landscapes provides the following environmental services: (i) habitat and food for natural enemies to agriculture pests and provide biological control services to farmers thereby reducing the need for pesticides; (ii) pollination services; (iii) regulation of the capture, infiltration, storage and flow of water across the landscape, improving quantity and quality of water, and reducing runoff erosion, peak flows and floods; (iv) improvement of soil structure and fertility; (v) provision of favourable micro-climate conditions for crops in terms of temperatures, humidity and wind; (vi) higher provisioning services, such as complementary income opportunities based on the production, processing and marketing of non-timber forest products –raw and processed - such as medicinal and aromatic plants, wild fruits, mushrooms, honey, firewood, fodder, etc.

[63] Conservation agriculture aims to create sustainable, profitable agricultural systems that tend to improve living conditions for farmers by simultaneously implementing three principles at plot level: minimal working of the soil, crop association and rotation, and permanent soil cover. Conservation agriculture holds great potential for all kinds of agricultural operations and agro-ecological environments. It is of great interest for small farms, where limited means of production stand in the way of overcoming time and labour constraints which is a priority goal. This is a way of reconciling agricultural production with improving living conditions and protecting the environment. Conservation agriculture is being implemented successfully by various types of production systems in a broad range of agro-ecological areas. It is seen by users as a valuable tool in long-term management of the land. http://www.fao.org/ag/ca/fr/index.html

attention away from intensive mono-cropping systems that are less sustainable in terms of water, energy, and chemical inputs required.

201. The existence of knowhow around products such as MAP harvesting and/or production and sustainable rangeland management represents an invaluable asset that is presently underdeveloped[64]. In this case, considerations relating to economic potential go hand in hand with preserving environmental services and combating land degradation and climate change impacts, making the ecological restoration and sustainable use of natural ecosystems a strategic activity from the point of view of socio-ecological resilience[65].

202. The strategic importance of MAP-based agriculture and linked natural products' industries for Morocco has been underlined by the "National Development Strategy for Aromatic and Medicinal Plants Sector" developed within an USAID funded project in 2008. In fact, this Outcome is firmly based upon this Strategy that positions MAP industry as a major competitive advantage of the country, the engine behind its growth and development, sector composed of mainly SMEs, thus giving employment to a significant part of Moroccan population. The National Institute of Medicinal and Aromatic Plants (NIMAP) has been created as a first and most indicative result of the policy to develop the new research capacities of Morocco, which are vital to socio-economic and national development of the country.

203. The aim of this Outcome is to test pathways to demonstrate the economic potential of natural ecosystem' products that are currently degraded, marginal and underdeveloped. This will be done combining innovative ecological restoration technologies with modern production techniques to produce high quality MAP products (e.g. dried or fresh herbs, essences, etc) that can be positioned well on the market and also be beneficial in combating the effects of climate change.

204. The project team will hire international and local experts to assess ecological restoration needs and to provide know-how on ecological restoration methodologies and techniques to ensure that sufficient future capacity is available within the Governmental departments, extension agents and farmers. In the framework of FFS, the project will demonstrate innovative planting techniques for multi-purpose native seeds and seedlings that help increase resilience to climate-related risks while providing high socio-economic benefits (e.g. drought-resistant and soil protection plant species, such *Euphorbia sp, Rosmarinus sp, Origanum sp, Satureja sp, Lavandula sp*, with apiculture, MAP and rangeland/fodder production value). The project will support the development of ecological restoration protocols, including planning, implementation and monitoring guidance, to become available for all project beneficiaries interested in establishing protective multi-purpose vegetation shelterbelts.

205. The project team will facilitate the creation of local producers' associations, with a special focus on women, which will gain access to a full package of technical assistance and training on ecological restoration techniques and MAP production, processing and marketing. The project will also provide financial support for the acquisition of high quality plant material (seeds and seedlings) and processing/storing facilities. In turn, the project will require that each producer makes available an adequate and suitable amount of land, which should meet a set of minimum requirements in terms of size, soil depth, height, etc.

206. The project will also assist local communities to create rangeland management associations and provide them with training and technical advise to ensure proper management and protection of rehabilitated rangelands.

207. An amount of research work would be needed at the early stages, in order to guide decisions on the location and nature of the plantations and value chains. It is suggested that the project team produce a directory and a GIS map of potential producers in the two project areas, and finds out who are the potential market opportunities and MAP retailers and buyer companies. The project team should also partner up with the National Institute of Medicinal and Aromatic Plants in Morocco (NIMAP) to carry out a preliminary soil analysis of each plot, so as to maximise chances of success and choose the most suitable MAP species. Other issues that need be looked at are the option of applying for available subsidies for MAP production.

[64] Hamimaz R. 2009
[65] Naggar M. 2000

208. The selection of the plants and products will be carried out at the very early stages of the project. A preliminary list of potentially interesting plants may included species with high apiculture value, such as *Rosmarinus sp, Origanum sp, Lavanda sp,* and *Satureja sp*. The final choice will be based on the following criteria: (i) native plants that are well adapted to the climatic and ecological conditions of the project area; (ii) Plants/products that have an undisputable commercial value, and that already have a well-established niche in the domestic/export market; (iii) Plants/products whose cultivation and processing does not entail any particular challenge, and that can easily be managed at the facilities established by the project.

209. The value chain should aim at adding the maximum possible value to the produce locally, in order to maximise the gain for the producers. In the short- and medium-term, the project could set for semi-processed products such as mixtures of dried herbs, high-value parts of dried plants (leaves, flowers), essential oils, etc. The project supported production and marketing actions will be oriented towards organic products and, possibly, fair-trade certification, which would add additional value and make them more interesting to foreign buyers.

210. The project team will foster the creation of a group of buyers including private companies already involved in the trade/import of MAP from the project areas and Morocco as a whole. The project team will seek for the buyers' commitment to purchase the project's produce, and quantity and quality thresholds would be agreed with the producers and the project management. The buyers should also become involved in the training of producers, so as to ensure that such thresholds are successfully met. The set up of buyers' groups would lead to a win-win situation, where both producers and buyers can minimise their investment risk, and where the creation of local wealth would be guaranteed since the early stages of the process.

211. In the framework of the FFS, some land, time and resources will be set aside to carry out research work aimed at developing the MAP value chain. The project team will gather information on existing experiences and practice of commercial cultivation of the selected species, and set up its own production protocol. Given the innovative nature of the proposed actions and the low baseline capacity of local beneficiaries, the provision of timely, continued, high-quality technical assistance is paramount to the success of the project. The potential buyers identified and contacted by the project should be provide part of the adequate TA throughout all the stages of the proposed process, from the inception phase, to the selection of production sites, MAP species and plant material, production and processing equipment, etc.

212. **Component 3 – Climate proofing of value chains and diversification of productive practices (GEF Contribution: USD 3,799,600)**

213. This Component will improve the indicator measuring positive changes in the index of production systems optimization in at least 70% of farmers. The production systems optimization index will be calculated on the basis of a series of parameters such as: (i) cost-benefit ratio in terms of production quality and quantity; (ii) reduction in water requirements for crops; (iii) reduction in post-harvest losses; (iv) reduction in waste management costs, specifically by recycling; (v) reduction in the cost of inputs and the cost of energy, water, transportation, plant health products; (vi) reduction in soil erosion; (vii) improvements in the soil water holding capacity; (viii) improvements in soil organic matter content; (ix) improvements in water quality due to lower use of chemical fertilizers and pesticides, etc.

214. Activities planned under this component will enable beneficiaries to deal directly with climate adversities by increasing productivity and the overall quality of the natural capital (soil fertility, soil organic matter, soil water content, pollination services, healthy natural vegetation cover, etc) so as to ensure a sustained production over the years of high quality products, and diversify investment. In addition, the strategy is intended to lower operating expenses and reduce post-harvest losses by increasing investment in new crops/varieties and technologies better adapted to climate change, and reduce dependency on aid and moneylenders.

215. A systemic and integrated approach is needed to support the process of build resilience of rural communities and adapting the rural economy to climate change. Such an approach needs to take into account the following factors: (i) the traditional value chain model, in its upstream (production) and downstream (processing and marketing) aspects;

(ii) diversification of agricultural production in key value chains; and (iii) diversification of practices to develop so-called minor products.

216. It is largely by diversifying crops, crop products, and related knowledge that rural people can adapt their own cropping practices and combat climate vulnerability, which affects both human groups and their ecosystems in which they live. The possible benefits and impact of diversification are many: (i) distributing risks, both climate-related and others, among different crops; (ii) redistributing income to a larger number of rural people; (iii) developing competencies around production, processing and marketing; and (iv) achieving a broader range of products that better reflect the productive potential of the mountain regions targeted by the project; (V) broader range of crops and varieties that better respond to climate changes.

217. Diversifying and adapting technologies to climate change, besides being an effective instrument to combat poverty and economic marginality of certain rural population groups, especially women, young people and the landless, lays the groundwork for addressing anthropogenic pressures on fragile territories, overuse of aquifers and increasingly scarce vegetation cover as a result of mal-adaptive farming practices oriented towards intensive mono-cropping with suboptimal use of inputs.

218. ***Outcome 3.1. – Fruit tree value chains improved through climate-resilient investments and diversification upstream and downstream the project areas (GEF: USD 3,442,800)***

219. Fruit tree species are present in great numbers in the project areas: Walnut and carob, together with almond and olive are particular present in the province of Azilal, while cherry, plum and apple are more frequent in the Azrou province. These crops are adapted to the local conditions: slopes, altitude and type of soil, and in some cases are highly resistant to water scarcity, such as carob and almond. The resulting products are easy to store and not immediately perishable, in the form of raw products in the case of dried fruits, and in the form of processed by-products and derivatives (e.g. vinegar, oil, gum, etc).

220. The project will provide financial support to farmers' organizations, cooperatives and local entrepreneurs in the project areas to invest in suitable adaptation technologies for agriculture production (e.g. CA/OA, integrated pest management, pressurized irrigation, water harvesting infrastructure), post-harvesting technologies and processing and marketing equipment. Farmer individuals and organizations trained in Outcome 1.2 will receive financial support and technical assistance for the adoption of the selected new technologies, and for the adequate operational and maintenance of all the equipment and infrastructures. The project will also guide farmers in the selection of the best adapted fruit tree varieties, based on local knowledge and scientific information developed by INRA and other research institutions. The use of several varieties from the same crop will be promoted as a climate-risk reduction strategy, as well as the combined use of different types of crops.

221. The governmental documents addressing CC adaptation in the agriculture sector (PICCPMV, SNC) propose efficient irrigation technologies (EIT) and conservation agriculture (CA) systems for soil conservation and sustainable water use and management as a key CC adaptation strategy that reduces environmental risks, increases agriculture productivity and secures food security. These adaptation technologies are featured in the GEF/UNEP Guidebook for CC Adaptation in Agriculture, among which the use of pressurised irrigation systems (sprinkler or drip) to improve water management and efficiency, and the adoption of CA systems (the combined use of reduce/no till, soil mulching, crops rotation and diversification, and integrated nutrient and pest management) to improve soil fertility and soil carbon and water storage.

222. Conservation agriculture (CA) is being practiced in the dry Mediterranean region with fruit trees in most cases in combination with cover crops and livestock (generally sheep)[66]. Integration of trees and shrubs into CA systems is a compatible practice since no-till favours the establishment and good growth performance of trees and shrubs that can add biomass and resilience to the production system as well as many other advantages related to ecosystem services and livelihood. The competing uses for crop residues could be potentially resolved through better area and on-farm integration of crop-fodder-tree-livestock systems involving community-based approaches to the effective management of functional biomass and stocking rates. Moreover, woody waste biomass from fruit tree pruning and nut-shells

[66] Kassam, A. et al (2012) Conservation agriculture in the dry Mediterranean climate. Field Crops Research (2012) 132: 7-17.

can be exploited for the production of bio-energy, which also helps reduce pressure on the natural vegetation cover.

223. Overall, conservation agriculture (CA) systems have a higher adaptability to climate change because of the higher effective rainfall use due to higher infiltration and therefore reduced surface runoff and soil erosion as well as greater soil moisture-holding capacity[67]. Thus crops under CA systems can continue towards maturity for longer than those under conventional tillage. Compared to conventional systems, CA has been found to maintain or increase yields, reduce production cost and labour requirements, improve soil fertility and reduce erosion[68]. These incentives make CA a viable alternative in the Atlas mountains under a CC aridification trend, where it could help address the challenges of water scarcity and degradation of the natural resources. The project will provide technical support for the design and development of site-specific and value-chain-specific CA systems through a comprehensive assessment of the ecological and socio-economic conditions under which CA would be adapted for smallholder farming in the project areas of Azilal and Sefrou.

224. Drip irrigation can help farmers by improving the efficiency of water use and achieving a more even application of water to agriculture land, thereby promoting steady crop growth. In areas subject to climate aridification, pressurised irrigation reduces demand for water, reduces water evaporation losses, and helps prevent salinization problems. The drip technology uses even less water than other micro-pressurized irrigation and is not affected by wind, which represent a major problem in the project areas. Scheduled water application will provide the necessary water resources directly to the plant, and when required. Furthermore, fertiliser application is more efficient since these can be supplied through the pipes. Drip irrigation will also represent an important tool to prevent salinization problems arising from the excessive use of irrigation water (e.g. drip irrigation effects in reducing root-zone soil salinity and drainage), as has been demonstrated in numerous agriculture development projects in arid, semi-arid and sub-humid zones worldwide.

225. The baseline project (PDRZM) will support beneficiaries in the establishment of new plantations to convert marginal farmland into apple (150 ha of new plantations), almond (700 ha of new plantations) and plum (75 ha of new plantations) crops, with the aim to increase productivity and diversify farmers' income while supporting erosion-reduction and climate adaptation objectives. In this case, the IPAC-MAM intervention will focus on: (i) identifying optimal areas for the establishment of new plantations based on CC predictions; (ii) selecting the better adapted varieties for the different crops and providing guidance for the diversification of tree plantations combining several fruit tree varieties and crop types (ii) supporting climate-resilient investments in production and post-harvesting technologies, and developing effective agronomic, operational and maintenance protocols to improve production in the existing/new plantations, and adapt these value chains to climate change.

226. In the case of Azilal region, the IPAC-MAM will play a specific role vis-à-vis the project baseline (PDRZM) in the expansion of two fruit tree crops – carob and walnut - that were selected during project identification missions and conversations with farmer groups, as the best crops to combat land degradation and respond to climate change impacts in this region.

Walnut value chain

227. In Azilal, walnut trees cover 900 ha, representing 20% of all walnut plantations in Morocco and the fourth most important tree growing activity in the province. Production of 385 tonnes of walnuts remains low at just 5% of domestic production. Walnut plantations in Azilal, as in other regions of Morocco, consist mainly of trees from seedlings, giving them specificity as a unique local product. In terms of cropping practices, walnut trees do not require any maintenance on the part of farmers. According to conversations with farmers, an average of 20% of walnuts produced are empty and 30% are shrivelled. Accordingly, 50% of production is not marketable and therefore lost to the producer. The benefits of developing the walnut value chain in Azilal are as follows: (i) the province's large share of Moroccan walnut production; (ii) the use of local plant material as varieties with high CC adaptation value due to their high resistance to soil and water constraints; (iii) the high market value of

[67] Ibid.

[68] Conservation agriculture (CA) systems have a higher adaptability to climate change because of: (i) a more effective water infiltration and greater soil moisture-holding capacity, that help minimise the impact of extreme weather events such as water stress during drought, and run off erosion and flooding during torrential rain events; (ii) the reduction of surface soil extreme temperatures and fluctuations help minimise the effect of heat weaves and frost periods; (iii) the higher soil resilience increase productivity and crop diversification, with a positive effect on food security; (iv) the reduced use of fossil fuel and the increase of soil carbon has an important mitigation effect.

walnuts on the Moroccan market; and (iv) the lack of competition in the form of potential imports.

228. The main opportunities available to the value chain are as follows: (i) MAPM's firm intention to develop the value chain on a national scale and in the province of Azilal, with a project to convert 250 ha of cereals to walnut production in the rural communes of the province; (ii) water resources available in the valleys where walnuts are cultivated; (iii) the presence of farmers' and women's associations to promote unique local walnut products; and (iv) the lack of drying, conservation and packing facilities for in-shell walnuts in Morocco to preserve the quality of the nuts and add value. On the other hand, the main constraint on value chain development lies in the extensive cropping system used, characterized by scattered plantations and vigorous trees that are difficult to maintain and harvest. Also, the strategy to develop the value chain should be based on an approach that allows for rational development, supporting the adaptation value of local varieties, and taking into account the farmers' technical and financial capacities.

229. Upstream, the following actions will be promoted to develop the value chain: (i) expand the area cultivated with local varieties of walnut in marginal farmland with soil degradation trend; (ii) build producer capacities with training and proximity support (UNIDO) to improve yields and nut quality, based on adopting climate-resilient agricultural practices, including organic farming to increase quality and market opportunities for the end products; (iii) rehabilitate existing walnut trees while preserving their natural character; (iv) adopt technical protocols adapted to existing cropping systems, particularly in connection with excessive tree vigour.

230. Downstream, the province of Azilal produces 385 tonnes of walnuts that are as yet little developed. The value chain is poorly organized, which affects the negotiating power of producers as value added accrues mainly to intermediaries. Walnut oil is produced on an artisanal scale by women's cooperatives using rudimentary equipment. Industrial crushing and packaging facilities are non-existent and are therefore done outside the province. The project will finance the setup of a 1.8 tonne/day capacity unit to remove walnut skins, dry, crush and package nuts. It will also strengthen the Tikniouine walnut oil cooperative by upgrading equipment (e.g. efficient and low-energy machinery) and premises and the Ait Bououali Association to promote women by developing a centre to process walnuts, by-products (walnut oil, rootstocks and juglandine) and derivatives (residue, husks and shells) in the commune of Tabant. It will provide support for units in obtaining the necessary quality certifications (including organic certification) and in marketing the final product. Walnut oil extraction and crushing units will be reserved for women's groups. The programme will finance training in post-harvest technologies and in best practices in manufacturing and hygiene.

Carob value chain

231. In Morocco, carob – a natural ecosystem type - accounts for an area of more than 30,000 ha. Morocco is the world's second largest producer of carob seed after Spain. Production is equivalent to 60,000 tonnes of pods and 10,000 tonnes of carob seeds, accounting for close to 25% of world production. The country has 10 units[69] producing mainly gum and crushed product, with an annual processing capacity in excess of 80,000 tonnes. The sector's trade balance is MAD 328.8 million in favour of exports. Demand for gum corresponds to about 35,000 tonnes of seeds. The species is of enormous socio-economic and ecological interest. Given its aptitude for developing different strategies to adapt to water constraints, this tree can play a major role for CC adaptation due to predicted aridification trend in Morocco, and more specifically in the mountain areas. However, the lack of value chain organization is one of the major obstacles to developing this crop. The region of Tadla-Azilal is the primary production area in Morocco. Several actions have been taken to promote the value chain in the region, specifically the partnership between MAPM, the High Commission for Water, Forests and Combating Desertification (HCEFLD) and local authorities in the region to promote carob cultivation with extension and technical support for farmers. The major issues facing value chain development are as follows: (i) as carob trees grow spontaneously, they cover land irregularly as opposed to an orchard with trees planted in regular lines; (ii) legislation governing operations is under HCEFLD oversight, posing problems with maintaining trees but above all with transporting and marketing pods; (iii) interaction between the population and the Department of Water and Forests is ongoing concerning the boundaries of private plots and forests in the public domain; and (iv) the operating system

[69] In Fez, Meknes, Marrakesh, Beni Mellal and Essaouira.

practised by farmers is one of gathering rather than agronomic cropping. The area covered by carob trees in the province of Azilal is estimated at 2,500 ha, including 1,500 ha in the forest domain and 1,000 ha on private land. The Azilal Department of Agriculture undertook in 2011 to double graft 9,000 male carob seedlings and plant 250 ha of grafted plants. This elicited demand from farmers who wish to continue the operation to double graft male seedlings and/or plant the grafted carob trees.

232. Upstream, actions within the value chain will involve: (i) expansion of 500 ha[70] of new area planted to carob by addressing constraints relating to plant material; (ii) capacity-building for producers in the form of training and proximity support (UNIDO) in carob technical management; and (iii) rehabilitation of existing carob trees while preserving their natural character.

233. Downstream, the substantial demand for local products opens up opportunities for developing production of this value chain. Production estimated at 4,000 tonnes is now being processed, but outside the province of Azilal. The programme will finance the setup of two crushing and package units and one gum manufacturing unit. It will finance support for their setup to ensure that they obtain certifications. It will support marketing of the final product and training in post-harvest technologies and best practices in manufacturing and hygiene for the staff of these units.

234. The potential of horticulture and livestock integration into fruit tree production is considered in the context of diversifying agriculture production under sustainable agronomic systems (CA/OA) and optimized irrigated farmland. Horticulture integrated with fruit tree growing, in addition to MAP and honey production, is the most feasible sector for investment. Certain horticultural products such as lentils or beans, when produced in rotation, favour soil improvements, in terms of fertility, organic matter and water retention capacity, which prevent the impoverishment that tends to occur in the case of intensive mono-cropping. Moreover, territorial surveys have shown that certain horticultural products feature characteristics in terms of quality and local identity that are not being developed, whereas they have the potential to exceed self-consumption or the limited circuit of local markets.

235. The project will support the acquisition and installation of automate weather stations[71] in the framework of the 22 FFS (Outcome 1.2) to strengthen the capacity of the project beneficiaries and partners (e.g. governmental extension officers) in managing climate data through the regular collection of weather parameters (e.g. wind speed and direction, rainfall amount and intensity, temperature, relative humidity, solar radiation, pressure, sunshine duration, soil temperature, soil moisture), that provide real-time and more localized information to help them in making decision (the best time to plant, to irrigate, to add fertilizers, etc; the amount needed; etc) and solving field operation problems to reduce climate-risks and ensure high yields and sustained crop production.

236. The project will provide training to project beneficiaries and stakeholders (namely extension officers) through international and national experts on: (i) the use of CC downscaling information to analyze the impacts of climate change on the sector of interest and adjust crop production and post-harvesting calendars, technologies and management systems; (ii) the use of automate weather stations for climate data gathering and forecasting; (iii) the development of indicators to verify the most critical aspects of climate changes along value chain stages; (iv) the transfer of the acquired knowledge to the FFS demonstrations on selected value chains, addressing recommendations for adjusting the adaptation measures in the planning of cropping systems, the selection of crop varieties, the agronomic measures and technologies, and the post-harvesting measures and equipment.

237. The project beneficiaries and stakeholders will learn in the FFS about the use of weather data, simple farm level weather forecasting, and the development and use of indicators to verify the most critical aspects of climate changes and adjust management along the value chain. Knowledge will then be transferred to their own farmland plots, and to other projects supported by PMV Pillar II.

238. ***Outcome 3.2 – An adapted honey value chain enhancing production and quality improvement (GEF: USD 356,800)***

[70] The Azilal DPA and ADA have prepared a project to convert 2,000 ha of surface area planted to cereals over to carob plantations, benefiting 912 people living in 16 rural communes located in the western part of the province.

[71] Compact equipment powered by storage battery and solar cells, equipped with data storage system, thus data downloading can be done on a daily, weekly or monthly basis. Data collection can be programmed according to the needs, and a telemetry system could be connected so that data can be remotely accessed through mobile SMS or other form of messages in real time.

239. Beekeeping as a whole is one of the sectors most sensitive to global changes, both anthropogenic (e.g. the increased use of pesticides and herbicides in agriculture) and climate change (e.g. changes to habitats and to behaviour of bees leading to declining numbers). Product quality and quantity are closely linked to the health of the ecosystem in which bees and beekeepers operate. On one hand, the crosscutting interests of beekeepers, in effect, tend to be aligned with safeguarding rich biodiversity and keeping the ecosystem in balance with respect to natural resource use, avoiding chemicals such as herbicides or pesticides[72]. On the other hand, farmers depend on the pollination services provided by bees and other insects to secure their crop yields, both in terms of quality and quantity, thereby it is in their own interest to adopt climate-resilient agronomic practices that help reduce the use of chemicals and preserve the natural ecosystems in/around cropland. Beekeeping represent a production system that, more than any other, helps us understand how producer's needs are closely aligned with paying attention more generally to natural resources and their sustainable use[73]. In this sense beekeeping is the banner or key activity under the entire project[74].

240. The importance of the beekeeping value chain in the project area lies in: (i) the size of the bee population, with a significant number of beekeeping cooperatives and a union in each of the two programme zones; (ii) diversity in terms of melliferous flora and natural and cultivated ecosystems, allowing for the practice of transhumance, and honey production for which there is strong demand at good prices; (iii) the existence of strong demand from the population to practice beekeeping; and (iv) the existence of a beekeeping tradition which however needs to be modernized to meet production and marketing standards. On the other hand, the value chain currently faces constraints in the form of fragility on the part of some beekeeping cooperatives and the two unions in existence, low production levels and low value added.

241. Due to the high diversity of the local melliferous flora, various types of honey are produced according to collection frequency per year and apiaries proximity to plant associations dominated by *Rosmarinus officinalis* (honey of Azir), *Origanum compactum* (honey of Zaatar, acrid taste), *Arbutus unedo* (honey of Sasnou or Mrouna), *Anthyllis cytisoides* (honey of Thargouith), *Ziziphus lotus* (honey of Sedra), *Eucalyptus* spp. (honey of Kaliteus), *Ceratonia siliqua* (honey of Kharoub), *Bupleurum spinosum* (honey of Santase), *Dittrichia viscosa* (honey of Bayramane) or *Globularia alypum* (honey of Taslgha, very spicy taste).

242. Honey is widely consumed at the local and is considered as a health food. Some beekeepers separate pollen of some plants for traditional medicine use (against allergy and liver diseases respectively for *Dittrichia viscosa* and *Globularia alypum*), and wax, sold or used for cosmetic purposes. However, other apiculture products such propolis, larva of bees, venom and royal frost could be exploited by using selected colonies of bees[75]). The unit price of honey is very high when compared to living standard of the local population, reaching 400 MAD.L-1, and fluctuates from 145±33.9 to 269±77.1 MAD.L-1 in terms of honey types. The cost production of honey varies also from 30±24.5 to 80±28 MAD.L-1. The honey collected from traditional hives is produced mainly from several plants (two collections a year) and highly demanded[76].

243. In developing the honey value chain, potential in both provinces lies in: (i) the high quality and quantity of honey produced; (ii) the existence of different brands of honey; (iii) producers' knowhow; and (iv) unique local potential. Furthermore, as beekeeping is often a side activity of farmers, investing in such value chain will allow to better channel among beneficiaries key concept of organic agriculture, conservation agriculture and

[72] Amourag A. 2010.

[73] Christmann S. 2012.

[74] The traditional approach to managing basic mountain resources, specifically forests, is to be replaced with a multi-use, less technical and more social and participatory approach. The aim is to preserve vital functions and equilibria while meeting social and economic needs by adding value to all products – commercial and otherwise – including those considered secondary such as honey, aromatic and medicinal plants, mushrooms and forage. There is a need to develop all areas of potential in mountain zones, which should not be perceived as handicapped but rather the source of specific opportunities, both for themselves and for society as a whole. There is a need for recognition of local specificities by adopting procedures that are adapted to different contexts, to arrive at a juxtaposition of models. To this end, procedures must be systematic, objectives-based, monitored, evaluated and constantly corrected. Prospects for Morocco 2030: sustainable management of natural resources and biodiversity in Morocco, report prepared by Mr Abdellah Laouina, High Commissioner for Planning, March 2006.

[75] Ennabili, Gharnit & Elhamdouni, 2000; Imdorf, Ruoff & Fluri, 2010; CRA, 2011.

[76] KHABBACH 2013.

integrated pest management. However, the value chain features shortcomings in marketing, quality and packaging and downstream organization.

244. The following areas of potential and constraints relate to outcome 3.2:

(i) The potential of the honey value chain in the programme area lies in: (i) a relatively large bee population, estimated at 6,000 hives in Sefrou and 5,000 in Azilal in the rural communes targeted; (ii) a growing interest among the population and the various institutional actors in developing the value chain;[77] (iii) substantial melliferous resources (28 native plants are known to be targeted by both itinerant and sedentary beekeepers) in the form of rosemary, thyme, carob and fruit trees capable of supplying quality honey to develop branding; and (iv) the presence of cooperatives – 20 in Sefrou and 14 in Azilal and unions. An important effort has been made by the Tadla-Azilal Department of Agriculture to build the Afourar honey development centre, managed by the regional union of beekeeping cooperatives, which has a quality control laboratory, a display and sales room, training facilities, a carpentry workshop and a packaging workshop.

(ii) Constraints relate to: (i) low productivity, estimated at between 7 and 9 kg/hive, owing to inadequate technical expertise; (ii) degraded natural resources; (iii) cold winters and their implications for vegetation phenology; (iv) the fact that transhumance is not widespread although it remains crucial to the production link in the value chain; and (v) problems encountered by beekeeping organizations in connection with transhumance, adding value and marketing. In addition, the Azilal union's honey centre is experiencing difficulties in performing its role as an aggregator effectively owing to insufficient human resources, particularly for the laboratory, marketing and scarce operating funds.

245. In the beekeeping value chain, in addition to supporting honey production, the focus under this second component will be on carrying out activities relating to the production and marketing of royal jelly, propolis, pollen, beeswax, venom for use as an inflammatory agent and queen breeding, in addition to hive construction, in order to strengthen the sector and ensure higher returns.

246. The end result of outcome 3.2 is to qualify and strengthen the honey value chain as a whole, as a strategic subsector and leader in combating the effects of climate change. Beekeeping becomes therefore an element of adaptation as their value chain is not only among the most vulnerable to changes in climate but as well a relevant engine of most of the other agricultural value chains. The wellbeing of bees and their role of pollinators is therefore an important entry point is pushing agriculture toward a more sustainable and natural resource management oriented process. Moreover, beekeeping has the potential for highly diversified production that is not yet being exploited by either beekeepers or their cooperatives.

The honey production value chain is expected to support the Moroccan system in two ways: on one hand, by consolidating procedures and practices in certification of quality honey, and on the other, by encouraging the institutions concerned to undertake a campaign, as in Europe[78], against pesticides that are lethal to bees.

247. **Component 4 – Project Management (GEF Contribution: USD 310,000)**

248. Effective project management, oversight and coordination, as well as mechanisms to monitor, evaluate, capture and disseminate lessons-learned and best practices are an essential component of the proposed project. The Agricultural Development Agency (ADA) will be the implementing agency and will be assigned project management responsibility to manage the PDRZM baseline and the SCCF project.

249. This component would finance project management, coordination and technical supervision of the implementation of the various activities of the fully blended PDRZM and IPAC-MAM projects including, financial management, procurement, monitoring and evaluation. In addition to the provision of staff and operating costs for the project, specific provision has been made for financing of baseline survey, interim and final impact evaluation surveys, workshops and staff training in specialised areas related to overall project management.

250. The significant weight of the capacity building component - with 22 FFS distributed in the target areas - will require the frequent presence of the project staff in the field, to provide

[77] MAPM, INDH, HCEFLCD.
[78] http://www.liberation.fr/societe/2013/04/29/trois-pesticides-mortels-pour-les-abeilles-interdits-en-europe_899822.

adequate technical support and monitor the implementation of the training and demonstration activities. Additionally, the project will hire international and national technical expertise to support the project surveys, capacity building and field implementation work. Project reporting of all outputs, as well as regular reviews of work plans and budgets and formal project evaluation will follow normative IFAD and GEF requirements with particular emphasis placed on ensuring that both qualitative and quantitative indicators demonstrate satisfactory progress, sustainability and replicability. The dissemination of lessons learned and results will be an important mean to ensure the upscaling and replication of successful experiences.

F. Additionality and Adaptation benefits

Benefits to PDRZM

251. The IPAC-MAM project, in alignment with the mandates of GEF and SCCF, focuses on identifying, implementing, modelling and transferring best practices in adaptation to the effects of climate change. With funding from GEF, PDRZM as a whole will become an innovative programme in which climate change resilience and adaptive capacity among rural communities is put into practice by means of experimental pathways, including economic ones, closely shared with the beneficiary populations.

252. The IPAC-MAM project complements the concept of productivity already adopted by PDRZM. As indicated in a recent study assessing vulnerability to climate change and its impact on food security in Morocco[79], risks and vulnerabilities in agriculture productivity can be reduced and managed by adopting climate-resilient pathways combining suitable adaptation and mitigation options with technologically efficient production systems. It helps identify areas where adaptation strategies should be underscored. For example, making food production more efficient can increase the food supply. We know that in high-income countries up to 30% of all food grown may be lost or wasted either before or after reaching the consumer, whereas in low-income countries most waste occurs at the farm and during transportation of goods. As such, investing in physical infrastructure to reduce losses during harvest, transportation, processing and storage is feasible, practicable and a high priority.

253. In the mountain zones of rural Morocco, conventional systems and technologies are more sensitive to climate change owing to the inadequate design or poor energy management of infrastructure available post-harvest. Against this backdrop, reducing post-harvest losses using renewable energy and other techniques is one of the most effective ways of improving food security and nutritional status, and reducing natural resource use. Increasing food availability by diminishing losses is more sustainable, easier and less expensive than increasing productivity. This is particularly true in Morocco because of rural vulnerability, the scarcity of good farmland in some areas, problems with soil and very limited water resources.

Benefits to natural capital management and climate change vulnerability

254. The contribution by SCCF will cover the additional cost of producing adaptation and participatory plans, capacity-building needed for implementation, investments in the field of adaptation and vulnerability reduction, and improving climate risk-reduction readiness in adaptation plans and policy dialogue at the provincial and watershed levels, in both targeted areas of Sefrou and Azilal.

255. The SCCF contribution will address the major causes of environmental and socio-economic degradation in the target areas by supporting adaptation and vulnerability reduction plans that build resilience by adopting a holistic view of natural capital, including forests and landscape agriculture, while reducing vulnerability and improving risk prevention and tangible economic benefits to the targeted rural communities, paying particular attention to women and young people of both sexes.

256. The planned activities will contribute to putting in place conditions to ensure that the beneficiary population receive the following outputs: (i) users of resources and administrations are enabled to optimize the use of available natural capital, ensuring long-term efficiency and resilience of available ecosystem services and boosting rural productivity; (ii) basic natural resource planning is sustainable and contributes to reducing vulnerability and promoting rational management of local natural capital; (iii) technologies are adapted and livelihoods diversified into the most productive and climate-resistant

[79] Rochdane S. et al 2014

products; and (iv) a database of suitable technologies for CC adaptation at a watershed level is created and used by local and international universities and by other development agencies and research institutes.

257. Conservation agriculture (CA) technologies have successfully demonstrated good results in Morocco, in terms of: (i) increased yields between 30% and 40%, especially in drought periods; (ii) water productivity increase of 60%; (iii) improvement of soil quality and organic matter between 3-14%; (iv) reduction of costs and energy consumption up to 70%.

258. Climate-resilient agronomic practices, such as conservation agriculture systems and technologies incorporating organic agriculture principles, also include climate change mitigation advantages through reduced emissions due to 60-70% lower fuel use, 20-50% lower fertilizer and pesticides use, 50% reduction in machinery and labour requirement, soil C-sequestration of 0.2-0.7 t/ha/yr or more, and no CO2 release as a result of no burning of residues. A side effect of the restoration of non-crop habitats such as shelterbelts and grasslands is the enhancement of key ecosystem services, such as erosion control, pollination and pest control services, soil water regulation, income diversification, which contribute to a more resilient agriculture production.

259. In Morocco, efficient supplementary irrigation before blooming and at the beginning of the ripping phase has demonstrated good results in fruit tree production under drought conditions with yield increase of about 50% and better quality of fruits. The use of micro-catchments for rainwater harvesting has increased yields up to 100% in fruit tree production in Morocco.

Benefits of participatory approach adopted

260. The theme of vulnerability to the effects of climate change will be addressed by prioritizing an approach to climate change adaptation with the direct involvement and active participation of rural communities in specific assisted activities, to build their resilience and the adaptability of their productive and economic activities to the effects of climate change.

261. The approach selected by IPAC-MAM is based on several principles: (i) strengthen reflection, coordination and exchanges on strategy around climate change adaptation issues and the mountain zones; (ii) territorial integration of value chains, taking into account problems in the zone in relation to the value chains adapted to climate vulnerability and local conditions; (iii) promote exchanges and scaling up among various areas; and (iv) seek out cofinancing and develop synergies among donors to reinforce actions in the field and meet demand.

262. The project is innovative in ensuring full integration of the private sector and cooperatives in a process that will support a transition from business as usual to climate adaptation by diversified and optimized agriculture, leveraging and intensifying IFAD's investment.

Benefits of transfer, replication, communication and awareness-raising

263. The proposed project has enormous potential for intensification and replication, as the depletion of natural resources owing to climate change and unsustainable crop and livestock practices is widely recognized as the main root cause of environmental degradation in Morocco. Best practices and lessons learned from the SCCF project will be reflected in IFAD's country programme and will contribute to policy dialogue.

264. Another factor characterizing implementation of the IPAC-MAM project is the evidence-based approach supporting specific assisted actions. The entire monitoring system will be through an ad hoc system to collect and input geo-referenced data (GIS). This system will be accessible through broadly accessible systems such as Google Earth. Each action identified in effect calls for a system of evaluation and control adapted to each and accompanied by:

(i) Gathering of preliminary baseline data, to be completed during the programme start-up phase, to consolidate the indicators and parameters already identified and of use in measuring performance and the desired impact;

(ii) Completion of management plans and multidisciplinary feasibility studies combining technical and economic considerations with social and environmental issues;

(iii) Monitoring using GIS to enable easy localization, broadly accessible through Google Earth, of the project areas, beneficiaries, headquarters of cooperatives concerned by programme activities, and midterm and final evaluations;

(iv) Creation of an effective reporting system of monitoring findings to oversee and support management, and for purposes of scientific disclosure of the experiments and actions undertaken.

265. Among awareness-raising activities, besides producing and distributing brochures and publications, will be the following: (i) an itinerant film festival whereby a bus travels from village to village showing videos and promoting reflection on agriculture and the effects of climate change in Morocco and neighbouring regions; and (ii) daily radio messages for farmers whereby local public radio stations broadcast information and commentary on prices, local weather forecasts, and interviews with farmers and specialists.

Table 5. Additional benefits of IPAC-MAM

Level	Additional benefits
Additional benefits to PDRZM	- Focus on identifying, creating, modelling and transferring best practices around resilience and adaptation to the effects of climate change. - Transformation and innovation of the concept of productivity, reducing net primary production of demand by increasing the technological efficiency of production - Reduction of post-harvest losses with renewable energy and other techniques
Additional benefits to natural capital management and climate change vulnerability	- Production of participatory plans, and capacity-building needed for their development and implementation - Increase in resilience by adopting a holistic view of natural capital, including forests and landscape agriculture - Users of resources and administrations are enabled to optimize the use of available natural capital - Basic natural resource planning is sustainable and contributes to reducing vulnerability and promoting rational management of local natural capital - Technologies are adapted and livelihoods diversified into the most productive and climate-resistant products - A long-term database on interrelated factor linked to the three levels of climate, energy and socio-economic conditions on the effects of climate change at a micro scale is created and in use
Additional benefits derived from the participatory approach adopted	- Direct involvement and active participation of rural communities in specific assisted actions. - Strengthen reflection, coordination and exchanges around strategy on aspects of adaptation to climate change and the mountain zones. - Territorial integration of value chains taking into account problems in the zone in relation to the value chains adapted to climate vulnerability and local conditions - Promote exchanges and scaling up in different zones. - Seek out co-financing and develop synergies among the various donors to strengthen actions in the field and meet demand. - Full integration of the private sector and cooperatives in a process that will support the transition from business as usual to climate adaptation by diversified and optimized agriculture.
Additional benefits derived from transfer, replication, communication and awareness-raising	- Best practices and lessons learned will be reflected in IFAD's country programme and will contribute to policy dialogue. - The evidence-based approach supporting specific assisted actions will be accessible through widely accessible systems such as Google Earth - Creation of an effective reporting system on monitoring findings. - Awareness-raising activities, production and distribution of brochures and publications, itinerant film festival, radio messages.

G. Liaison with other initiatives

266. The project is being funded by the SCCF as part of the PDRZM project, supporting the medium- and long-term development of mountain zones within the framework of the Government's strategic vision to 2030 as set forth in the PMV. PDRZM will act over the long term to obtain a critical mass of results that can make a significant contribution to sustainable development in these zones. This will involve coordination with IFAD projects, synergies and complementarities with technical and financial partners, a partnership between the private sector and rural actors, and new ways of financing development in the

mountain zones. The programme to be undertaken will be characterized by holistically taking into account all aspects of development of the rural territory concerned, both socio-economic and environmental.

267. In any case, the issue of climate is by no means absent from recent national initiatives. Studies have been conducted to build climate change adaptation into the implementation of PMV, projects under INDH and other programmes to combat poverty and develop rural infrastructure, as well as in policies undertaken to rationalize water use. Morocco is clearly aware of the environmental stakes, has ratified the major international conventions on the environment and has undertaken numerous institutional and legislative reforms.

268. Additional synergies and linkages have been identified and have been noted to some extent between the project, FDA and the Department of Finance (DEF) of MAPM in connection with developing policies on public subsidies taking into account adaptation by farmers to the effects of climate change[80]. The DEF/FDA has confirmed full support for the approach taken by IPAC-MAM. FDA has expressed interest in pursuing an experience already tested under another GEF project[81] for the identification of best practices around adaptation to climate change, pilot tests, technical and scientific verification, modelling and creation of dedicated subsidy instruments by FDA. In particular, connections will be created with the law under discussion on subsidies for renewable energy water pumping systems, which will include existing services in the coming months.

269. The project will seek synergies the Adaptation to Climate Change Implementation Nagoya Protocol (ACCN), proposing the representation of ACCN and IPAC-MAM in each other's steering committees. This will be advantageous as both projects complement each other and will benefit from both projects' interventions and expected results.

270. Synergies will also be possible with the Technical Assistance Project to Promote Young Agricultural Entrepreneurs[82], particularly in connection with promoting green occupations and setting up occupational groups to create spin-off agricultural services and self-employment. Other initiatives may be included, above all GEF initiatives in Morocco[83], or for example under insurance conventions covering climate change-related agricultural risks[84], or support for cooperatives and their boards of directors under an initiative promoted in collaboration with AFD[85].

H. Risks and assumptions

271. The main risks and measures to mitigate them are outlined in the table below:

Table 6. Main risks and mitigation measures of IPAC-MAM

Risk	Level	Mitigation measures
Efficiency		
Delay in programme start up	**Medium**	- Arrangements to support implementation are provided for one year prior to start up; - Procedures manual and AWP/B for the first 18 months will be available in the design document. IFAD will provide support for programme start up.
Disbursement delays	**Medium**	- Technical assistance mobilized to support preparations for project start-up; - Capacity-building for PMUs in preparing WRs and reduce transfer delays; - Programme will benefit from the experience of IFAD projects

[80] FDA is already working in this direction with full and partial subsidies on: drip irrigation systems, solar pumping, anti-hail measures, anti-freezing measures, use of select seed, direct purchase of seeders, certified plants, irrigation of supplements, value addition facilities (10 per cent), hives for beekeepers and rainwater collection systems.
[81] PIC PMU, World Bank initiative valued at about US$4.2 million.
[82] PJEA project financed by the African Development Bank (AfDB)
[83] For example, the Participatory Project against Desertification and for Reducing Poverty in Arid and Semiarid Ecosystems in the High Plateaus of Eastern Morocco (GEF-LCD)
[84] CNUCED 2008
[85] In the context of implementing the AFD programme in support of the PMV – the PAPMV – and in particular component B, calls for developing an agricultural board of directors for small and medium-sized farmers on a pilot basis in the AFD intervention areas – the three regions of Tangier-Tetouan, Taza-Al Hoceima-Taounate and Fez-Boulmane – and the two CTB project areas – the eastern region for the almond project and Souss Massa Draa for the Safran date project.

		under way.
Complexity of participatory process	**Medium**	- Intervention will be supported by effective PMUs set up in previous IFAD projects, and with the collaboration of UNIDO, which have already demonstrated mobilization capacity, quality staff deployed in the field, the provision of appropriate incentives and the implementation of effective strategies to ensure women's participation in the process.
Training for unions and cooperatives by offices of MAPM and PDRZM does not ensure the active engagement of farmers and beekeepers	**Medium**	- An analysis of the strengths and weaknesses of unions, cooperatives and farmer and beekeeper groups will be done during the first phase of the project and during collection of baseline data; the cost of this analysis is provided for in the Costab; - Based on the analysis of cooperatives, interventions will be individualized to take advantage not only of GEF funding but also all actions under PDRZM
The quality of some services is less than satisfactory during implementation	**Low**	- Mobilization of technical assistance for control and audit of works; - Government continues to reinforce the system of controls; - MAPM has also reinforced internal auditing; - Supervision by IFAD.
Effectiveness		
Recurrent climate events such as drought and hailstorms threaten the implementation of activities	**Medium**	- Political and public authorities are aware of the phenomenon and a number of actions are planned in liaison with partners - An early warning system is strengthened by the project and put in place by the Ministry of Environment in liaison with HCEFLCD. - Agricultural insurance against the effects of climate change is in place since 2011.
Pressures from livestock and grazing practices rise in the areas involved in project activities	**Low**	- Awareness-raising on the adverse impact of intensive livestock raising on natural resources will be a particular focus of the project; - Awareness-raising will involve both the policy level and Government by producing a study on sylvo-pastoral land use as well as the farmers involved in PDRZM activities
Impact		
Existing institutional, political and legal capacity to conduct a transfer of best practices from one context to another.	**Medium**	- This risk will be mitigated by a specific focus on creating an enabling environment for innovation in value chain development and planning based on actual examples of successful experiences in the country and elsewhere; - The private sector and institutional decision-makers will be targeted in awareness-raising campaigns and involved in planning investment options to ensure ownership at all levels.
A number of socio-cultural factors could diminish the project's ability to give a stronger voice to women and disadvantaged groups such as the landless and young people.	**Medium**	- Trust and relationship building with communities will increase the chances of success in achieving the project objectives. The "economic" approach introducing a convergence between the private interests of agricultural actors and the public interest in sound natural resource management will encourage dialogue and conflict resolution among the various segments of rural communities.
Irrigation generates salinization	**Low**	- Water pumping using solar energy will be adopted exclusively in combination with drip irrigation, to encourage optimal water use. Drip irrigation will also represent an important tool to prevent salinization problems arising from the excessive use of irrigation water (e.g. drip irrigation effects in reducing root-zone soil salinity and drainage), as has been demonstrated in numerous agriculture development projects in arid, semi-arid and sub-humid zones worldwide. - A complete system for monitoring farmers field schools will

		link the supply of equipment to good transmission of competencies.
Environmental impact of works and activities in the programme area	**Low**	- The activities and works to be done will not lead to changes in ecosystems; - All value addition projects will be preceded by technical and economic feasibility studies and environmental impact assessments; - The cost of specific and environmental studies are provided for in COSTAB. - Any expansion in cultivated land will be covered by an assessment of groundwater resources to measure risks to the aquifer. - Sustainable water saving arrangements will be put in place with the main partners (DPA, ABH, DREF and others) to reinforce monitoring and train producers in techniques and equipment that will enable them to manage water savings; - According to the procedures in effect at ADA, any new value addition unit installed will be subject to a technical and economic study to assess feasibility and inherent risks.

I. Sustainability and replicability

272. The strategy to ensure the sustainability of project impact is based on:

(i) The empowerment of farmers and beekeepers trained and organized in groups, cooperatives and associations.

(ii) Products with value added placed on the appropriate marketing circuit.

(iii) Continuation of the partnership developed under the programme between groups, local associations, DREF/DPEF and DPA to improve and sustainably manage sylvopastoral resources.

(iv) Ownership and dissemination of best practices in production.

(v) Continuation of the partnership developed under the programme for sustainable management of natural resources.

(vi) Access to government subsidies and credit, in particular from FDA

273. The economic sustainability of the programme is confirmed by demand for agricultural products at the regional and national, and even international levels. The IPAC-MAM project will markedly improve productivity and the cost-income ratio by developing and adding value to VCs both upstream and downstream in response to demand. In addition, sustainability is assured by economic rates of return calculated over a longer life cycle of 20 years in connection with the sensitivity analysis, based on conservative assumptions, taking into account the gradual adoption of technology packages offered to producers and annual rotation of specific products under the programme.

274. Economic sustainability is reinforced by the partnership to be built between the programme and Tamwil Al Fellah (an agricultural finance company) for rural finance, in particular to meet the financial needs of promoters of small and medium-sized agricultural enterprises. In addition, the fact that ADA will provide oversight of the programme and will host the central coordination unit will lower operating costs and create the conditions for synergy in financing additional projects under PMV pillar II, technical support for the project and PDRZM, specifically by involving technical and financial partners in achieving the programme objectives.

275. One important aspect of the project is the transmission, replication and transfer of best practices identified. Transfer will be horizontal, between farmers and their organizations, and vertical, between development agencies, universities and research centres, ministries and local institutions. Transfers will take place on a territorial basis, from one region to another in Morocco, and on a thematic basis, from one sector of rural production to another.

Part VI – Project implementation

Project oversight

276. IPAC-MAM will be placed together with the PDRZM baseline project under the administrative oversight of the Ministry of Agriculture and Ocean Fisheries, through the Agricultural Development Agency (ADA). ADA will provide overall coordination and supervision at the central level, and will coordinate actions with the two Provincial Agriculture Directorates (DPA) and the two Regional Agriculture Directorates (DRAs) that will facilitate the implementation of the project activities in the field.

277. A Project Central Coordination Unit (PCCU) will be hosted within ADA. It will provide overall coordination, monitoring and supervision of the project components and activities and capitalization of achievements. The PCCU will be staffed with an overall manager, an IPAC-MAM project coordinator, and a M&E officer, and will be equipped with the resources to fulfil its mandate. The IPAC-MAM coordinator will provide coordination and supervision of the IPAC-MAM activities and act as the liaison with other PDRZM activities for ensuring the value added of the CC adaptation measures. She/he will also ensure coordination with the various initiatives on CC adaptation being promoted by various ministries and departments and being funded by the Government or externally.

278. Provincial Management Units (PMU) will be placed at the provincial level under the oversight of the Provincial Director for Agriculture (DPA) of Sefrou and Azilal, who will act as director and deputy authorizing officers for the implementation of the components and activities funded under the baseline and GEF projects. The PMUs will include the following staff: (i) a coordinator; (ii) agro-economist engineer; (iii) a veterinarian; (iv) a rural engineer; (v) an accountant; and (vi) various specialists (horticulture, livestock, sociologist, environmental, marketing, etc) according to the value chains selected for each province. The DPA services will provide accounting and financial support as well as support in managing programme materials and equipment. The technical services (SVA and SMOP) of the two DPAs will allocate staff for the PDRZM and GEF implementation.

279. UNIDO will be in charge as a service provider of all CC adaptation activities related to awareness raising and communication, capacity development, training, FFS, technical assistance, and support to project beneficiaries in applying to funding for investments in climate-proofing technologies. In particular, this will include technical and feasibility studies, natural resource management plans, technical assistance on energy efficiency and optimizing production, organizing exchange visits between beneficiaries and farmers field schools, and capacity-building for cooperatives, occupational teams, groups and value addition units as provided for by the project. UNIDO will assure all procurements related to the above mentioned activities.

280. UNIDO and ADA will sign an agreement as soon as the project is GEF cleared where all the details of the services will be defined and described. UNIDO is already implementing a project for IFAD with MAPM and has demonstrated its effectiveness in work in the field.

281. The National Agriculture Advisory Office (ONCA), which is already responsible under PDRZM for training and transferring competencies in all subject areas within its competence and relating to agricultural production and techniques, will be trained by UNIDO in matters relating to climate change adaptation and its role will be to transfer such competencies to the various offices of MAPM.

282. A National Steering Committee (NSC) will be established for both the PDRZM and IPAC-MAM, and will be hosted by Secretary-General of MAPM. The NSC will include representatives from MAPM (ADA), IFAD, the GEF focal point, as well as a representative from the ACCN project. Generally speaking, the NSC operations will be as already provided for by PDRZM, of which IPAC-MAM will be fully blended.

283. At the local level, the local technical committees created[86] under the PMV will be expanded to include other partners – ONCA, ONSSA, DPEFLCD, the National Sheep and Goat Association (ANOC), ODECO, among others. The committees will meet - in addition to the two meetings called for reviewing technical, economic and organizational project issues - at least once a year to validate AWP/Bs, and will provide assistance to monitor implementation of the project components and activities.

[86] According to MAPM circular 257/cab of 26/7/2012.

284. The following issues relate to proper execution of each outcome:

Table 7. Project management arrangements for IPAC MAM

Project Components	Management arrangements
C.1 - Participatory Adaptation Planning	Implementing these activities will be possible only by using specialized technical assistance, experts in participatory techniques and methodologies of community facilitation.[87] Another key aspect will be decision-making and propositions contained in plans, which in addition to being strategic in nature will include one-off operational guidelines on implementing actions involving both individual farmers and their families, and groups, cooperatives and unions, as well as officers and technicians from DPAs and other management bodies of local government in rural development. The transfer of these best practices will be a cornerstone in achieving specific assisted actions with support from ADA and ONCA in accordance with protocols and procedures to be refined during the programme start-up phase.
C.1 – Capacity building	This Outcome 1.1 will be entrusted to UNIDO that will train ONCA, including its proximity structures, under partnership agreements with the programme. Partnership agreements will be concluded by PDRZM with the National Cooperation Development Office (ODCO), to support cooperatives and unions in administrative and financial management; regional agricultural research centres; teaching and research institutes, specialized consulting firms, cooperatives and unions of producers and farmers, and inter-professional associations. Capacity-building for producers will be done in several ways: (i) recruitment of proximity technical assistance to support farms; (ii) advisory assistance provided by engineers and technicians in ONCA proximity offices; (iii) participation by OPA in agricultural fairs; (vi) training for officers and technicians in both DPA and in the ONCA proximity offices involved in programme implementation.
C.2 – Water, energy and waste management efficiency	The implementation of actions to optimize water use will be entrusted to private enterprises under the supervision of SMOP of the DPA of Azilal and Sefrou, with technical assistance support from UNIDO engineers and GR technicians in collaboration local consulting firms in both classroom and hands-on sessions in the field. Partnership agreements will be signed between programme management and ABH[88] for supervision and monitoring of aquifer prospection and with water user associations for demonstration tests and monitoring of works. Maintenance and management of irrigation systems will be done by water user associations following training and in consultation with ancestral entities in Jamâa. The implementation of energy optimization activities will be preceded by feasibility studies performed by outside consultants from UNIDO. Technical and energy efficiency issues will be included together with an analysis of implementation costs, investment payback and actual economic benefits. Calls for tenders and construction of infrastructure will be the responsibility of programme technical assistance, which will obtain technical consultants and specific expertise from UNIDO in doing so. Cooperatives and unions of cooperatives will be directly involved so that the infrastructure built also serves as testing and demonstration opportunities for the largest possible number of farmers through exchanges and visits to building sites. Specific assisted actions, to be controlled by DPA in liaison with the technical assistance M&E unit for the project, will be enriched by the involvement of MAPM offices – ONCA, the National Agricultural Research Institute (INRA) and the Irrigation and Land Use Management Directorate (DIAEA) – as appropriate on the basis of competencies for transfer to other regions and other areas of agricultural

[87] The work calls for role-play (http://www.climatecentre.org/site/games), the use of open space technology (http://www.openspaceworld.org/) and World Café (http://www.theworldcafe.com/) or the use of project instruments for economic activities such as the Business Model Canvas (http://www.businessmodelgeneration.com/canvas).

[88] Sebou, Oum Er-Rabia.

	production, in order to maximize the impact of the best practices tested.
C.2 – Ecological restoration and MAP production	The coordination of activities relating to this Outcome will be the responsibility of the ADA Unique Local Products Promotion Directorate. UNIDO will provide technical assistance and direct management of activities. A detailed definition of the related activities will be done only after completion of the participatory adaptive management plans as provided for under Outcome 1.1. Regional staff from the High Commission of Water and Forests and Fight Against Desertification will be involved in the planning and implementation of ecological restoration activities.
C.3 - Fruit value chains improved upstream and downstream	This task will be carried out by the MAPM departments responsible for planting new tree growing plots and UNIDO for technical assistance and coordination between the PMU, the technical assistance unit and ad hoc outside consultants specializing in technical issues and practices to combat climate vulnerability, the DPAs, ADA and the MAPM offices contributing to implementation, modelling and transfer of individualized best practices, such as ONCA and ONSSA.
C.3 - Honey value chain developed and quality improvements made	The honey industry is considered strategic by the project, as its characteristics match the project priorities and needs. For this reason, it will be essential to support the strengthening of the value chain throughout production and value addition of honey products and by-products. Prioritizing cooperatives as a point of access, the project will work mainly with individual beekeepers. Support for provincial beekeepers unions will be based on their actual capacity to organize services that are effectively complementary to production by individual beekeepers. The DPA and other MPDA offices will also be involved in the project's efforts to diversify bee products, a sector largely unexplored hitherto in the project areas.

Workplan

285. The workplan will be carried out over the five-year period in accordance with the following stages:

(i) Phase 1: mobilization, fine-tuning of working hypotheses, confirmation of professional organizations and activities planned (months 1 to 6);

(ii) Phase 2: feasibility studies, market studies, evaluations, participatory natural resources management plans at local level (months 7 to 12);

(iii) Phase 3: implementation of specific assisted actions and investments, organization of farmers field schools and direct transfer of best practices (months 13 to 48);

(iv) Phase 4: continuation of activities to transfer best practices and horizontal and institutional awareness-raising campaign (month 48 to 60).

286. The identification phase allowed for a detailed definition of activities, areas of intervention and the engagement of organizations of beneficiaries as listed below and described in the attached document (annex F). The workplan, however, may be modified following the mobilization phase, particularly in the light of the results of preliminary studies and plans.

Procurement

287. Procurement of goods, works and consulting services financed by the Grant shall be subject to IFAD's conditions and will strictly follow the established modalities in the country. The provisions of the procurement regulations of the Government of Morocco will be used, to the extent that such are consistent with IFAD's "Procurement Guidelines" approved by the IFAD Executive Board (the "Procurement Guidelines") as such guidelines may be amended from time to time by IFAD.

288. To the extent possible, the goods, works and consulting services shall be bulked into sizeable bid packages to permit the optimal use of competitive bidding.

289. Before the commencement of procurement and annually thereafter, the Government shall furnish to IFAD for approval, a Procurement Plan as described in the Appendix 1, paragraph 1 of IFAD's Procurement Guidelines. The Procurement Plan shall specify, inter alia, the

method of procurement for each contract to be financed from, and thresholds, ceilings and preferences to be utilized in the implementation of procurement under the Project; the Procurement Plan shall also specify any additional requirements as may be set out in the Procurement Guidelines with respect to certain methods of procurement.

290. Three Categories of procurement expenditures are used: (a) Category 1: Goods; (b) Category 2: Works and (b) Category 3: Services.

291. Any arrangement for subcontracting should be included in the original submission and financial proposal for works and services. The scope of work of the sub-contractor should be disclosed with the conditions provided meeting the same requirements as the main contractor. The sub-contracting arrangements will be part of the bid evaluation. No sub-contracting will be allowed after contract award.

292. The Government shall ensure that all bidding documents and contracts for the procurement of goods, works and services financed by the SCCF shall include a provision requiring bidders, suppliers, contractors, sub-contractors and consultants to permit IFAD to inspect their accounts, records and other documents relating to the bid submission and contract performance and to have them audited by IFAD-appointed auditors and investigators.

PART VII – Project cost and financing

A. Financing terms and conditions

293. Total project costs are estimated at USD 35,010,000, covering the SCCF grant of 6,510,000 and a co-financing source of IFAD soft loan of USD 26 million and two IFAD grants of USD 2,5 millions. The SCCF grant is except from taxes and duties.

294. Cost estimates are based on field surveys (detailed PDRZM design mission and GEF formulation mission in the provinces of Azilal and Sefrou, organized in November 2013 and March 2014). The costs have been imputed in MAD and converted to United States dollars.

295. The following table provides the project costs by component and outcome. A breakdown of costs is provided in annex 3.

Table 8. Project costs by component and outcome

Project Component and Outcome	SCCF Budget (USD)
Component 1 - Community empowerment on adaptive planning and climate-resilient value chains	1,203,600
OT 1.1. Adaptive participatory management plans for the sustainable use of natural resources are developed and implemented by the project value chain beneficiaries	372,900
OT 1.2. – Agriculture practitioners acquire and demonstrate the capacity to implement climate-resilient agriculture systems and technologies in the target areas	830,700
Component 2 - Strengthening Ecosystem Services	1,196,800
OT 2.1. Climate-proof technologies for the efficient management of water, energy and waste in sustainable crop production are applied	953,400
OT 2.2. Ecosystem services supporting agriculture production are restored in the target areas	243,400
Component 3 - Climate proofing of value chains and diversification of productive practices	3,799,600
OT 3.1. Fruit tree value chains improved and diversified through climate-resilient investments and diversification upstream and downstream the project areas	3,442,800
OT 3.2. An adapted honey value chain enhancing production and quality improvement	356,800
Component 4 – Project management	310,000
Total GEF Budget	6,510,000

Annexes

Annex 1 - Monitoring and evaluation

296. Project monitoring and evaluation will be conducted in accordance with established IFAD and GEF procedures. The Strategic Results Framework provides indicators for project implementation along with their corresponding *means of verification*. These will form the basis on which the project's Monitoring and Evaluation system will be built. In line with the GEF/SCCF operational principles, the SCCF M&E activities will be country driven and will provide for consultation and participation.

297. The M&E system for the project is an integrated process that encompasses a number of specific actions. There is a dual objective: to ensure technical and procedural control over project activities to maximize efficiency and effectiveness, and to promote training and awareness-raising for direct stakeholders – beneficiaries, public servants and organizations involved – and other indirect stakeholders – other institutions, universities and development agencies.

298. The M&E system is a key cross-cutting project activity and calls for strengthening for the use of data produced not only for control and management effectiveness purposes, but more generally in producing functional knowledge for replication and transfer of best practices in other contexts, both in Morocco and in other production areas and countries.

299. To meet the M&E needs of IFAD and GEF, the results and impact management system (RIMS)[89] and the CC-Tracking Tool[90] will be set up at programme start-up with IFAD support. Primary geo-referenced data collection and analysis will be done by the PMU in collaboration with proximity offices of ONCA and UNIDO. The project will also contribute data to the national environmental monitoring system in accordance with the DPSIR model[91] used in evaluating ecosystems.

300. **Baseline study –** During the first eight months of the project, a baseline study will be done. It will consist of a quantitative and qualitative survey of a representative sample of all beneficiaries, to establish characteristics affecting their adaptation capacity to the effects of climate change prior to implementation of project activities. Other areas of intervention will relate to socio-economic factors and, in particular, their income-generating capacities and competencies. The survey unit will be family production units, or households considered as the most appropriate basic unit for developing a sustainable circular economy.

301. **Geographic information system** – This system will have the dual purpose of locating the various project activities in a specific and detailed fashion, as well as project inputs and pre-existing conditions, and facilitating information collection and sharing in the form of photographs, video or documents, using easily accessible open source instruments such as Google Earth.

302. **Community Climate-resilient Adaptation plans (CAPs)** – The CAPs, provided for in preparatory activities, will be another source of valuable information for an understanding of the baseline situation in the provinces concerned. The CAPs will allow for a grasp of the potential and criticality of a sample of the territories in question, adding the CC adaptation and ecosystem management perspective to the agronomic and socio-economic point of view.

303. **Ongoing M&E system with semi-annual reporting** – Monitoring will be based on the initial data, using a system of comparison and recording of progress made over time by the project activities.

304. The project M&E system set up will allow for: (i) meeting the information needs of IFAD and government participants on a timely basis on programme activities, immediate results, and short- and long-term impact; and (ii) producing, organizing and disseminating the information needed for strategic steering purposes. To this end, the programme will be supported with technical assistance at start-up to define indicators, install a computer system and develop the data collection and analysis methodology and technical specifications for the baseline surveys.

[89] http://www.ifad.org/operations/rims/handbook/f.pdf

[90] http://www.thegef.org/gef/tracking_tool_CCM

[91] DPSIR: Driving forces, Pressure, State, Impact, Response.

305. For each output and outcome an M&E and verification system adapted to each will be established, including:

(i) Collection of baseline data, to be completed during the programme start-up phase, to consolidate the indicators and parameters already identified in order to measure performance and impact; a baseline survey in accordance with the guidelines set by IFAD, ASAP and GEF for RIMS and the CC-Tracking Tool, will take place at programme start-up, and a final evaluation survey will be conducted during the final year of the programme to evaluate results and impact.

(ii) Completion of management plans and multidisciplinary feasibility studies, to include technical and economic aspects as well as socio-environmental considerations;

(iii) Conduct of monitoring using a GIS to allow for easy localization, widely accessible using Google Earth, of the project areas, beneficiaries, and headquarters of cooperatives involved in programme activities;

(iv) Performance of two evaluation, one at midterm and one upon completion;

(v) Development of an effective reporting system for monitoring findings for management control and support and for purposes of scientific disclosure of the experiments and actions undertaken.

Monitoring and evaluation SCCF budget

Type of M&E activity	**Responsible Parties**	**Budget USD (SCCF contribution) Excluding project team Staff time**	**Time frame**
Inception Workshop (IW) and report	Project Coordinator/ PCCU/PMUs	USD 10,000	Within first two months of project start up
Annual Progress Report (APR) and Project Implementation Report (PIR)	Project Team IFAD		Annually
Tripartite Review (TPR) and TPR report	Steering Committee Project team IFAD		Every year, upon receipt of APR
Steering Committee Meetings	Project Coordinator IFAD		Following Project IW and subsequently at least once a year
Mid-term Evaluation	Project team IFAD External Consultants (i.e. evaluation team)	USD 20,000	At the mid-point of project implementation.
Final External Evaluation	Project team, IFAD External Consultants (i.e. evaluation team)	USD 25,000	At the end of project implementation
Terminal Report	Project team IFAD External Consultant		At least one month before the end of the project

Table. Monitoring and Evaluation Framework

Main source	Outcomes	Milestones	Results indicators	O. Verifiable indicators
FDA data, survey of direct beneficiaries of the project	Outcome 1.1 Outcome 1.2 Outcome 2.2 Outcome 3.1 Outcome 3.2	Baseline data and preliminary data as at six months from project start-up Increase in 7% in the number of farmers having received a government credit to purchase more resilient techniques (midterm review, 30 months after start-up)	Number of requests for financing in the water, energy, diversification and job creation sectors	Number of communes with adaptive management plans Number of farmers having received government credit to purchase more resilient techniques has increased at least 20%.
Field survey, comparison between starting situation and changes in a sample of direct beneficiaries	Outcome 2.1 Outcome 2.2 Outcome 3.1 Outcome 3.2	Baseline data and preliminary data as at six months from project start-up 30% of farms aided by the programme have increase productivity in the targeted value chains by at least 15% (mid-term review, 30 months after start-up)	Proportional input reduction and efficient use of soil, water, energy and waste by (a) cost of inputs; (b) water consumption; (c) energy costs; and (d) post-harvest costs, by at least 70% of the farmers concerned Fruit tree production in the areas concerned increases 20%. Productivity increases 50% Positive change in beehive productivity (honey: at least 20%)	70% of farmers aided by the programme have increased productivity in the targeted value chains by at least 20%
Field survey, comparison between starting situation and changes in a sample of direct beneficiaries	Outcome 1.1 Outcome 1.2 Outcome 2.1 Outcome 2.2 Outcome 3.1 Outcome 3.2	Baseline data and preliminary data as at six months from project start-up At least 30% of beneficiaries are more resilient to climate change (resilience index calculated on the basis of indicators for outcomes under components 1 and 2) (midterm evaluation, 30 months after start-up)	Positive change in productivity in the sectors concerned. Creation of at least 50 new occupations relating to 15 green spinoffs. Fruit tree production in the areas concerned increases 20%. Productivity increases 50%	At least 144,000 (80%) of beneficiaries are more resilient to climate change (resilience index calculated on the basis of indicators for outcomes under components 1, 2 and 3)
MAPM data for the provinces of Sefrou	Outcome 2.2	Baseline data and preliminary data as at six months from	Fruit tree production in the areas	Productivity ($/ha) in the targeted value chains has

and Azilal. Field survey, comparison between starting situation and changes in a sample of direct beneficiaries.	Outcome 3.1 Outcome 3.2	project start-up Productivity ($/ha) in the targeted value chains has increased at least 10% (midterm evaluation, 30 months after start-up)	concerned increases 20%. Productivity increases 50%	increased by at least 30%
MAPM data. Field survey, comparison between starting situation and changes in a sample of direct beneficiaries.	Outcome 2.2 Outcome 3.1	Baseline data and preliminary data as at six months from project start-up. Demand for improved local products has increased by at least 5% (midterm evaluation, 30 months after start-up).	Positive change in income generated by production and sale of adapted unique local products (at least 20%). Positive change in productivity of other bee products (at least 20%).	Demand for improved local products (MAP, Livestock, horticulture) has increased by at least 15%.
MAPM data. Field survey, comparison between starting situation and changes in a sample of direct beneficiaries.	Outcome 2.1	Baseline data and preliminary data as at six months from project start-up At least 8,000 ha managed using new practices involving adaptation to climate change (midterm evaluation, 30 months after start-up).	Proportional input reduction due to efficient use of water, energy and waste by (a) cost of inputs; (b) water consumption; (c) energy costs; and (d) post-harvest costs, by at least 70% of the farmers concerned.	At least 24,000 ha managed using new practices involving adaptation to climate change.

1. Day to day monitoring of implementation progress will be the a responsibility of the project team, based on the annual work plan and its indicators. IPAC-MAM intervention will be fully blended with PDRZM operations and monitoring and evaluation system. The project will include gender expertise, and will adopt a gender-sensitive monitoring and evaluation system, providing disaggregated information by gender and age.
2. The project team will fine-tune the progress and performance/impact indicators of the project during an inception workshop, where specific targets for the first year of implementation, progress indicators, and their means of verification will be agreed. These will be used to assess whether implementation is proceeding at the intended pace and in the right direction and will form part of the annual work plan. Targets and indicators for subsequent years would be defined annually as part of the internal evaluation and planning processes undertaken by the project team.
3. Measurement of impact indicators related to adaptation benefits will occur according to the schedules defined in the inception workshop. The measurement of these will be undertaken through subcontracts or retainers with relevant institutions, or through specific studies that are to form part of the projects activities, or periodic sampling.

4. Periodic monitoring of implementation progress will be undertaken by IFAD. This will allow parties to take stock and to troubleshoot any problems pertaining to the project in a timely fashion to ensure smooth implementation of project activities.

5. In line with GEF requirements, the SCCF project will adopt criteria for its monitoring systems, which are SMART - Specific, Measurable, Achievable and Attributable, Relevant and Realistic, Time-Bound, Timely, Traceable and Targeted. These are duly reflected in the project logical framework. A part of the participatory M&E will be devoted to ascertain the extent of women's participation in programme activities, constraints faced, benefits gained, aspirations met and impact on women's status in the family, their involvement in community affairs and the climate-proofing of their agriculture.

REPORTING

6. A **Project Inception Workshop** (IW) will be conducted with the full project team, MAPM and relevant government counterparts, co-financing partners, IFAD and representation from the GEF as appropriate. A fundamental objective of the IW will be to help the project team understand and take ownership of the project's goals and objectives, as well as finalize preparation of the first annual work plan on the basis of the project's strategic results framework (SRF). This will include reviewing the SRF (indicators, means of verification…), imparting additional detail as needed, and finalizing the Annual Work Plan (AWP) with precise and measurable performance indicators, and in a manner consistent with the expected outcomes for the project.

7. Additionally, the purpose and objective of the Inception Workshop (IW) will be to: (i) detail the roles, support services and complementary responsibilities vis à vis the project team; (ii) provide a detailed overview of IFAD-GEF reporting and monitoring and evaluation (M&E) requirements, with particular emphasis on the Project Implementation Reviews (PIRs) and related documentation, the Annual Project Report (APR), as well as mid-term and final evaluations. Equally, the IW will provide an opportunity to inform the project team on IFAD project related budgetary planning, budget reviews, and mandatory budget rephasings.

8. The IW will also provide an opportunity for all parties to understand their roles, functions, and responsibilities within the project's decision-making structures, including reporting and communication lines, and conflict resolution mechanisms. The Terms of Reference for project staff and decision-making structures will be discussed again, as needed, in order to clarify each party's responsibilities during the implementation phase.

9. A Project Inception Report will be prepared immediately following the IW, including a detailed First Year/Annual Work Plan divided in quarterly time-frames detailing the activities and progress indicators that will guide implementation during the first year. This Work Plan will include the dates of specific field visits, support missions by IFAD or consultants, as well as time-frames for meetings of the project's decision making structures. The Report will also include the detailed project budget for the first full year of implementation, prepared on the

basis of the Annual Work Plan, and including any monitoring and evaluation requirements to effectively measure project performance during the targeted 12 months time-frame.

10. The Inception Report will include a more detailed narrative on the institutional roles, responsibilities, coordinating actions and feedback mechanisms of all partners. A section will be included on progress to date on project establishment and start-up activities and an update of any changed external conditions that may effect project implementation.

11. The Annual Project Report (APR) is an IFAD requirement and part of central oversight, monitoring, and project management, to reflect progress achieved in meeting the Annual Work Plan and assess performance of the project in contributing to intended outcomes through outputs and partnership work. The format of the APR is flexible but should include the following:
    - An analysis of project performance over the reporting period, including outputs produced and, where possible, information on the status of the outcome
    - The constraints experienced in the progress towards results and the reasons for these
    - The three (at most) major constraints to achievement of results
    - AWP and other expenditure reports
    - Lessons learned
    - Clear recommendations for future orientation in addressing key problems in lack of progress

12. The PIR is an annual monitoring process mandated by the GEF. It has become an essential management and monitoring tool for project managers and offers the main vehicle for extracting lessons from ongoing projects. Once the project has been under implementation for a year, a Project Implementation Report must be completed by IFAD together with the project. The individual PIRs are collected, reviewed and analysed by the steering committee (SC) prior to sending them to the focal point at IFAD headquarters. The PIRs are then discussed in the GEF Interagency Focal Area Task Forces in or around November each year and consolidated reports by focal area are collated by the GEF Independent M&E Unit based on the Task Force findings.

13. As and when called for by IFAD, the project team will prepare Specific Thematic Reports, focusing on specific issues or areas of activity. The request for a Thematic Report will be provided to the project team in written form by IFAD and will clearly state the issue or activities that need to be reported on. These reports can be used as a form of lessons learned exercise, specific oversight in key areas, or as troubleshooting exercises to evaluate and overcome obstacles and difficulties encountered. IFAD is requested to minimize its requests for special Thematic Reports (given that there are some of these already included in the workplan), and when such are necessary, will allow reasonable timeframes for their preparation by the project team.

PROJECT PUBLICATIONS

14. The project will support the preparation of a number of awareness raising printed materials, knowledge dissemination publications and tecnhical reports that will be available online and/or as hard copies. Printed copies will be disseminated during field work, conferences, through mailing, etc, and will also be available at the PIU and MoA.

EVALUATION

15. **Mid-term Evaluation**: An independent Mid-Term Evaluation will be undertaken at the end of the second year of implementation. The Mid-Term Evaluation will take the form of a qualitative study to determine the progress being made towards the achievement of outcomes and will identify course correction if needed. It will focus on: (i) the effectiveness, efficiency and timeliness of project implementation; (ii) will highlight issues requiring decisions and actions; and (iii) will present initial lessons learned about project design, implementation and management. Findings of this review will be incorporated as recommendations for enhanced implementation during the final half of the project's term, including the revision of indicators if needed. The organization, terms of reference and timing of the mid-term evaluation will be decided after consultation between the parties to the project document. The ToR for this Mid-term evaluation will be prepared by IFAD.

16. **Final Evaluation**: An independent Final Evaluation will take place three months prior to the terminal review meeting, and will focus on the same issues as the mid-term evaluation. The final evaluation will also look at impact and sustainability of results, including the contribution to capacity development and the achievement of global environmental goals. The Final Evaluation should also provide recommendations for follow-up activities. The ToR for this final evaluation will be prepared by IFAD.

Annex 2 - Logical framework

Increasing productivity and adaptation capacities in the mountain zones of Morocco (IPAC-MAM)

Objective hierarchy	Key performance indicators[92]	Means of verification	Risks and assumptions
SCCF Goal – *To reduce the overall climate vulnerability of rural communities living in risk-prone mountain watersheds of Central Morocco, through the sustainable use of natural resources and the diversification of the local economy.* Agricultural production practices perform better and are more resilient and proactive in combating climate change.	The number of farmers having received government credit for climate-resilient investments has increased Child chronic malnutrition is reduced from 12.4 to 10 in Sefrou and from 11.7 to 10 in Azilal	Statistics from FDA and other financial institutions OMS/UNICEF Surveys National statistics	
SCCF Objective – *To strengthen the resilience and income capacity of beneficiaries in target communes in the provinces of Sefrou and Azilal, by adapting and upgrading value chains through reducing post-harvest losses, optimizing the use of inputs and natural resources, and promoting diversification in agricultural production.*	At least 24,000 ha are being managed using new climate change adaptation practices At least 144,000 (80%) beneficiaries are more resilient to climate change (resilience index calculated on the basis of results indicators for components 1, 2 and 3) 70% of farms assisted by the programme have increased productivity in the targeted value chains by at least 20%	M&E system and evidence-based data Midterm and final evaluations compared to baseline data Results and impact management system (RIMS) and CC-Tracking-Tool Survey on a representative number and sample of beneficiaries and their families	Global market crisis does not worsen National policies and incentives to support the agriculture sector, particularly in mountain zones, remain in place. Governmental policies on CC adaptation are improved
Outputs	**Key performance indicators**	**Means of verification**	**Risks and assumptions**
Component 1 – Community empowerment on adaptive planning and climate-resilient value chains			
Outcome 1.1 – *Adaptive participatory management plans for the sustainable use of natural resources are developed and implemented by the project value chain beneficiaries*	12 targeted communes with Climate-resilient Community Adaptation Plans (CAPs) for VC development Nº of farmers receiving financial support for adaptation measures included in the Plans	Midterm and final evaluations compared to baseline data Reports and documents Feedback from beneficiaries and concerned stakeholders National statistics	All stakeholders, public, private and civil society, keep alive their interest and willingness to take part in the participatory planning process
Outcome 1.2 – *Agriculture practitioners acquire and demonstrate the capacity to implement climate-resilient agriculture systems and technologies in the target*	At least 50% beneficiaries have received training and technical assistance on CC adaptation measures for VC development Demand for advisory assistance on adapting to	Field surveys Audits of cooperatives and farmers' associations Midterm and final evaluations compared	All stakeholders, public, private and civil society, keep alive their interest and willingness to take part in the capacity building process

[92] Performance indicators will be identified during the detailed design phase.

areas	climate change in targeted zones has increased at least 30% 40% of cooperatives supported by the project become autonomous	to baseline data	
Component 2 – Strengthening Ecosystem Services			
Outcome 2.1 – Climate-proof technologies for the efficient management of water, energy and waste in sustainable crop production are applied	Proportional increase in inputs efficiency by reduction of: (a) cost of inputs; (b) water consumption; (c) energy costs; and (d) post-harvest losses by at least 70% of beneficiaries WUAs recover roughly 70% of royalties from irrigation water management	Field surveys Monitoring and midterm and final evaluations compared to baseline data MAMP data	The cost of water, energy and inputs remains a key factor for the agricultural economy
Outcome 2.2 - Ecosystem services supporting agriculture production are restored in the target areas	Positive change in income generated by production and sales of MAP products (at least 20%) Positive change in the ecosystem vulnerability index (e.g. Nº of hectares with reduced erosion based on RUSLE)	Field surveys National statistics Monitoring and midterm and final evaluations compared to baseline data	Progress continues on Moroccan regulations governing certification of local and organic products Rural exodus by landless young people does not increase significantly
Component 3 - Climate proofing of value chains and diversification of productive practices			
Outcome 3.1 - *Fruit tree value chains improved through climate-resilient investments and diversification upstream and downstream the project areas*	Fruit tree production in the zones concerned increases 30% Creation of at least 50 small local businesses based on climate-resilient diversification activities (disaggregated by gender) The revenues of local cooperatives have increased by at least 20% due to produce valorization and diversification (disaggregated by gender) Positive change in the local agricultural diversity index	Field surveys Midterm and final evaluations compared to baseline data MAMP data	Global markets for fruits and nuts do not experience a downturn Progress continues on Moroccan regulations governing certification of local and organic products Rural exodus by landless young people does not increase significantly
Outcome 3.2 - *An adapted honey value chain enhancing production and quality improvement*	Positive change in beehive productivity (for honey, at least 20%) Positive change in productivity of other bee products (at least 20%)	Field surveys Midterm and final evaluations compared to baseline data MAMP data	Management systems in beekeeping cooperatives and unions operate without internal dysfunction Progress continues on Moroccan regulations governing certification of local and organic products Rural exodus by landless young

			people does not increase significantly

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Annex 3 - Project cost table

(See Attached File)

Annex 4 - References

(See attached file)

Annex 5 - Terms of Reference GEF Project Coordinator

(See attached file)

Annex 6 - Economic and Financial Analysis

(See attached file)

Annex 7 - CC Vulnerability Assessment

(See attached file)

Annex 8 - Timeframe

(See attached file)