Survey on the role of women in agriculture in Lebanon

Pilot survey

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Outline and objective

This report outlines the results of the work that the experts assigned by CIHEAM Bari have undergo within the **objective** of providing technical assistance to the Statistics and Economic Studies Service (SESS) at Ministry of Agriculture (MoA) to improve gender indicators, survey questions, sampling, data collection methodologies and analysis in the field of agriculture statistics, and to support the dissemination of the results for both the annual agriculture production survey (APS) and the upcoming agricultural Census 2020 (AC).
The document is divided in three main parts that intend to respond to the main objective of providing technical assistance to the SESS at MoA for improving gender indicators, sampling and data analysis within the agricultural statistics.
The first part consists of developing a new sampling strategy for the APS based on the Census 2010 report information as well as the definition of the sample for the survey on women's role.

The second part gives an overview of the international context with reference to the FAO indicators and to the SDGs one. It builds on the Census 2019 and the APS survey to give suggestions on including gender indicators, making census questionnaires more gender sensitive and designing the survey on women's role in agriculture and agro-processing with related issues.

The **third part** consists in the development of a survey tool and a pilot survey of the tool developed. It provides new instruments to analyze data and build indicators considering the most recent studies on women empowerment. The final objective is to integrate the economic prospective of the Census and the APS with indicators able to capture social and intra-household dynamics, and dimensions of women empowerment.

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CONTENTS

1 Sample for survey on role of women in agriculture

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1.1 Short resume of the document "Sampling methodology" concerning the APS

The Regulation (EC) No 1166/2008 on farm structure surveys and the survey on agricultural production methods, at Article 2 (definitions) states that: "sample surveys mean statistical surveys based on stratified random sampling which are designed to provide representative statistics concerning agricultural holdings at regional and national levels. **The stratification shall include the size and type of the agricultural holding** to ensure that agricultural holdings of different sizes and types are adequately represented". This means that the FSS sampling design is explicitly mentioned in the regulation: Stratified random sampling, as well as the stratification characteristics:

- size of the agricultural holding
- type of the agricultural holding
- regional level NUTS2 (the sample should provide reliable estimates at regional level)

1.1.1 The APS survey

For APS, for each sampling strategy adopted it has been decided to have 2 samples:

1. One providing estimates whose statistics was representative ONLY at NATIONAL LEVEL
2. One providing estimates whose statistics was representative at both NATIONAL and MOHAFAZAS/PROVINCE LEVEL.

Some precision requirements for characteristics under investigation were indicated by the Ministry of Agriculture staff, with regard to:

a) UAA and crop characteristics
   i. Similar to FSS, the main land characteristics for whose minimum precision requirements were set to be attained were: 1. Permanent Crops (especially olives); 2. Arable land.
b) Livestock characteristics
   i. Different from FSS, for each of the following characteristics it has been decided to fix a precision requirement:1. Cattles; 2. Sheep; 3. Goats; 4. Poultry.
c) Precision requirements were set in addition to beehives.
d) Precision requirements were proposed for irrigated area. As irrigated area is strongly correlated to arable land, whose usage varies upon years, it has been decided to fix precision requirements only for arable land (in the following noted as temporary crops).

It was decided to adopt a one stage stratified random sampling of the farms, i.e. the farms are divided on strata and then a simple random sample of farms is selected in each stratum. Simple Random Sampling Without Replacement (SRWoR) inside strata is a common practice, which means selection inside strata MUST BE carried out randomly. The stratification choice is the crucial issue in such a design, especially in presence of multi-purpose, multivariate target variables.
As a matter of fact, the stratification variables must be correlated with target variables for which the statistics must be representative, each strata must represent a homogeneous domain, otherwise there is no gain in efficiency, i.e. the stratification is not able to lower the overall sample.
In agreement with the Ministry of Lebanon Agriculture it was decided to choose as target variables the following ones:

- UAA at the census
- Area with non-permanent crops at the census
- Area with permanent crops at the census
- Bovines
- Sheep
- Goats
- Beehives
- Poultry (hen industrial, poultry industrial, poultry traditional exceeding 100).

In addition, we have these definitions:

LURID=0.8*Cattles+0.15*(Sheep+goats).
LU<-(sheep+goats)*0.15+cattle+beehives*0.1+poultry_ind*0.007+then_ind*0.014
LU2<-(sheep+goats)*0.15+cattle+beehives*0.35+poultry_all*0.01
LURID2<-(sheep+goats)*0.15+cattle+beehives*0.35

As a result, it was decided to use as stratification variables:
UAA

1. Temporary crops were set apart, as showing a low correlation to UAA
2. Cattles, sheep, goats, beehives, showed the best (ie. Highest) linear relationship to lurid2….> Lurid2.
3. Poultry did not show any linear relationship to LU or LU2; poultry was set apart.

The decision of limiting the number of variables used for stratification derives by the need of reducing the overall number of strata and correspondingly the final sample size (the higher is the number of strata the higher will be the basic sample given that at least 2 farms per stratum should be selected).
As the use of 4 stratification variables seemed to be too much to cut each variable into 3 classes for each domain (567 strata), it was decided to use a genetic algorithm proposed by Ballin, Barcaroli “Stratified sampling in multipurpose and multidomain surveys: joint determination of optimal stratification and sample allocation “, whose purpose is to compute at the same time the optimal stratification and the optimal allocation based on the bethel optimal allocation problem, by the use of a Genetic Algorithm. It is not straightforward to understand how stratification

classes are built, but in order to ensure such a low sampling rate as requested in the Tor with so many target variables requested, no other sampling strategies ensured such a sampling rate and theoretical expected CVs.

1.1.2 The final scenarios

It is considered a one stage stratified random sampling of the farms, i.e. the farms are divided on strata and then a simple random sample of farms is selected in each stratum.
The initial stratification (atomic stratification in the following) was set by using as stratification variables:

- Classes of UAA observed at the census
- Classes of area of non-permanent crops as observed at the census
- Classes of a variable "ubarid2". Such variable was the most correlated with the starting variables (Bovines, Sheep, Goats, Beehives)
- Classes of poultry as the correlation was poor with livestock units.

The collapsing of the initial strata has been performed in order to minimize the final sample size given the precision constraints set for the target variables.
Given the initial finer stratification the genetic algorithm was launched by considering as target variables, which translates into imposing the maximum expected CVs for the following variables:

- UAA at the census
- Area with non-permanent crops at the census
- Area with permanent crops at the census
- Bovines
- Sheep
- Goats
- Bees
- Poultry

Since poultry data had in intrinsic variability and was very skew with extreme values, it turned out that the genetic algorithm was disaggregating into too may strata and the overall sample size was remaining too high to ensure the expected CVs. For this reason, it has been decided to use the package stratification (freely available in R), which automatically computes based on the Hiridoglu algorithm the size of the variable which determines the take all strata (note, this algorithm is univariate). As a result, it was decided to take apart 44 records whose size of poultry were exceeding 40000.
Within this approach, the results with the genetic algorithm improved very much, even though the final take all strata must be added manually and CVs must be recomputed ex post, by re writing extra programs.

1.1.3 National level

Number of strata turned out to be 411 with 62 take-all strata, with a total sample size consisting of 1.894 units. Expected CVs are: Lebanon 2,65%, temporary crops 4,01%, permanent crops 4,72%, cattle 4,79%, sheep 6,19%, goats 6,30%, bees 7,34%, poultry 5,47%.

1.1.4 Province level

The genetic algorithm provides a stratification of the final population consisting in 295 strata 85 take-all, and the final sample size is 3.289. The sample size at province level is reported in the table below:

Province	Population	Sample
1	31,141	269
2	28,107	524
3	27,560	492
4	2,1545	560
5	12,500	601
6	22,096	462
7	26,373	381
Lebanon	169,322	3,289

Expected CVS

Mohafaza	UAA	temporary crops	permaent crops	cattle	sheeps	goats	bees	poultry
1	4,6%	26,8%	6,0%	9,6%	19,8%	15,9%	7,7%	18,7%
2	3,5%	4,8%	6,9%	7,9%	14,4%	11,9%	9,7%	5,0%
3	3,9%	17,7%	4,5%	9,8%	14,9%	16,9%	5,8%	39,7%
4	3,3%	4,9%	6,6%	9,7%	5,8%	5,8%	10,9%	14,5%
5	4,6%	4,6%	12,4%	4,6%	4,9%	4,7%	20,4%	37,8%
6	4,6%	17,5%	6,1%	9,6%	12,7%	4,8%	7,7%	30,4%
7	4,8%	11,3%	6,4%	9,7%	15,8%	9,6%	12,3%	52,8%
National	1,6%	2,8%	2,6%	3,1%	3,5%	3,3%	3,6%	6,4%

The following table reports the expected CVs by domain:

1.2 Suggestions regarding the APS surveys sampling design

In order to give indications or suggestions on the APS surveys sampling design, we should be able to clarify some of the doubts that have arisen from reading the methodological report.
In particular:

- Are the national and the province level sample independent?

- It is not so clear why it was decided to take apart 44 records whose size of poultry were exceeding 40000.
- What is the difference between “lurid”, “lurid2” and “ubarid2”? Ubarid2 is defined as a stratification variable but this variable has not been declared in the report.
- More details about the linear combination variables created.

One point to be clarified is therefore the relationship between the national sample and the sample by provinces (the first point on the bulleted list). Are they different farms, i.e. do we have two independent samples? How will the estimates be calculated? In fact, even the national sample will obviously be composed of farms located in the various provinces, so by merging the two samples you will have a total sample of 1.894 + 3.289 = 5.183 farms that will be located in the seven Lebanese provinces.
The entire sample of 5.183 farms can be used to calculate the estimates, or independent estimates can be calculated using the two samples separately: in the latter case how will the estimates converge?
For example, if you estimate the UAA of each of the seven provinces by adding them together, you get the national UAA, and a similar estimate will result from the use of the national sample only. Clearly these will be different estimates, so how will they be aligned with each other?
According to 2021 Census data, about 9 out of 100 farms are managed by women: choosing at random the farms, you should look at 170 companies run by women with the national sample and 296 with the provincial sample, in all 466 farms. At least some types of data could be post-stratified by gender (type of cultivation by province, size of UAA by province, whether it has livestock or not and what type by province).
As an alternative to the proposed sampling design, gender could be added as a stratification variable, which would make the design even more complicated by doubling the number of strata: number of strata would turn out to be 822 for national sample and 590 at province level sample. This would improve the efficiency of the estimates, but at the same time it would increase the costs of the survey, so a cost-benefit assessment would be necessary as well as an evaluation of budget constraint.
In any case, it would be necessary to verify the correlation of gender with the main variables to be estimated in order to understand whether or not it is worth adding gender among the stratification criteria.
In general, we suggest to act for the following steps:

- Accurate analysis of the micro-data collected with the latest waves of APS (for example, the years 2016, 2017, 2018);
- choice of some variables on which to calculate average farms values and calculation of indicators distinguishing by gender (i.e. the same indicator is calculated for farms managed by women and for those managed by men);
- verification of the statistical significance of the difference between each pair of indicators (male vs. female) relative to each of the variables examined;
- on the basis of the test results, decide whether and for which variable gender is a discriminating variable.

Basically, data already available from the latest waves of the APS survey are post-stratified.
This approach also allows to verify the number of farms that are managed by women as a result of a sampling that did not include gender among the stratification variables.
If the empirical verification leads to the observation that about 9% (or a greater share) of the farms of the APS sample is managed by women[1], it may not be necessary to add gender among the variables to be considered in the stratification of the sample, because the randomness of the sample implies to capture a share of female companies in line with the expected share (about 9%).
On the other hand, finding in the latest waves of APS a very low share of female farms could derive from the greater difficulty in reaching and interviewing female farms, therefore imposing a priori in the APS sample a minimum guaranteed share of female farms by adding gender among the stratification variables could be useful, and maybe necessary.

1.3 Quality checks: sampling and non-sampling errors

No matter how well a census or a survey is organized, it is difficult to guarantee final data quality[2]**.**
However, for any statistical survey it should be a common best practice to analyse the accuracy of data collected.
The main errors can be classified into:

- Sampling Errors: refer to the discrepancies between the sample estimates and the population values that would be obtained by enumerating all units in the population. Sampling errors can be computed from the sample and reduced by enlarging the sample size.
- Non-Sampling Errors: refer to the discrepancies between data collected and their true value. They are due primarily to the variable performance of human beings and their lack of precise knowledge of the data requested. Strictly speaking, they are the result of mistakes occurred in various phases of the census and survey work.

Sampling Errors refer to the discrepancies between the sample estimates and the population values that would be obtained by enumerating all units in the population.
Sampling errors can be computed from the sample, controlled and reduced by:

- enlarging the sample size, deceasing variance, increasing costs
- using more efficient sampling design (stratified sampling)
- using more efficient methods of allocation of units (Neyman procedures)
- using estimators with auxiliary variables (regression estimator)

FAO classifies the non-sampling errors with regard to phase of the data collection process in which they occur:

a) errors resulting from preparatory activities;

[1] That is aligned with 2010 Census results.
[2] FAO guidelines about quality of data can be found at www.fao.org.

b) errors committed in the data collection stage;
c) processing and tabulation errors.

a) Errors Committed in the Preparatory Stage**.** Depend on the survey organizers and primarily due to insufficient pre-testing of various operations. They can be classified into:

- A.1 Biased Tool: refer to means used for data collection such as: questionnaires, instruction manuals, tables of random numbers for selection of sample holdings, etc.
- A.2 Biased Procedures Errors: refer to measurement procedures, sample selection, estimation procedures, etc.

b) Data Collection Errors. Data collection errors are the responsibility of enumerators and respondents. They can be broken down into:

- B.1: coverage errors
- B.2: measurement and processing errors
- B.3: nonresponse (total of partial)

B.1 - Coverage errors
Coverage errors are very common both in sample and census survey. The most frequent coverage errors are:

- clusters of units: the same name in the list is associated to more than one unit in the population;
- unknown or not existing names: the list contains some names that do not correspond to any unit in the population;
- replicated names: the population includes units to which correspond more than one name in the list. The main consequence of these errors is that they influence the real inclusion probabilities respect to the original sampling design.
- not completeness: the bias depends on the share of units not included in the list and the difference between the y-means in the two subpopulations (belonging and not belonging to the list)

The main consequence of these errors is that they influence the real inclusion probabilities respect to the original sampling design.

B.2 - Measurement and Processing Errors
The observed value is different from the true one (at micro level). They may be introduced during data editing, data editing and data tabulation, in both sampling and census surveys.
They produce a bias in the final estimation (independently of N) and a variance in the final estimation (inversely correlated to N).
They may be caused by:

- behaviour of the respondent unit (lack of capability to report correctly: enterprise instead of KAU, household instead of consumer);

- the instruments used to get information (ambiguous phrasing of questions; unclear layout of questionnaire);
- the effect to the interviewer and, in general, the kind of survey technique (insufficient knowledge to answer correctly; lack of motivation to report correctly).

In order to detect this kind of error, it is useful to compare observed and true values (of course, when available) and to replicate interviews using more expert interviewers.
In particular, data tabulation errors at the data entry stage depend on the data collection method used (Computer-assisted methods guarantee logical consistency and immediate controls, as on-line compilation of questionnaire is simple, controlled and pre-tested). Editing should be done at the same time as the data are entered in the database.

B.3 - Non-Responses Errors.
They can be divided in two categories:

- missing values (partial non-response): respondents do not complete the whole survey. Sometimes respondents are not willing or able to answer a certain question
- missing records (total non-response): respondents are not able or willing to cooperate with the whole survey.

Non-responses errors have two main consequences:

- increase of the sampling error, since the estimate variance increases if the number of respondent units decreases;
- effects on the non-sampling error, due to the potential bias derived from the fact that the average profiles of respondent and not respondent units are different. Bias depends on the share of not respondents (in the population) and the difference between the y-means of respondents and not respondents.

In order to prevent non-response errors, the following actions are recommended:

- a constant monitoring of the response rates during the fieldwork period;
- both weighted and un-weighted response rates are watched;
- to improve response rates, re-interviews can be managed (large firms); non-responding firms/consumers can be substituted at random;

c) errors committed in the processing and tabulation errors. They include those errors committed at the stage of data entry from questionnaire to computer media. Such errors are normally discovered by data entry verification or by computer checking for data consistency. Errors in the data processing stage are easier to control then errors committed in the field and can be avoided in a good organization. Nevertheless, routine controls such as checking for duplicate records, always discover unexpected mistakes.

1.4 The sampling design on the Survey on the role of women in agriculture (SRWA)

The questionnaires will be submitted to a sample of female holders drawn from the agriculture census 2010.The data collection technique will be Computer Assisted Personal Interviewing (CAPI).

Basic issue 1: Is it possible to update with APS the reference universe of female holders? If not, sample estimators and weights have an obsolete reference population and this can increase coverage errors (missing female holders and household, duplicates).

Basic issue 2: it is important to define how you handle the outcome of the survey. If half of the respondents are not women or they gave up their farms or refuse the interview, what happens? Do you already plan how to deal with expected difficulties in tracing respondents who have moved?

Basic issue 3: please consider the response burden imposed, with regard to questionnaire length and complexity, questions' sensitivity, questionnaire language and respondents' cultural backgrounds.

Non-sampling errors present major problems in sample surveys. While sampling errors can be estimated and can be controlled by increasing the sample sizes, there is no simple means for controlling and predicting non- sampling errors.

Given the characteristics of SRWA, non-sampling errors are likely to occur.

Basic issue n.1 deals with the quality of the Lebanese list of female holders derived from 2010 Census from which the sample will be drawn. Update the reference population with APS surveys results will increase the quality of the list and, thus, decrease the probability of under/over-coverage. In this way, not more existing units could be deleted from the list as well as information about farms could be updated (i.e. gender of the holder, residence and contact details).

Basic issue n.2 deals with the processing of the outcome of the survey that is a key element of the survey design. For instance, if half of the respondents are not women or they gave up their farms or refuse the interview, what happens? Before starting the data collection, it is necessary to plan how to deal with expected difficulties in tracing respondents who have moved, gone out of business, and so on.

A recommendation:

- plan a supplementary sample from which to extract, if necessary, additional women to be interviewed in case of personal information errors in the list or subsequent modifications in the state of activity; include in the questionnaire the possibility to interview other farms conducted by women related to the farms already included in the sample. This could happen in the case of, for example, inheritance or business transformation.

Basic issue n.3 deals with partial and total non-response errors that have important consequence on estimates variance and bias.

We strongly suggest the following action:

i. pre-testing of the questionnaire (understanding, response propensity definitions and time of compilation);
ii. during the survey, or during follow-up (if planned), try to collect as much basic information on the respondent as possible to avoid making adjustments based on assumptions a little later;

iii. try to update the list of female holders and household with recent statistical or administrative data sources;
iv. consider any available auxiliary information (as much as possible);
v. try to build an effective respondent relations program, especially if future waves of the survey are planned;
vi. increase the communication strategy in order to inform respondents of the importance of the survey, relate well to the respondent and encourage relationship of trust;
vii. train survey enumerators, with specific regard to thematic issues as well as skills in interpersonal relationships.

1.5 Some guidelines for SRWA sampling design

1.5.1 Some theoretical remarks

The sampling frame for the SRWA survey is 2010 Agriculture Census.
Starting from APS sampling design (one-stage stratified random sampling), we strongly suggest the following steps:

1. Update the list of reference (2010 Agriculture Census) with the results of APS surveys (or other sources, if any)
2. Stratification variables
   - The main recommendation is to use gender as stratification variable. In this case, the sample is drawn by using as layer the women holders of 2010 agriculture census. In addition, another sample could also be extracted from the list of male holders in agriculture census 2010. The use of both samples is particularly important for statistical inference. From the first sample, you can assess the farms that continue to be held by women as well as those that are now held by men. From the second sample, you can estimate how many farms that in 2010 were managed by men in ten years have seen a gender change in the holder (and therefore are managed by women). For this second sample, it is not necessary to conduct the whole interview but only to take note of change of gender in the holders in order to update the characteristics of the population.
   - Try to identify any other stratification variables (different from those already used for APS survey) that are available for the whole population and correlated with the main variables investigated. We suggest to calculate a limited set of variables or indicators (from 5 to 10) from the Census 2010 questionnaire, to post-stratify data according to these indicators and to check their statistical significance using some statistical tests (e.g. Spearman or Pearson correlation/ANOVA/Fisher's exact test).
   - Territory is necessary as stratification variable. Please check if the province is a good one or if a different territorial domain is required.

3. Target variables

Identify any other target variables (other than the target variables already used for APS survey), available for the whole population. For instance, you may also consider family workers, seasonal workers and age of holders.

4. Calculate the expected CVs by domain

For instance, we suggest to calculate a table as the one below (in which the proposed target variables are in red colour):

Expected CVs

Province	UAA	Temporary crops	Permanent crops	cattle	sheep	goats	bees	poultry	Family workers	Seasonal workers	Age of holders
1											
2											
3											
4											
5											
6											
7											

5. Identify the sample size and allocation in the layers to minimize the overall variance.

Through the analysis of the results of the coefficients of variation, it will be possible to evaluate the size of sample, taking into account budgetary constraint.

6. In the data dissemination phase, it is very important to highlight the different profiles of farms held by men and women.

Certainly, farms held by women differ from those held by men for both structural and individual characteristics. With regard to structural variables related to farms, you may consider average size (in terms of UAA), type of cultivation, multifunctional pattern (i.e. farms that carry out different activities), territorial localization, kind of labour force employed, size (in terms of labour force or some economic variables such as income or turnover), legal status. Referring to individual characteristics, you may consider age, education or any other relevant information about the holder.

1.5.2 Excel file

To better illustrate the working scheme, it is possible to check and to use the Excel file (Annex 1 - Sampling sheet with formulas), consisting of the following sheets:

- DATABASE: it contains a dataset of 100 farms (as an example, data have been invented), three stratification variables (province – with 3 modes, size – with 2 modes, and kind of unit – with 2 modes), 12 strata (3*2*2=12) and a target variable Y. Of course, when using

real data, you should have more than 100 units (some thousands), as well as different stratification variables. However, one stratification variable must be given by province or a different territorial breakdown. If you have k provinces, the column “province” will have k modes. On the other hand, you may also consider each file as a province and so you may produce k separate files, each file referred to a specific province. As regards the other stratification variables, some recommendations have been provided in the previous section 5.1, but we suppose that a dimensional variable (“size”) may be important: the ideal indicator would be the value of production, which includes agricultural crops, livestock and other farm incomes. If this indicator is not available, you may use proxies. Another important indicator should be the “kind” of unit. The higher is the level of cultural development of the household, the lower should be the problems encountered by female holders, so you should check the possibility to obtain some proxies of this indicator using the data available from the starting list from which the sample will be drawn. For instance, the legal status of the farm broken down by gender were available, it could be used as a proxy of the kind of unit (under the hypothesis that civil person farms are more favourable to women). In any case, it is fundamental to use a limited number of stratification variables (2 or 3) that should be correlated with the main purposes of the survey. Our recommendation is to produce a list of available variables in order to choose the stratification variables and the target one.

- SAMPLE SIZE & OUTPUT: if you enter any value of n from 1 to 100, you get the coefficient of variation (CV) estimation of the estimated average of Y, also in percentage (below), for three sampling strategies: stratified sampling with proportional allocation in the layers, stratified sampling with Neyman allocation in the layers and simple random sampling. The comparison of CV shows the advantages of stratified sampling. The Design Effect DEFF shows the efficiency gain due to stratification instead of simple random sampling, given the overall sample size n. Please note that in order to use optimal Neyman allocation you should know at least one Y variable for each unit in the starting list. If you do not have this information, you must use the proportional allocation among strata, which is sub-optimal option. If a variable Y is available for the whole population, you may choose Neyman allocation in which the total sample size is proportional to the stratum size multiplied by the standard deviation of the stratum. If the variances are correctly specified, Neyman allocation will give an estimator with smaller variance compared to proportional allocation.
- CALCULATIONS: it contains the allocation (total, proportional and optimal) of 100 units to 12 strata defined by the province, size and kind of unit. For each stratum, there are the calculation of the estimates and their variances, in both optimal and proportional allocation of stratified sampling, for any value of n – from 1 to 100 - entered.
- FORMULAS: it contains some clarifications about the symbols used in the stratified sampling, the formulas of the unbiased estimator of the total, its variance and the definition of optimal (i.e. Neyman allocation). Please note that these formulas refer to the

estimation of a total and not of an average value (in order to obtain the variance formulas for an average value you can divide the variance formula by N^2, where N is the population size).

2 Indicators proposal

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2.1 The international context: an overview

2.1.1 The FAO Global Strategy

FAO (Food and Agriculture Organization of the United Nations) is the most important world reference as regards agriculture. FAO's main goals are:

1. the eradication of hunger, food insecurity and malnutrition;
2. the elimination of poverty and the driving forward of economic and social progress for all;
3. the sustainable management and utilization of natural resources, including land, water, air, climate and genetic resources for the benefit of present and future generations.

The main overall concept, which is driving modern agriculture statistics at the international level, is the assessment of a *Global Strategy*[3] (GS). The main purpose is to provide the vision for national and international statistical systems to produce the basic data and information to guide the decision-making required for the sustainability. The initiative to develop the global strategy came as a response to the declining quantity and quality of agricultural statistics. In practice, the *GS* is a comprehensive framework for improving the availability and use of agricultural and rural data, necessary for evidence-based decision making, whose main goals are:

- to address developing countries' lack of capacity to provide reliable statistical data on food and agriculture;
- to provide a blueprint for long-term sustainable agricultural statistical systems in developing countries.

The *GS* is based on three pillars:

1. produce a minimum set of core data (see next Tables 1 and 2);
2. better integrate agricultural statistics into National Statistical Systems;
3. improve governance and statistical capacity building.

Table 1 - Economic indicators

GROUP OF VARIABLES	KEY VARIABLES
Output	Production - Area harvested and planted - Yield/births/productivity
Trade	Exports in quantity and value - Imports in quantity and value
Stocks	Quantities in storage at beginning of harvest

[3] www.fao.org/fileadmin/templates/ess/documents/meetings_and_workshops/ICAS5/Ag_Statistics_Strategy_Final.pdf.

Stock of resources	Land cover and use - Economically active population - Livestock - Machinery
Inputs	Water - Fertilizers in quantity and value - Pesticides in quantity and value - Seeds in quantity and value - Feed in quantity and value
Agro-processing	Volume of core crops/livestock/fishery used in processing food - Value of output of processed food - Other use (e.g., biofuels)
Prices	Producer prices - Consumer prices
Final expenditure	Government expenditure on agriculture and rural development - Private investments - Household consumption
Rural infrastructure (capital stock)	Irrigation/roads/railways/communications
International transfer	ODA (Official Development Assistance) for agriculture and rural development

Table 2 - Social, environmental and geographic indicators

GROUP OF VARIABLES	KEY VARIABLES
Demographics of urban and rural population	Sex – Age in completed years - Country of birth - Highest level of education completed - Labour status - Status in employment - Economic sector in employment - Occupation in employment - Total income of the household - Household composition - Number of family/hired workers on the holding - Housing conditions
Land	Soil degradation
Water	Pollution due to agriculture
Air	Emissions due to agriculture
GIS coordinates	Location of the statistical unit
Degree of urbanization	Urban/Rural area

2.1.2 The role of women

Today, agriculture and food systems face an unprecedented array of challenges. We must feed a growing global population in a context of persisting and emerging economic, environmental and social concerns. Nowadays, it is more important than ever that the agriculture sector perform to its full capacity, while also becoming more efficient, inclusive and sustainable.

Across the developing world, women make up nearly 50 percent of agricultural employment. As farmers and farm workers, horticulturists and market sellers, businesswomen, entrepreneurs and community leaders, they fulfil important roles throughout agri-food value chains, as well as in the management of natural resources such as land and water. Women are just as good as men in farming: evidence[4] shows that when rural women have the same access as men to productive resources, services and economic opportunities, there is a significant increase in agricultural output and immediate and long term social and economic gains, all contributing to the reduction

[4] FAO: The State of Food and Agriculture 2010–11. http://www.fao.org/publications/sofa/2010-11/en/.

in the number of poor and hungry people. As illustrated in the many examples featured on this site, rural women are resilient, resourceful, industrious and innovative.
However, yet the gender gap in food and agriculture is extensive. As consumers, women are more likely to be food-insecure than men in every region of the world. As producers, rural women face even greater constraints than their male counterparts in accessing essential productive resources and services, technology, market information and financial assets. They are under-represented in local institutions and governance mechanisms and tend to have less decision-making power. In addition to these constraints, prevailing gender norms and discrimination often mean that women face an excessive work burden, and that much of their labour remains unpaid and unrecognized.
Gender equality and women's empowerment is central to FAO's mandate to achieving food security for all, improving agricultural productivity and ensuring the full participation of rural people in decision-making processes.

2.1.3 The SDGs

The focus on gender equality and women's empowerment is explicit throughout the Sustainable Development Goals (SDGs), both in the form of a dedicated Goal on Gender Equality (SDG-5) and as a cross-cutting theme with more than 30 related targets across other SDGs. Every aspect of FAO's work in gender equality and the empowerment of rural women and girls is aligned with the SDG international framework, and contributes to each of the 17 SDGs, in line with the pledge that lies at the heart of the 2030 Agenda: to leave no one behind.
Gender equality does not mean that men and women will become the same, but rather that their rights, responsibilities and opportunities will not depend on whether they were born male or female. Empowering and enabling men and women to participate more effectively in agriculture also translates into improved well-being for their children, thereby building human capital for future generations. As such, achieving gender equality and empowering rural women, men, girls and boys will not only improve nutrition, health and education outcomes, it will also bring both immediate and long-term economic and social benefits for families, communities and nations at large.
The success of the Sustainable Development Goals[5] rests largely on effective monitoring, review and follow-up processes. SDG indicators are the foundation of this new global framework for mutual accountability. FAO is the 'custodian' UN agency for 21 indicators, for SDGs 2, 5, 6, 12, 14 and 15 and a contributing agency for four more. The whole list of 21 indicators is described as follows. The symbol **(F)** means that the indicator concerned should be declined according to some gender stratification criterion.

SDG-2: Zero Hunger

2.1.1 Hunger

The prevalence of undernourishment (PoU) is an estimate of the proportion of the population whose habitual food consumption is insufficient to provide the dietary energy levels that are required to maintain a normal active and healthy life. It is expressed as a percentage. **(F)**

2.1.2 Severity of food insecurity

[5] http://www.fao.org/sustainable-development-goals/indicators/en/.

This indicator provides internationally comparable estimates of the proportion of the population facing moderate or severe difficulties in accessing food. The Food Insecurity Experience Scale (FIES) produces a measure of the severity of food insecurity experienced by individuals or households, based on direct interviews. **(F)**

2.3.1 Productivity of small-scale food producers

This indicator refers to the value of production per labour unit operated by small-scale producers in the farming, pastoral and forestry sectors. Data will be produced by classes of enterprise size. **(F)**

2.3.2 Income of small-scale food producer

The indicator refers to the average income of small-scale food producers employed in the farming, pastoral and forestry sectors. Data will be disaggregated sex and indigenous status. **(F)**

2.4.1 Agricultural sustainability

The area under productive and sustainable agriculture captures the three dimensions of sustainable production: environmental, economic and social. The measurement instrument - farm surveys - will give countries the flexibility to identify priorities and challenges within the three dimensions of sustainability. Land under productive and sustainable agriculture will be those farms that satisfy indicators selected across all three dimensions. (**F, according to the gender of the farm holder**)

2.5.1a Conservation of plant genetic resources for food and agriculture

The conservation of plant genetic resources for food and agriculture in medium or long-term conservation facilities (ex situ in gene banks) represents the most trusted means of conserving genetic resources worldwide.

2.5.1b Conservation of animal genetic resources for food and agriculture

The conservation of animal genetic resources for food and agriculture in medium or long-term conservation facilities (ex situ in gene banks) represents the most trusted means of conserving genetic resources worldwide.

2.5.2 Risk status of livestock breeds

The indicator presents the percentage of local livestock breeds among local breeds with known risk status classified as being at risk of extinctions at a certain moment in time, as well as the trends for this percentage.

2.a.1 Public Investment in agriculture

The Agriculture Orientation Index (AOI) for Government Expenditures is defined as the Agriculture Share of Government Expenditures, divided by the Agriculture Share of GDP, where Agriculture refers to the agriculture, forestry, fishing and hunting sector. The measure is a currency-free index, calculated as the ratio of these two shares.

2.c.1 Food price volatility

The proposed indicator of food price anomalies measures the number of "Price Anomalies" that occur on a given food commodity price series over a given period of time.

SDG-5 Gender equality

5.a.1 Women's ownership of agricultural land

(a) Percentage of people with ownership or secure rights over agricultural land (out of total agricultural population), by sex; and (b) share of women among owners or rights-bearers of

agricultural land, by type of tenure. This indicator is divided in two sub-indicators. Part (a) is an incidence measure. It measures how prevalent ownership or secure rights over agricultural land are in the reference population. Part (b) measures the share of women among owners or rights-bearers of agricultural land. Therefore, it can be used to monitor the under-representation of women among the owners or holders of agricultural land. (F)

5.a.2 Women's equal rights to land ownership

Proportion of countries where the legal framework (including customary law) guarantees women's equal rights to land ownership and/or control. The indicator collects all existing national policy objectives, draft provisions, legal provisions and implementing legislation that reflect good practices in guaranteeing women's equal rights to land ownership and/or control. (F)

SDG-6 Clean water and sanitation

6.4.1 Water use efficiency

Water Use Efficiency (WUE) at national level is the sum of the efficiencies in the major economic sectors weighted according to the proportion of water withdrawn by each sector over the total withdrawals. The indicator measures changes in WUE.

6.4.2 Water stress

The level of water stress: freshwater withdrawal as a proportion of available freshwater resources is the ratio between total freshwater withdrawn by major economic sectors and total renewable freshwater resources, after taking into account environmental water requirements. This indicator is also known as water withdrawal intensity.

SDG-12 Responsible production and consumption

12.3.1 Global food losses

SDG target 12.3 has two components, Losses and Waste that should be measured by two separate indicators.

Sub-Indicator 12.3.1.a - Food Loss Index

The Food Loss Index (FLI) focuses on food losses that occur from production up to (and not including) the retail level. It measures the changes in percentage losses for a basket of 10 main commodities by country in comparison with a base period.

Sub-Indicator 12.3.1.b - Food Waste Index

A proposal for measuring Food Waste, which comprises the retail and consumption levels, is under development.

SDG-14 Life below water

14.4.1 Fish stocks sustainability

This indicator measures the sustainability of the world's marine capture fisheries by their abundance. A fish stock of which abundance is at or greater than the level, that can produce the maximum sustainable yield is classified as biologically sustainable.

14.6.1 Illegal, unreported unregulated fishing

Progress by countries in the degree of implementation of international instruments aiming to combat illegal, unreported and unregulated fishing through the effective implementation of key international instruments.

14.7.1 Value added of sustainable fisheries

Sustainable fisheries as a percentage of GDP in small island developing States, least developed countries and all countries. It is expressed as a percentage of the country's Gross domestic product.

14.b.1 Access rights for small-scale fisheries

Degree of application of a legal / regulatory / policy /institutional framework which recognizes and protects access rights for small-scale fisheries.

SDG-15 Life on land

15.1.1 Forest area

Forest area as a percentage of total land area. This indicator measures the proportion of the world's land area that is forested and is expressed as a percentage. Changes in forest area reflect changes in demand for land for other uses and may help in identifying unsustainable practices in the forest and agriculture sectors.

15.2.1 Sustainable Forest management.

This indicator measures progress towards Sustainable Forest Management (SFM) through five sub-indicators. As an aid to interpretation, a dashboard of traffic lights is used, with green, yellow and red indicating the direction and rate of change in each of the sub-indicators.

15.4.2 Mountain Green Cover

The Mountain Green Cover Index (MGCI) measures changes in the area of green vegetation in mountain areas (forest, shrubs and pasture land and cropland). This information will help identify the status of conservation of mountain environments.

2.2 The Lebanese context

2.2.1 Premise

The use of data already available to calculate statistical indicators in agriculture broken down by gender is highly recommended. Some examples of re-use of past statistical data will be given in the section 2.2 and 2.3.

However, it is also recommended the preliminary evaluation of the minimum set of indicators which each country in the World should be able to calculate, as those listed in the previous Tables 1 and 2 and at least some among the SDGs – basically part of the SGD-2 and the two SDG-5.

In other words, it is necessary to be aware of the theoretical general framework before using results of the available surveys. By using this approach, it will be easier to assess which changes should be introduced in surveys due to the not possibility to satisfy all the need derived from Tables 1 and 2 and/or some SDGs which cannot be calculated since basic data are missing.

2.2.2 The Census 2010 data

The first recommendation is to calculate the indicators by including gender as classification variable (tables 3-6 and 8-10, in which suggested indicators are shown in red). In this way, any gender differences are immediately detectable, as the gender gaps across regions or within different kind of farms clearly emerge. Moreover, we suggest to add in some tables the same columns calculated only for holdings managed by women (tables 11-14).

The second recommendation is to use farm size classification in the analysis, classified in terms of either their physical or economic size. Actually, the dimension of farm is considered as an important overview of the profile of holder farmers and farms across the world. Moreover, by comparing farm size along time and within regions, some cross-regional as well as time series analysis can be conducted. In many tables, the average size has been calculated in the physical meaning as measured by their utilised agricultural (tables 3-7, in which suggested indicators are shown in red). For example, a number of analysts classify smallholders based on a threshold size of 2 hectares. Following this approach, civil persons hold small farms (average size of 1.3 ha) while juridical persons manage farms of larger dimension (Table 3).

Table 3 - HOLDINGS AND UTILIZED AGRICULTURAL AREA (UAA), BY LEGAL STATUS, AVERAGE SIZE AND GENDER OF THE HOLDER

Holdings and Utilized agricultural area (UAA), by legal status				Male holder			Female holder		
	Holdings	UAA (ha)	Average size (ha)	Holdings	UAA (ha)	Average size (ha)	Holdings	UAA (ha)	Average size (ha)
Total	**169 512**	**230 994**	1,4						
Civil persons	157 055	196 929	1,3						
Juridical persons	12 006	28 865	2,4						
Others*	451	5 200	11,5						

*Please note others includes cooperative, public and religious institutions

Table 4 - Utilized agricultural area (UAA), by land tenure, average size and gender of the holder

UAA, by land tenure				Male holder			Female holder		
	Holdings	UAA (ha)	Average size (ha)	Holdings	UAA (ha)	Average size (ha)	Holdings	UAA (ha)	Average size (ha)
Total	**169 512**	**230 994**	1,4						
Owned	142 303	163 481	1,1						
Rented	12 954	48 596	3,8						
Other form of tenure	14 255	18 917	1,3						

Table 5 - Distribution of holdings by land size classes of Utilized agricultural area (UAA), average size and gender of the holder

Distribution of holdings by land size classes of UAA				Male holder			Female holder		
	Holdings	UAA (ha)	Average size (ha)	Holdings	UAA (ha)	Average size	Holdings	UAA (ha)	Average size
Total holdings with UAA	**169.512**	**230.994**	1,4						
Holdings without UAA	4.142								
Holdings with UAA	165.370	230.994	1,4						
Less than 0.1 Ha	929	61	0,1						
0.1 - 0.2 Ha	26.490	3.358	0,1						
0.2 - 0.5 Ha	51.622	15.389	0,3						
0.5 - 1 Ha	35.682	23.309	0,7						
1 - 2 Ha	26.269	34.149	1,3						
2 - 4 Ha	13.977	36.455	2,6						
4 - 6 Ha	4.412	20.598	4,7						
6 - 8 Ha	1.998	13.410	6,7						
8 - 10 Ha	902	7.826	8,7						
10 - 15 Ha	1.409	16.350	11,6						
15 - 20 Ha	557	9.284	16,7						
20 - 50 Ha	835	24.020	28,8						
50 Ha and over	288	26.786	93,0						

Table 6 - Land use, average size and gender of the holder

Land use				Male holder			Female holder		
	Holdings	Area (ha)	Average size (ha)	Holdings	UAA (ha)	(ha)	Holdings	UAA (ha)	(ha)
Total	**169 512**	**321 580**	1,9						
Utilized agricultural area	169 512	230 994	1,4						
land temporary fallow	n.a	12 900							
Land under permanent crops	n.a	125 928							
Permanent fallow land (Land Not cultivated for more than 5 Years)	n.a	47 027							
Uncultivated farm area	n.a	21 665							
Forest and other wooded land	n.a	18 823							
Other land	n.a	3 071							

Table 7 - Distribution of holder, by sex, average size and gender of the holder as percentage

Distribution of holders, by sex				
	Number	Area operated (ha)	Average size (ha)	Number %
Total	**169 022**	**224 544**	1,3	100,0
Male	154 457	214 964	1,4	91,4
Female	14 565	9 580	0,7	8,6

A further recommendation is to calculate the indicators using both absolute values and percentage compositions (tables 7-11, in which suggested indicators are shown in red).

Table 8 - Members of holder's household, by sex, composition and gender of the holder as percentage

Members of holder's household, by sex			Of which males		Of which females		
	Number	% composition	Number	% composition	Number	% composition	% share of women
Total	**817 513**	100,0					
Engaged in agricultural activities on the holding	404 594	49,5					
Permanent workers	165 594	20,3					
Casual workers	239 000	29,2					

Table 9 - Employees on holding, by gender

Employees on the holding			Of which males		Of which females		
	Number	% composition	Number	% composition	Number	% composition	% share of women
Total employees	**95 715**	100,0					
Permanent workers	51 049	53,3					
Casual workers	44 666	46,7					

TABLE 10 - DISTRIBUTION OF HOLDERS, BY SEX AND AGE AND PROPORTION OF FEMALE BY AGE

Distribution of holders, by sex and age	Number	Female (%)
Total	**169 022**	**100,0**
Male	154 457	
Female	14 565	
under 25 years	3 115	
Male	2 946	
Female	169	
25 to 34 years	15 592	
Male	14 769	
Female	823	
35 to 44 years	35 071	
Male	32 644	
Female	2 427	
45 to 54 years	43 460	
Male	39 840	
Female	3 620	
55 to 64 years	32 760	
Male	29 427	
Female	3 333	
65 years and over	39 024	
Male	34 831	
Female	4 193	

TABLE 11 - HOLDINGS, BY MAIN PURPOSE OF PRODUCTION - ABSOLUTE VALUES AND PERCENTAGES

Holdings, by main purpose of production	Holdings	Area (ha)	Holdings %	Area (ha) %
Total producing mainly for	**169 512**	**230 994**	100,0	100,0
Home consumption	43 278	15 987	25,5	6,9
Sale	126 234	215 007	74,5	93,1

TABLE 12 - LIVESTOCK SPECIES, HOLDINGS AND HEADS

Livestock	Holdings	Heads
Holdings with livestock	**15 773**	
Cattle	10 410	68 568
Sheep	4 094	265 345
Goats	5 847	403 861
Pigs/swine	51	7 735
Poultry	15 252	n.a
Chicken	12 416	412 000
Broilers	689	45 000 000
Laying hens	1 417	3 800 000
Ducks	417	31 251
Turkeys	185	26 160
Other	128	55 873
Quail	102	54 792
Ostriches	26	1 081
Insects		
Bees (hives)	6 183	169 308

TABLE 13 - METHODS OF IRRIGATION, HOLDINGS AND IRRIGATED AREA

Methods of irrigation		
	Holdings	Area irrigated (ha)
Holdings with irrigated land	**91 818**	**112 956**
Surface	71 241	55 930
Sprinkler	5 844	28 246
Localized irrigation	14 733	28 778

TABLE 14 - SOURCE OF IRRIGATION, HOLDINGS AND IRRIGATED AREA

Sources of irrigation water		
	Holdings	Area irrigated (ha)
Holdings with irrigated land	**91 818**	**112 956**
Surface water	47 440	44 053
Groundwater	21 857	56 478
Other	22 521	12 425

2.2.3 The APS survey

On the basis of the information obtained from the APS questionnaire (2016), in comparison with the one of 2010 Agricultural Census, it should be interesting to calculate (and recalculate every wave) time series indicators, in order to verify if there have been important changes.
The indicators that can be calculated for both APS and 2010 Census refer to holding characteristics, with regard to land use (total agricultural area, utilized agricultural area, land under permanent and temporary crops, irrigated area), livestock (livestock species) and labour force (permanent and seasonal workers[6]).
As things stand, time series analysis about household characteristics cannot be conducted (lack of common variables).
In order to enlarge time series analysis, it would be necessary to include in the APS questionnaire some information about:

- sex of the holder;
- age of the holder;
- gender composition of labour force;
- land tenure.

Anyway, it would be very useful to standardise the information requested in the questionnaires in order to calculate coherent indicators. For instance, with regard to agricultural labour force, APS requests information about the number of different kind of workers, while in the 2010 Census non-permanent workers can be calculated in terms of working days.
Actually, it would be possible to calculate the following indicators:

- Share of agricultural holdings (AH) managed by women;
- Average size (hectares) of AH managed by women compared with the overall average;

[6] In APS labour force is requested in terms of number of worker while in 2010 Census for non-permanent workers the number of working days is required.

- Average number of adult livestock units of AH managed by women compared with the overall average;
- Share of land owned on the total land (owned +rented) by gender;
- Breakdown of land use (by kind of use: permanent crops, vegetables, etc.) by gender;
- Breakdown of members of holder's household engaged in the AH activities by kind of work (permanent, not permanent) by gender of the holder and by gender of the workers;
- Breakdown of the employees of the holding engaged in the AH activities by kind of work (permanent, not permanent) by gender of the holder and by gender of the workers;
- Average age of the workers of the AH (broken down by permanent or not permanent and by gender) by gender of the AH holder;
- Share of AH working only for self-consumption on the overall number of AH, broken down by gender of the AH holder;
- Share of AH (and of their utilized agricultural area) with irrigated land on the overall number of AH.

All these indicators should be calculated separately in each province and along time, in order to build up a time series of data.
Additional analyses may be carried out according to the availability of a unique identifier for the same AH along time. For instance, some demography analysis could be conducting, starting from 2010, by implementing the following procedure:

- we consider the set of AH which were included in the census 2010;
- we calculate the percent of AH which stopped their activity according to the results derived from all the APS surveys managed after 2010;
- the previous indicator can be broken down by gender of the holder.

The basic question, which explains the usefulness of the previous calculation, is: do the AH managed by women have a larger probability to survive along time?

2.2.4 The survey on the role of women in agriculture (SRWA)

The questionnaire will be sent to a sample of female holders drawn from the agriculture Census 2020 (for full questionnaire refer to Annex 2).
Indicators of the questionnaire have been designed to quantify information and generate statistics around agricultural production and women empowerment in Lebanon.
Indicators have been built on current best practices, mapping the existing indicators in use, as in Agriculture Production Survey 2016, Agricultural Census 2010 and other Lebanese sources of information from Central Administration of Statistics (CAS) and other Institutes in Lebanon, to indicators and statistics widely accepted by the development community, as the ones from Word Bank, FAO and IFPRI statistics.
The result is a set of indicators that serve to provide high-level diagnostic information on the state of farming activities and women empowerment in Lebanon, and also readily convey specific and vital information that can inform policy and decision-making.

The indicators used and the mapping to the country and international literature are in the excel file provided together with the present document.
The set of indicators is re-grouped in Key-Characteristics, Economic and Social characteristics.

- Key -characteristics: This set re-groups characteristics, ranging from holding and household characteristics, to land tenure and main livestock and agricultural activities.
- Economic characteristics: This set re-groups measures of income, credit, and assets to include factors of decision making and gender empowerment.
- Social characteristics: This set covers a range of issue ranging from individual empowerment, to food security and access to basic services.

The first two set of indicators are mainly related to the Holding and its farming activities, while the social indicators are more focused on the household, its structure and dynamics.

A Basic issue related to the sampling strategy is that if the survey will concern female holders only, it will not be possible to carry out any comparison with respect to male holders. For instance: is access to credit from banks easier for males if compared with females? We cannot provide any answer because we will have data on female holders only. Please consider "guidelines for SRWA sampling design" contained in the Sampling paragraph– particularly 1.5.1.

2.2.5 Quality of agricultural statistics indicators

Some final remarks about the assessment of quality of statistical indicators.
The general definition of quality is "the totality of features and characteristics of a product or service that bear on its ability to satisfy stated or implied needs"[7].
Eurostat defines quality of statistics[8] with reference to the following six criteria:

- relevance: it is the degree to which statistics meet current and potential users' needs. It refers to whether all statistics that are needed are produced and the extent to which concepts used (definitions, classifications etc.) reflects user needs;
- accuracy: in the general statistical sense it denotes the closeness of computations or estimates to the exact or true values;
- timeliness and punctuality: timeliness of information reflects the length of time between its availability and the event or phenomenon it describes. Punctuality refers to the time lag between the release date of data and the target date when it should have been delivered;
- accessibility and clarity: accessibility refers to the physical conditions in which users can access and obtain data (availability of micro or macro data, various formats, etc.). Clarity refers to the data's information environment whether data are accompanied with appropriate metadata, illustrations such as graphs and maps, whether information on

[7] ISO 8402:1986 - Quality — Vocabulary, International Organization for Standardization (1986).
[8] Standard quality report, Eurostat (2003). Available at: https://ec.europa.eu/eurostat/documents/3859598/6651706/KS-GQ-15-003-EN-N.pdf.

their quality also available and the extent to which additional assistance is provided by the data producer;

- comparability: it aims at measuring the impact of differences in applied statistical concepts and measurement tools/procedures when statistics are compared between geographical areas, not geographical domains, or over time. We can say it is the extent to which differences between statistics are attributed to differences between the true values of the statistical characteristic.

  There are three main approaches under which comparability of statistics is normally addressed:

  - comparability over time refers to comparison of results, derived normally from the same statistical operation, at different times;
  - comparability between geographical areas the geographical component of comparability emphasises the comparison of statistics between countries and/or regions in order to ascertain, for instance, the meaning of aggregated statistics at European level;
  - comparability between domains refers to non-geographical domains, for instance between industrial sectors, between different types of households, etc.
- coherence: it is therefore their adequacy to be reliably combined in different ways and for various uses. It is, however, generally easier to show cases of incoherence than to prove coherence.

It is worth noticing that there is a trade-off between the different components of quality, especially timeliness/accuracy, accuracy/geographic comparability, relevance/comparability.
Moreover, the OECD has developed a quality framework with eight components: relevance, accuracy, credibility, timeliness, punctuality, accessibility, interpretability and coherence[9] .
With regard to quality issues, it is important to consider dimension of quality about statistical indicators.
All the suggestions included in this report aim at producing data and indicators with high comparability. In particular, comparability between geographical areas should be ensured, in order to be able to compare Lebanon statistics with other international statistics.
Looking at APS and Census, it would be necessary to assess, in particular, comparability over time, in order to produce high quality time series indicators (for instance, with regard to survey time frame). At the same time, accessibility is a very important dimension, both for users and specialists, as it allows use, understand, evaluate and spread the knowledge of the phenomenon.
Relevance of indicators should be considered as well, by including in the surveys some information that is at the centre of international interest such as, for example, gender statistics.
Finally, although not a measure of quality, the costs involved in the production of statistics as well as the burden on respondents act as constraints for quality. When designing and

[9]OECD (2002) Quality framework for OECD statistics. OECD. Paris. Available at the address: www.oecd.org/doc/m00029000/m00029990.doc.

implementing a questionnaire, it is necessary to take into account the cost and burden of statistics, with specific regard to compilation time and sensitivity of the questions.
Basically, it is important to start the regular production of a minimum set of indicators derived from actual sources existing in Lebanon and, possibly, which may be related to at least some of the indicators listed in the section 1. About these indicators it is necessary to have access to basic definition and statistical sources; they should be calculated according to some gender breakdown; they should be calculated along time for longitudinal comparisons and by regions in order to identify different territorial behaviours.

2.2.6 Summary of the suggestions to introduce gender in APS survey

In order to improve gender indicators in the annual agriculture production survey (APS), our recommendations can be summarized in the following three alternative options:

a. Introduce in the APS questionnaire the most relevant questions referred to gender (sex of the holder, gender composition of the labour force and land tenure), as described in section 2.3.
b. Incorporate in the APS questionnaire a **selection of the modules** developed for the Survey on Role of Women in Agriculture in Lebanon (SRWA) with reference to both household and individual level information. In particular, we refer to module A-J concerning the gender aspects related to land and agriculture, income sources and labour. Even a shorter version of these modules may be included in the APS, in the case the original modules were considered too long and complex.
c. Incorporate in the APS questionnaire all the modules developed for the Survey on Role of Women in Agriculture in Lebanon (SRWA), or a shorter version of these modules.

Of course, these three options imply different levels of complexity as regards the operational and methodological steps to be develop further.
The less costly option is the a). As a matter of fact, using the additional questions concerning gender it will be possible to cross-tabulate all the answers provided to the other questions.
The final choice will be based on a careful evaluation of costs and benefits, as well as according to time and budget constraints. In case these constraints were very strict, the option a) may be suggested, according to a strategy which will manage the gender issue using a gradual approach: first attempt using the approach a) and, further, additional modules in the next years survey waves.

2.2.7 Summary of the sampling strategy survey on the role of women in agriculture (SRWA)

Regarding the sampling strategy for the Survey on the role of women in agriculture, the original alternative proposals were:

a. to take all units that are operated by women from the APS sample - around 110 units;
b. to draw a new sample of around 500 units.

We suggest a **mixed strategy (option c).** The sample should be based on about 510 units, of which 110 are the farms that are held by women in APS (a) and about 400 units are drawn from the 2010 Agriculture Census, following the recommendations given in the Sampling Report (in particular section 5). Even though we suppose to pay the gap of time distance with respect to the last 2010 Census, and there is the risk of a low response rate when contacting the 400 units derived from the Census (for instance, 50%), the final number of answers would be 110+200=320, quite larger than that derived from the proposal (a). Please consider that the non-response rate itself would be a very useful feedback from the last Census, because we could derive useful information on the probability of survival (after 10 years) of an agricultural holding managed by woman.

The additional sample (about 400 units) should be enough higher than the original one based on 110 agricultural holdings, because otherwise sampling results could not be used for producing detailed data (data with territorial details, for instance). However, in case the additional sample is considered not sustainable in terms of additional burden and costs, it may be reduced to not less than 200 additional units. Additional units may be selected at random.

In this way, it would be also possible to carry out the pilot survey on the role of women in agriculture, as well as to lay the foundations for a future farm register.

The basic steps of the mixed strategy can be summarized as follows:

- Selection of 110 units managed by women from the APS sample.
- Selection of 400 units (in case it will not be possible, not less than 200 units) managed by women as derived from the Census 2010 results. The selection may be not at random. We suppose to explain the probability to survive (from 2010 until 2020) on the basis of some structural information available (for instance, age of the female holder, civil status, education degree, geographical location of main premises, size of the agricultural holdings, etc.). Afterwards, we could use this information in order to select a sample of 400 units for which the probability to survive within 10 years should be higher than the average.
- Carrying out the survey adopting the options c).
- Analysing results, with the (additional) goal of providing the profile of units managed by women which “died” between 2010 and 2020 (main reason, year of “death”, structural profile of “dead” units).

According to the mixed strategy, the data collection technique should be evaluated as well. For instance, if data collection will be carried out according to CAPI, the sample selected should include units having high probability to be reached and interviewed by person.

3 Pilot of survey on role of women in agriculture

Elena Serfilippi

3.1 Research methodology

The Survey on the Role of Women has been developed with the aim to assist the Statistics and Economic Studies Service (SESS) at MoA to effectively integrate a gender dimension into the APS. CIHEAM divided the operative work into two phases, the first phase consisted in the development of the measurement tool, while the second phase focused on the pilot test of the tool. The tool is a set of indicators and survey questions developed to ensure the integrations of the economic perspective captured by the APS with social, intra-household and women empowerment dimensions.

3.1.1 Phase 1: Tool development

Indicators were built on current best practices, mapping the existing indicators in use, as in Agriculture Production Survey (2016), Agricultural Census (2010) and other Lebanese sources of information from Central Administration of Statistics (CAS), to indicators and statistics widely accepted by the development community, as the ones from Word Bank (2013;2009), FAO(2019; 2019b; 2018; 2016a; 2016b; 2016c; 2015a;2015b) and IFPRI (2016; 2018) statistics.
The result is a set of indicators that serve to provide high-level diagnostic information on the state of farming activities and women empowerment in Lebanon, and also readily convey specific and vital information that can inform policy and decision-making.

The set of indicators is re-grouped in Key-Characteristics, Economic and Social characteristics.

- Key -characteristics: This set re-groups characteristics, ranging from holding and household characteristics, to land tenure and main livestock and agricultural activities.

- Economic characteristics: This set re-groups measures of income, credit, and assets to include factors of decision making and gender empowerment.

- Social characteristics: This set covers a range of issue ranging from individual empowerment, to food security and access to basic services.

The first two set of indicators are mainly related to the household and its farming activities, while the social indicators are more focused on the household, its structure and dynamics**. A separate excel file with a full list of indicators and the mapping to the most recent literature has been provided to SESS at MoA.**

The full set of indicators constitutes a monitoring and evaluation tool that will help the Ministry of Agriculture (MoA)' staff and partners to monitor and evaluate the level of social and economic dimensions during time and keep track of the level women empowerment in the area of interest.

3.1.2 Phase 2: Pilot test

CIHEAM tested the set of indicators through a pilot survey involving 402 female holders that have been randomly sampled by MoA staff following the advice in first part of this report.
This approach allows to measuring and analysing changes in intra-household dynamics and the level women empowerment through the use of the PRO-WEAI Index developed by IFPRI in 2018.
The PRO-WEAI modules have been adapted to the Lebanese context, and to a situation in which only female holders have been interviewed.
The results emerging for this pilot study constitutes a fundamental baseline in the frame of the actions aimed at supporting gender mainstreaming at institutional level. The results will serve as the basis to promote policy dialogue with the involved stakeholders regarding the status of rural women and contribute to close the policy gap.

3.2 Analysis of the results

3.2.1 Composition and demographics of the sample

Female holder surveys were conducted across the different governorates in Lebanon. In all, 402 surveys were conducted. Female holders have been randomly sampled from the Lebanese Census (2010), following the guidelines draft in the first part of this report. Although only female holders participated at this round of the survey, however the idea is to extend this pilot survey to both female holders and the main adult male belonging to the same household in the next rounds of the survey.

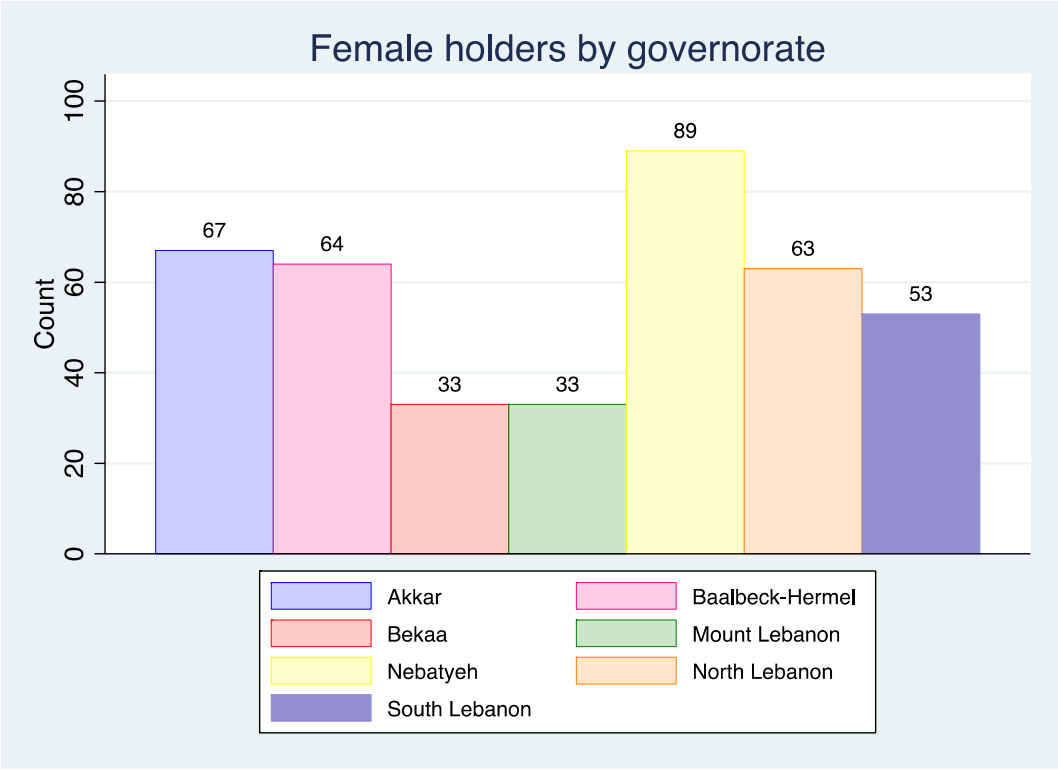


FIGURE 1:DISTRIBUTION OF FEMALE HOLDERS PARTICIPATING IN THE SURVEY BY GOVERNORATE

About 282 observations belong to the original sample created by MoA, while the other 120 observations come from the replacement list. The replacement list has been used when female holders originally selected in the sample could not participate in the survey because they were dead (42%), or it was impossible to reach them (8%), or because of mistakes in 2010 Census data (19%), or change in holding property (25%) or because female holders simply refuse to participate at the survey (6%). Figure 1 reports the final distribution of the sample by governorate.
Data was gathered on a number of different household characteristics of the respondent, such as age, education, marital status, and household composition.

Concerning the age, female holders participating in the interview are around 62 years old, Figure 2 . The sample used for the survey might have under-looked some of the young women farmers or entrepreneurs who have been engaged in agriculture- related activities over the past 10 years (this is shown by the average old age of the women farmers in the sample). The results are comparable with the 2010 census, where the average age of farmers was 52 for men and women and 55 for women only. The update of the Agricultural census planned for 2020 but postponed until 2022, due to budgetary constraints, will help to include a number of young women entrepreneurs who were newly engaged in the agricultural sector.

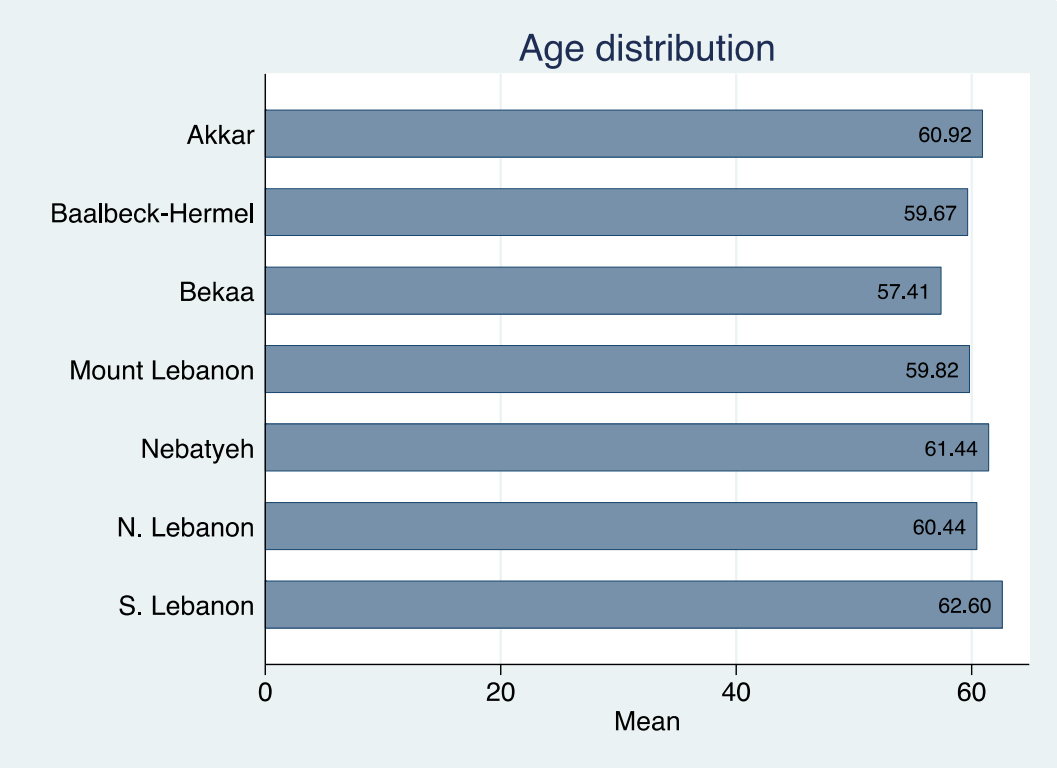


FIGURE 2:FEMALE HOLDERS AGE DISTRIBUTION BY GOVERNORATE

We asked female holders for level of education they had completed. Across the whole sample, we found that female holders had a generally low level of educational attainment. Around 34% of female holders does not have any education, Figure 3. The highest percentage of uneducated female holders is registered in Akkar (52%). On average, about 23% of female holders simply completed primary education; about 31% completed secondary or preparatory studies (preparatory, secondary and vocational school), while the remaining 12% has a higher level of education (University, PhD, Master). The highest percentage of female holders with an university degree or higher is registered in Mount Lebanon, Figure 3.

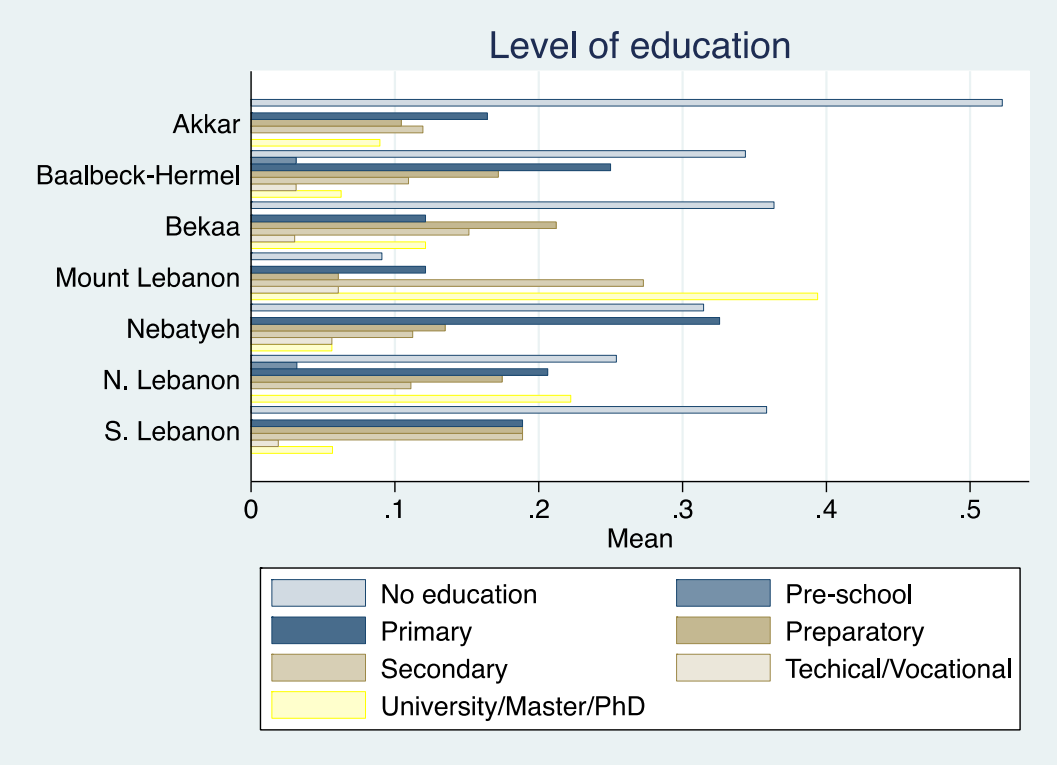


FIGURE 3:LEVEL OF EDUCATIONAL ATTAINMENT BY GOVERNORATE

The majority of female holders are married (46%) or widow (28%), Figure 4. About 22% are single and a very small percentage is divorced (4%). The females who are single are not in a wedding age since they are around 60 years old on average.

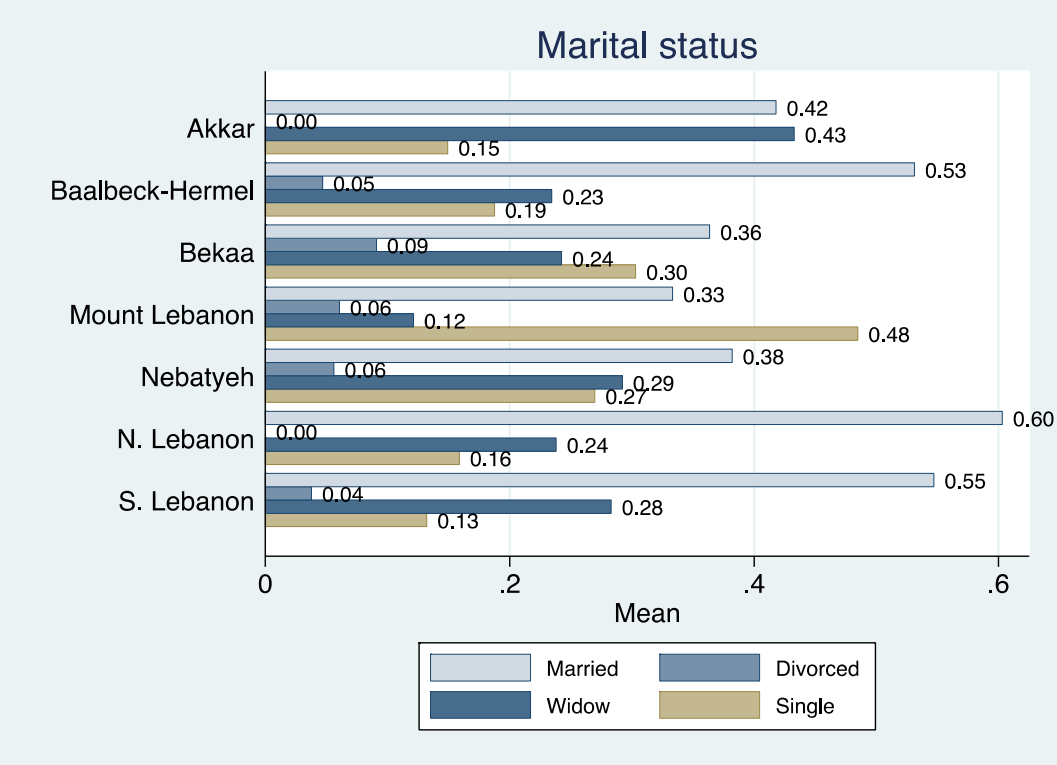


FIGURE 4: FEMALE HOLDERS MARITAL STATUS BY GOVERNORATE

The reported household size depends, to a large extent, on the definition of a "household". In our survey, we defined household as a group of people who take food from the same pot and who live together. The average household size is around four members with three adults and one child, Figure 5. We classified the family members with an age lower than eighteen years in the children's category. The low number of children can be due to the fact that household composition was largely affected by the old age of the women holders.

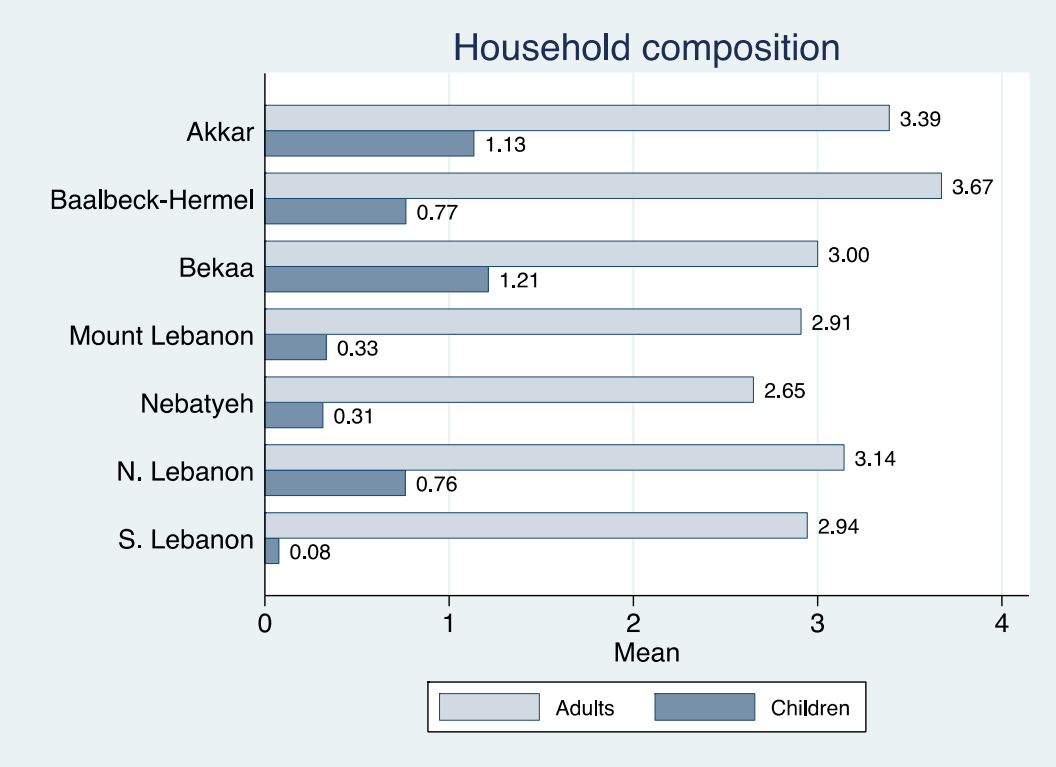


FIGURE 5:HOUSEHOLD COMPOSITION BY GOVERNORATE

3.2.3 Holding characteristics

About 72% of female holders interviewed are at the head of an agricultural holding and 8% run a livestock holding; 20% of the holders carry out both livestock and agriculture activities. Figure 6 reports the type of holding activities (agriculture and/or livestock) by governorate.

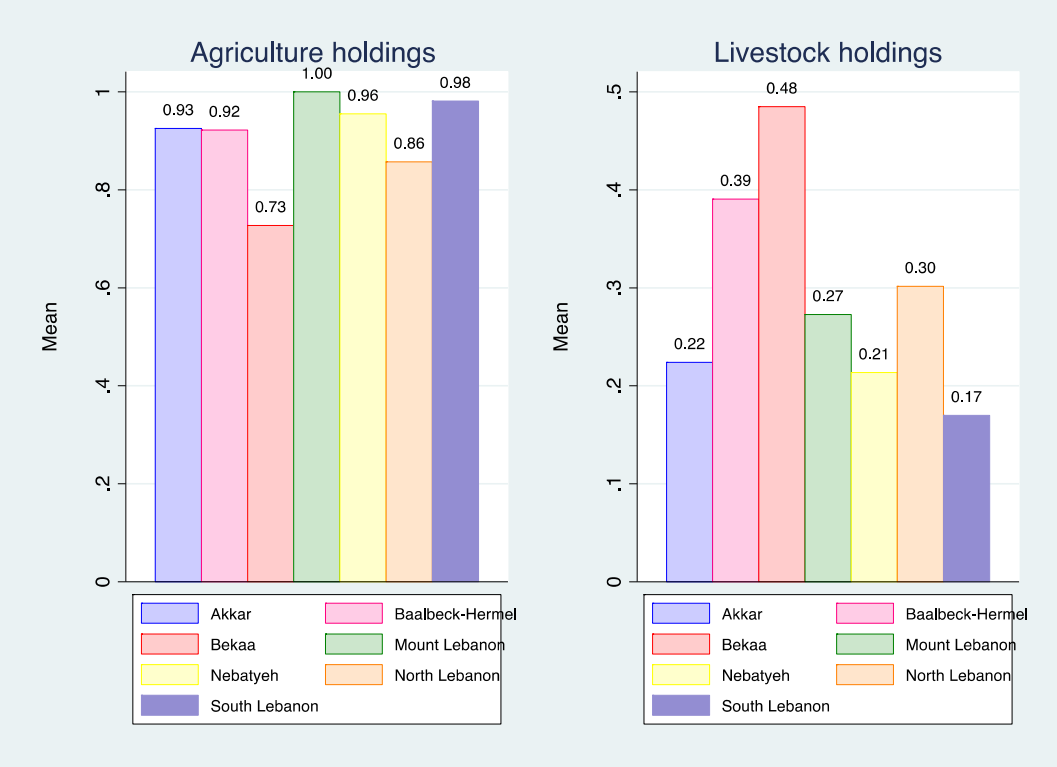


FIGURE 6:HOLDING TYPE BY GOVERNORATE

Around 73% of the holdings are run by a single individual, while 26% is run by multiple individuals in the same household, Figure 7. We did not register any land ownership issue in the survey since almost all the female holders (94%) own their land.

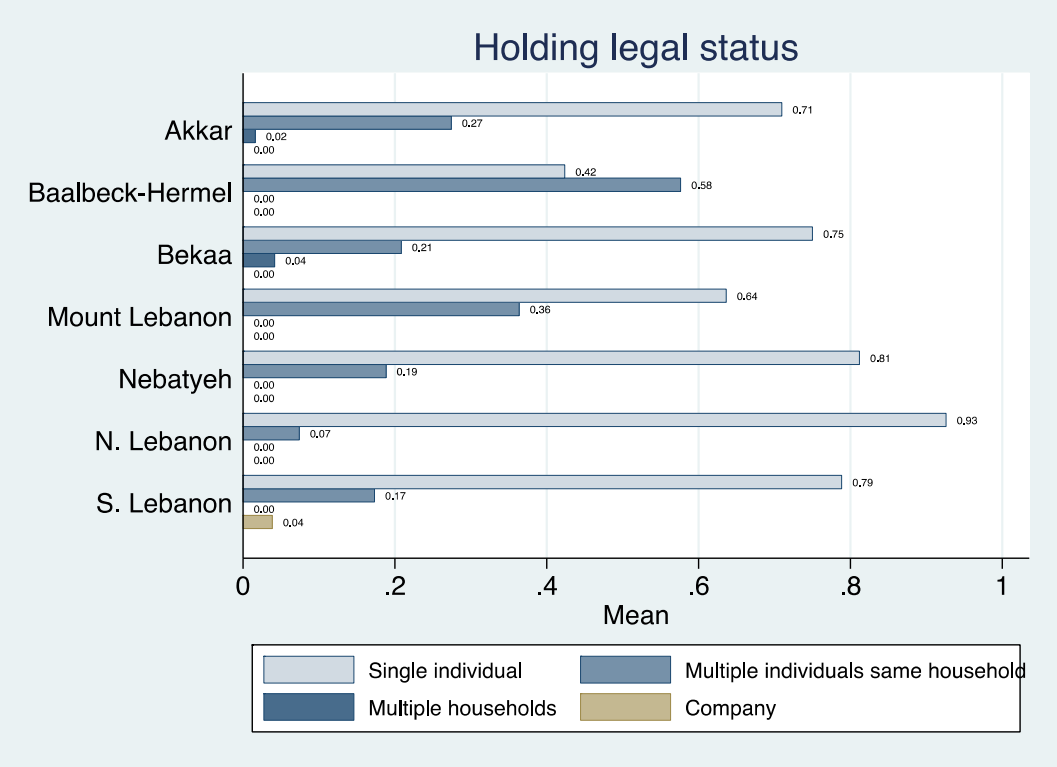
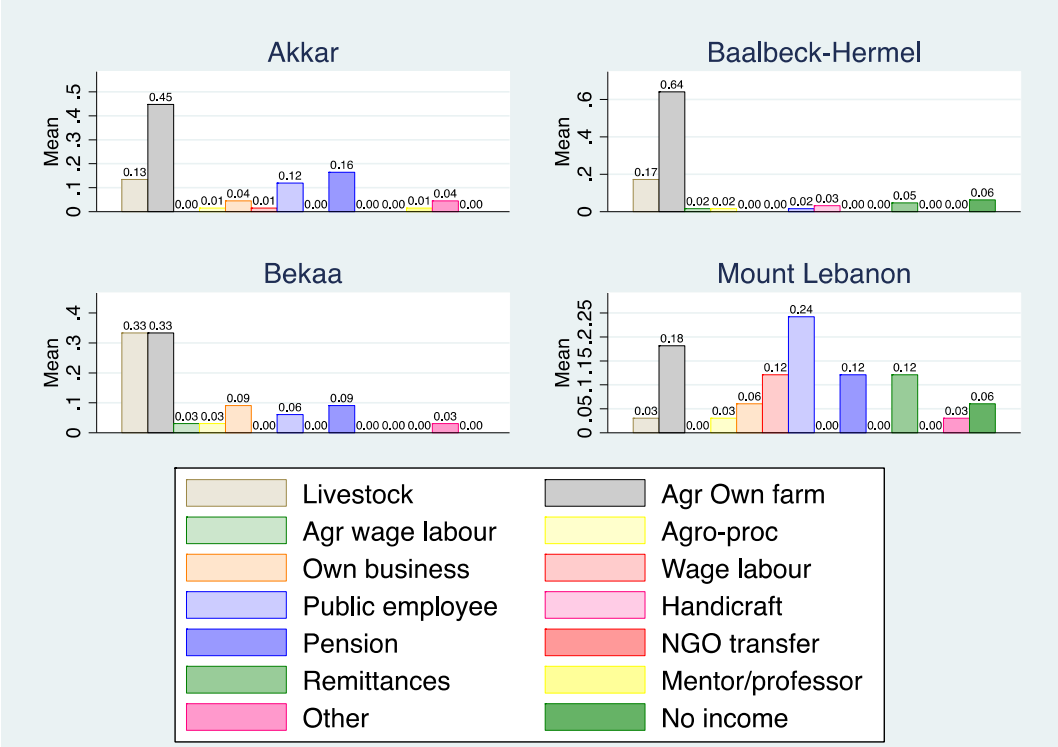


FIGURE 7:LEGAL STATUS OF THE HOLDING BY GOVERNORATE

3.2.4 Female holders' main income sources

Data shows that female holders contribute to half of the household income, 49% of the total household income.

Farming activities represent the main source of income for the majority of females in the sample. In particular, 40% of female holders run activities in the filed of agriculture and 15% focus on livestock rising activities, Figure 8. Remittances constitutes the main income source of income for 26%, 25% and 12% of female holders in Nebatyeh, South Lebanon and Mount Lebanon, respectively. In Mount Lebanon we register that also pensions and public employee salaries represent the principal income source for 12% and 24% of female holders interviewed, respectively.



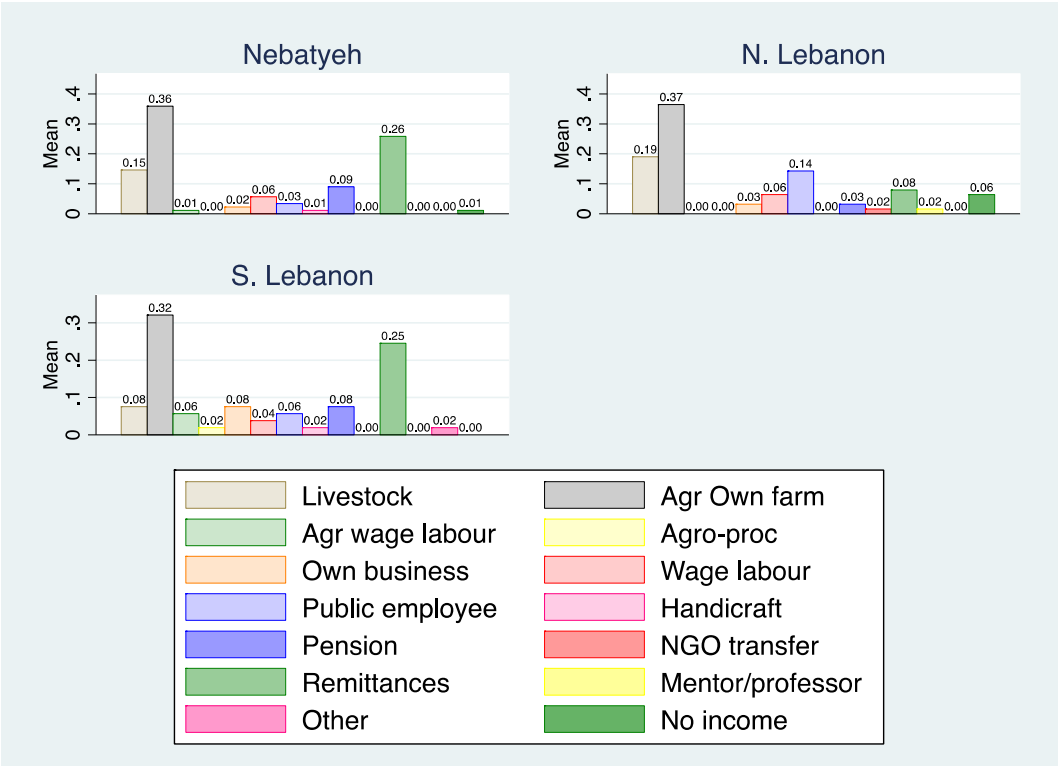
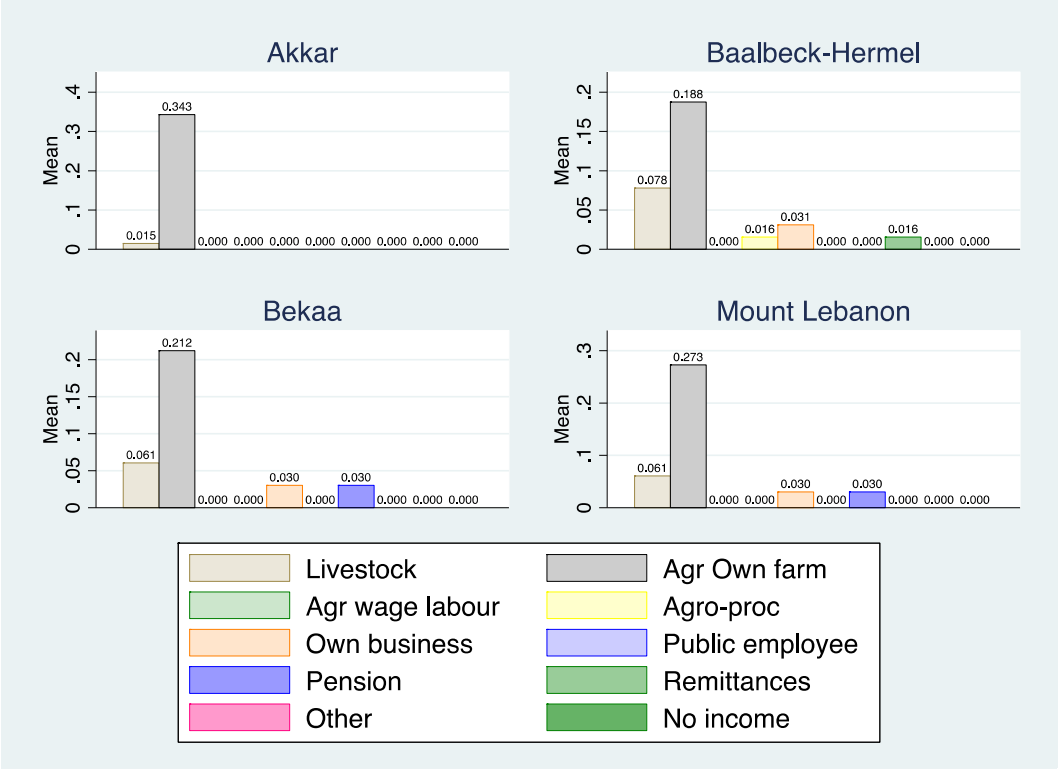


FIGURE 8:MAIN INCOME SOURCES BY GOVERNORATE

The level of income diversification is weak. About 51% of the sample does not have a secondary source of income, and between the ones diversifying, the secondary source belongs to the sphere of agriculture (37%) or livestock raising (4%), Figure 9. It follows that in presence of a shock affecting the farming sector, the population cannot count on a strong income diversification strategy as absorptive capacity.



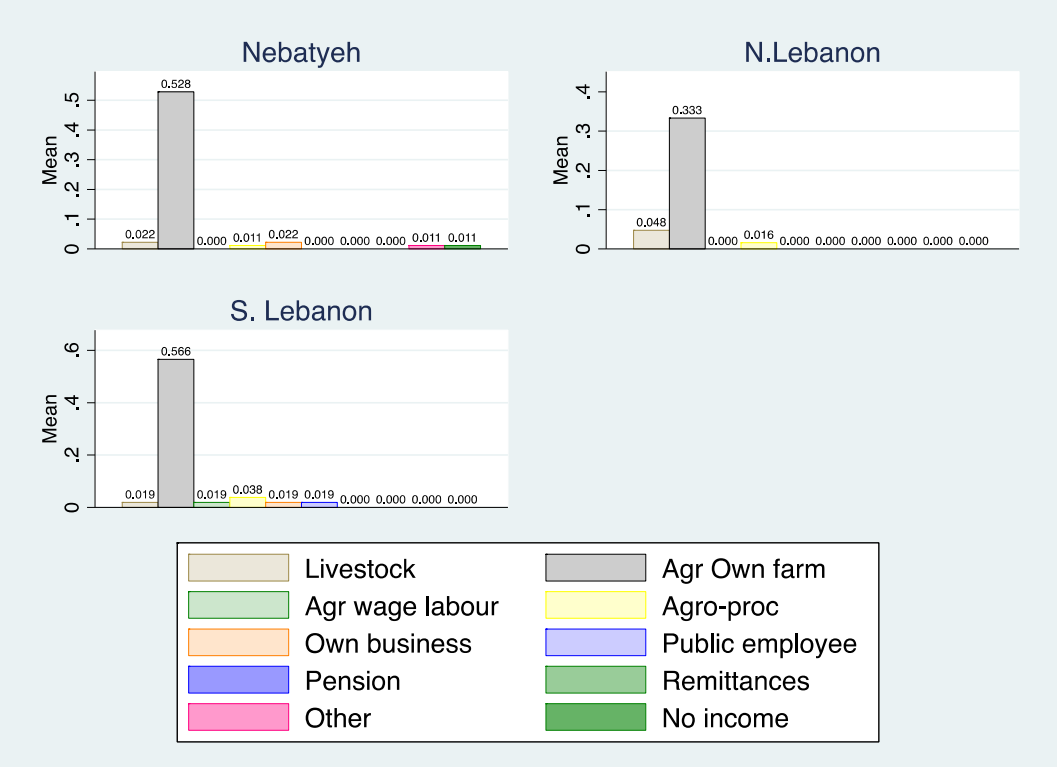


FIGURE 9:SECONDARY INCOEM SOURCE BY GOVERNORATE

3.2.5 Cultivated crop land

The sample contains 369 female holders running agricultural activities. Between these, 182 female holders cultivate permanent crops and 88 focus on seasonal cultures; 88 female holders are performing both cultures. The remaining 11 female holders did not specify any culture and 18 outliers have been identified. The outliers are observations that present extreme values for production and/ or land cultivated due to mistakes in the specification of the unit or value of land and/or production. We remove 18 extreme outliers that presented values of land and or production deviating more than 4 standard deviations from the mean.

Culture	Observations
Permanent culture	182
Seasonal culture	88
Both cultures	88
Missing information	11
Sub-Total	**369**
Outliers	18
Total	**351**

TABLE 15:AGRICULTURE FEMALE HOLDERS

In our study, all respondents were first asked in which unit they would like to report their land size. We think that land size estimates are more accurate when respondents can opt for the unit they are most comfortable reporting in. In Lebanon, farmers frequently responded in square metes (37%), but the majority (62%) also used a unit known locally as 'dunums'. In this report, land size in dunums and square meters have been converted to hectares to be consistent with most research in agriculture.

The female holders in the sample are all small holders, Table 10. The area under permanent and seasonal crops is around 0.64 and 0.99 hectares on average, respectively. In Baalbeck –Hermel and Bekaa we register a higher average number of hectares for both permanent and seasonal cultures.

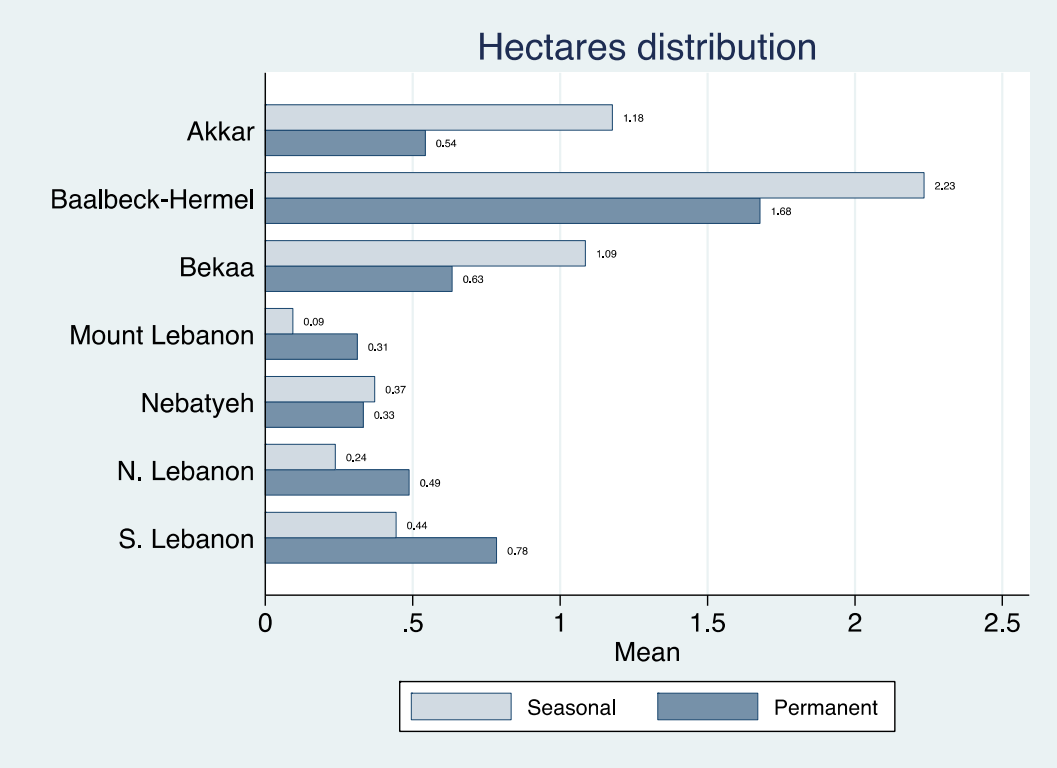


FIGURE 10: AVERAGE HECTARES DISTRIBUTION BY GOVERNORATE

Seasonal and permanent crop cultivation

These lands are home to a diverse agricultural production of seasonal and permanent crops. The total cultivated area under permanent crops is estimated at 163.04 hectares. Governorates as Baalbeck-Hermel, South Lebanon, and Akkar account respectively for 32% (53.70 hectares) 17% (27.46 hectares) and 14% (23.86 hectares) of the total area under permanent crops, Figure 11.

The area under seasonal/temporary crops reaches 170.20 hectares, of which 58% (98.30 hectares) are in Baalbeck Hermel, 21 % (35.31 hectares) in Akkar and 9% (15.20 hectares) in Nebatyeh, Figure 11.

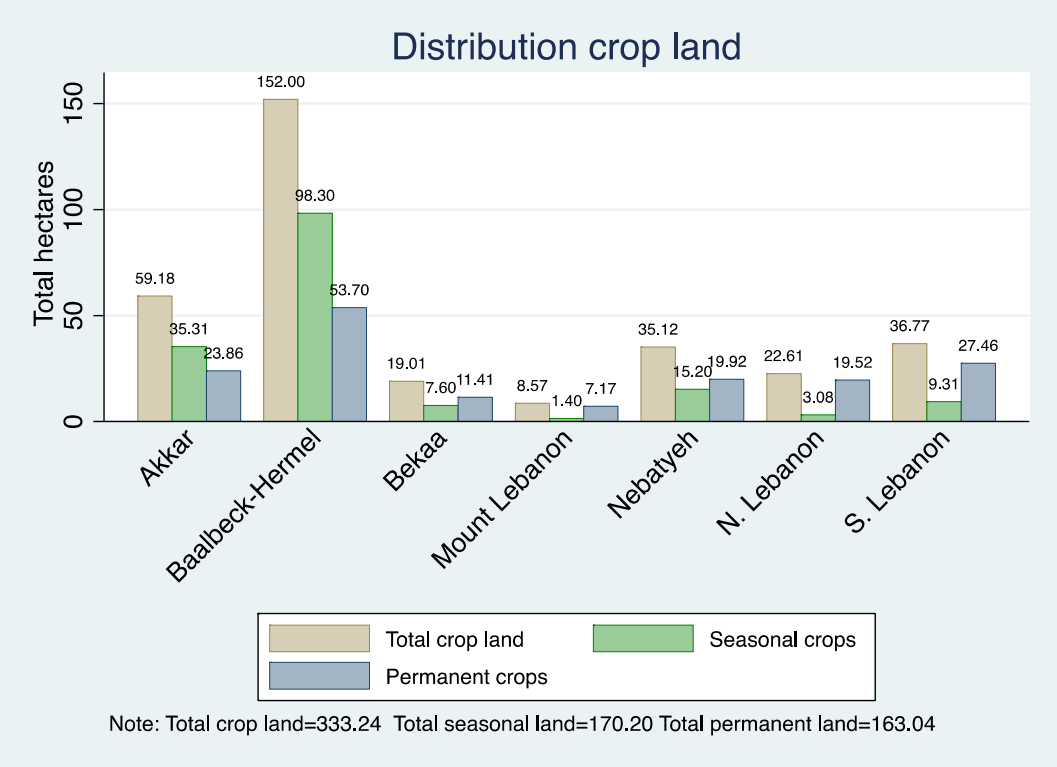


FIGURE 11:DISTRIBUTION TOTAL CROP LAND BY GOVERNORATE AND TYPE OF CULTIVATION

The share of each crop category shows that cereals are the predominant seasonal crop, covering 35% of the total crop land, for a total of 116 hectares, Table 16. The second most important seasonal crop is represented by vegetables covering a surface of 29 hectares equal to 8% of the total crop land.

Seasonal crops Total hectares by crop and governorate						
Governorate/Crop	Cereals	Vegetables	Pulses	Sugar crops	Other	**Total**
Akkar	29.4	3.71	0.205	2	0	**35.315**
Baalbeck-Hermel	68.55	15.45	3.8	3.5	7	**98.3**
Bekaa	5.5	1.9	0.2	0	0	**7.6**
Mount Lebanon	0	1.083	0.303	0.01	0	**1.396**
Nebatyeh	6.77	3.425	0.55	4.25	0.2	**15.195**
N. Lebanon	2	1.085	0	0	0	**3.085**
S. Lebanon	3.8	2.71	0.9	1.7	0.2	**9.31**
Total	**116.02**	**29.363**	**5.958**	**11.46**	**7.4**	**170.20**

TABLE 16: LAND CULTIVATED WITH SEASONAL CROPS

Governorates as Baalbeck-Hermel and Akkar have the largest average number of hectares under cereal cultivation with 2.67 and 3.43 hectares on average, respectively. Bekaa and Akkar account for 1.03 and 0.63 average number of hectares of land cultivated under vegetables, Figure 12.

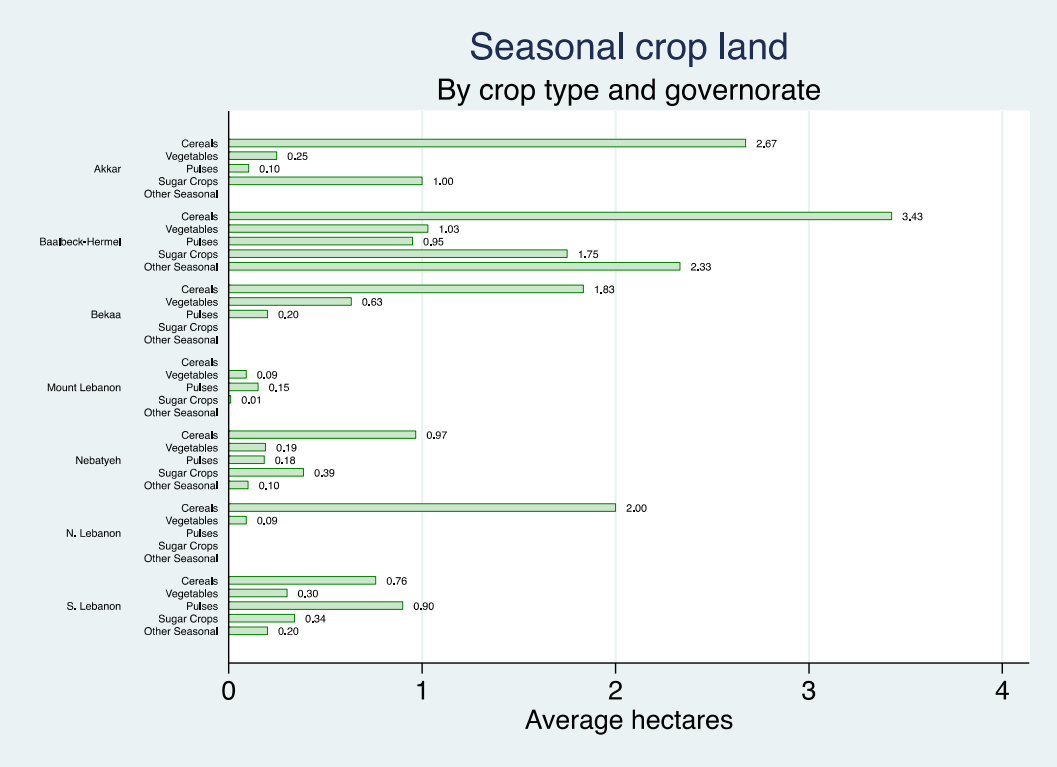


FIGURE 12:AVERAGE HECTARES CULTIVATED BY SEASONAL CROPS AND GOVERNORATE

Olive together with pome and stone fruit cultivations are the most important permanent cultures since they are cultivated in 24% and 14% of the total crop land, covering 81.55 and 45.84 hectares, respectively, Table 17.

Permanent crops Total hectares by crop and governorate								
Governorate/Crop	Tropical	Citrus	Olives	Grapes	Pome/ stone	Nuts	Other	Total
Akkar	0	1.5	20.92	0	0.3	0	1.14	23.86
Baalbeck-Hermel	0	0	6.6	3.2	36.6	2	5.3	53.7
Bekaa	0	0	5.1	0.4	5.21	0.7	0	11.41
Mount Lebanon	0	0.54	3.97	0	2.3	0.01	0.36	7.18
Nebatyeh	0.4	0.4	18.09	0	0	0.02	1.1	20.01
N. Lebanon	0	0.2	15.29	0	1.43	2.45	0.15	19.52
S. Lebanon	0.7	14.9	11.58	0.2	0	0	0.08	27.46
Total	**1.1**	**17.54**	**81.55**	**4**	**45.84**	**5.18**	**8.13**	**163**

TABLE 17:LAND CULTIVATED WITH PERMANENT CROPS

Between the most important permanent crops, Baalbeck-Hermel has both the largest average surface cultivated with olives, 0.94 hectares on average, and the largest average surface cultivated with pome and stone fruits equal to 1.93 hectares on average, Figure 13

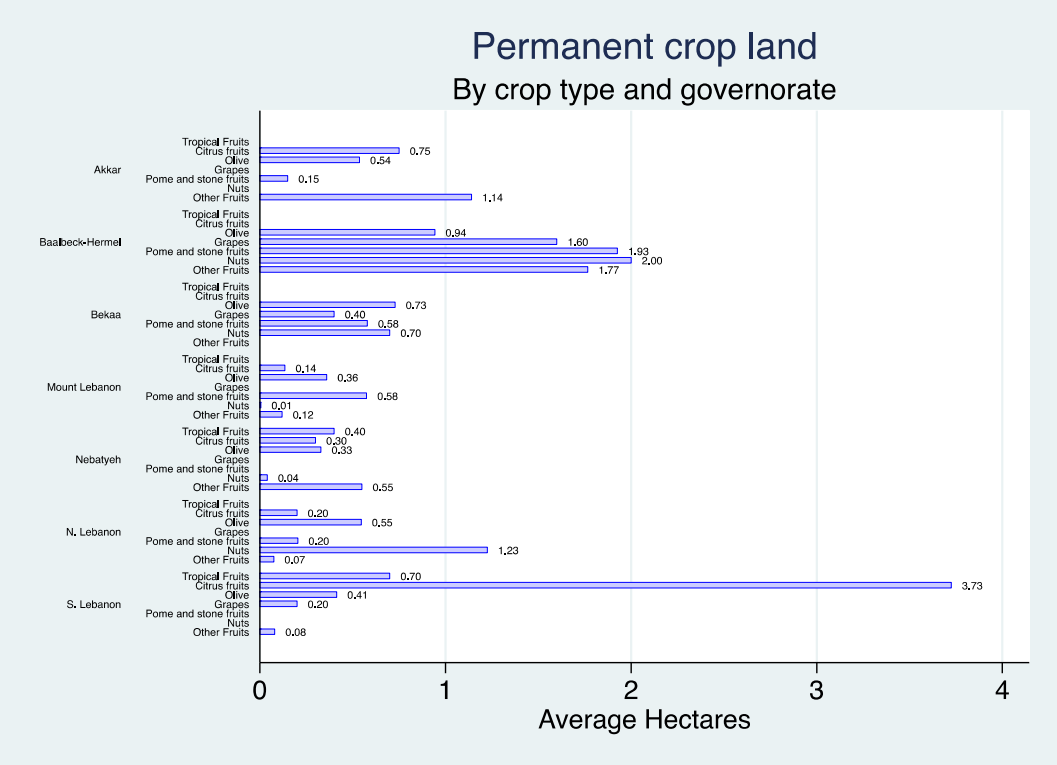


FIGURE 13:AVERAGE HECTARES CULTIVATED BY PERMANENT CROPS AND GOVERNORATE

Production seasonal and permanent crops

In our survey, respondents were asked what unit of measurement they used for measuring production (such as box, bunches or pills, piece, gallons or kilogrammes). Production figures are calculated from total production divided by the amount of land under productive crop. It is important to note that respondents were able to answer questions in any unit they liked for both production (usually box or kilogrammes) and land size (usually meter squares, dunums or hectares) to enhance data quality and accuracy. The data was then re-calculated by researchers as kilogrammes per hectare.

In general, the production per ha is a bit lower for some groups of plant products and livestock products (such as pome and stone fruits, citrus, milk). This may be due to various reasons in addition to the low number of observations for some crops and animals /large diversity of crops and plant varieties, as limited access of women farmers to training, extension, agricultural knowledge, technology, access to capital and finance- all of which could have helped improve their agricultural practices and thus increase their production capacities.

The analysis shows that cereals and vegetables are the two most important crops not only in terms of land cultivated, but also in terms of production (Kg/ha). The total production of cereals reaches 389712 Kg, with 115 hectares cultivated and 14056 Kg/ha. Vegetables account for a total production of 416742Kg, with 29 hectares cultivates and 76923 Kg/ha produced, Table 18.

Governorate	Cereals			Vegetables		
	Kg prod.	Hectares	Kg/Hectares	Kg prod.	Hectares	Kg/Hectares
Akkar	23394.85	29.4	795.7431973	40171.85	3.71	10827.99191
Baalbek-Hermel	320887.325	68.5	4684.486496	252667.45	15.45	16353.88026
Bekaa	24511.95	5.5	4456.718182	2050	1.9	1078.947368
Mount Lebanon	0	0	0	2377.2	1.083	2195.01385
Nebatyeh	14048.5	6.77	2075.110783	43847.1	3.425	12802.07299
North Lebanon	1000	2	500	10420	1.085	9603.686636
South Lebanon	5869.625	3.8	1544.638158	65208.8	2.71	24062.28782
Total production	**389712.25**	**115.97**	**14056.69682**	**416742.4**	**29.363**	**76923.88084**

TABLE 18:TOTAL PRODUCTION OF SEASONAL CROPS BY CROP AND GOVERNORATE

Governorates as Baalbeck-Hermel, Bekaa and Nebatyeh have the highest average cereals production per hectare. The average production under vegetables reaches the highest picks in South Lebanon, Baalbeck-Hermel and Nebatyeh.

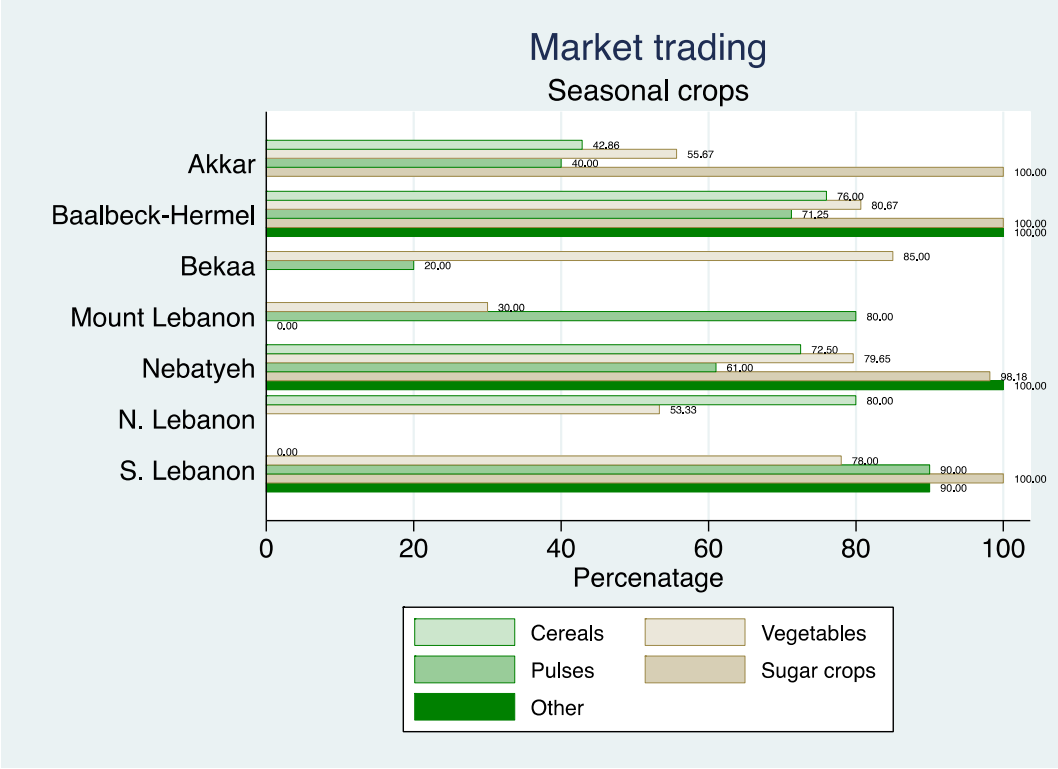
The total production of olives reaches 69083, with 81 hectares cultivated and a production per hectares of 5398 Kg/ha, Table 19. Pome and stone fruits account for a total production of 77324 Kg, with 45 hectares cultivated and 1713 Kg/ha, Table 19.

Governorate	Olives			Pome and stone fruits		
	Kg prod.	Hectares	Kg/Hectares	Kg prod.	Hectares	Kg/Hectares
Akkar	1867.8514	20.92	89.28543977	45	0.3	150
Baalbek-Hermel	7047.1	6.6	1067.742424	45224.9	36.6	1235.653005
Bekaa	2690.4248	5.1	527.5342745	18627	4.5	4139.333333
Mount Lebanon	743.971	3.965	0	5957.25	2.3	2590.108696
Nebatyeh	22286.8813	18.085	1232.340686	0	0	0
North Lebanon	23551.496	15.29	1540.320209	7470	1.43	5223.776224
South Lebanon	10895.6936	11.5775	941.1093587	0	0	0
Total production	**69083.4181**	**81.5375**	**5398.332392**	77324.15	45.13	1713.364724

TABLE 19: TOTAL PRODUCTION OF PERMANENT CROPS BY CROP AND GOVERNORATE

North Lebanon and Nebatyeh have the highest production of olives with 1540 Kg/ha and 1232 Kg/ha, respectively, Table 19.While, the governorates with the highest average production of pome and stone fruits are North Lebanon with 5233 Kg/ha and Bekaa with 4139 Kg/ha,Table 19.

Considering each crop and governorate, we register a high percentage of production allocated to the market with more than half of the production traded, especially in the case of permanent cultures, Figure 16. Concerning seasonal cultures, governorate as Akka and Bekaa seem to produce pulses (Bekaa and Akkar) and cereals (Akkar) more for consumption than for selling them to the market.



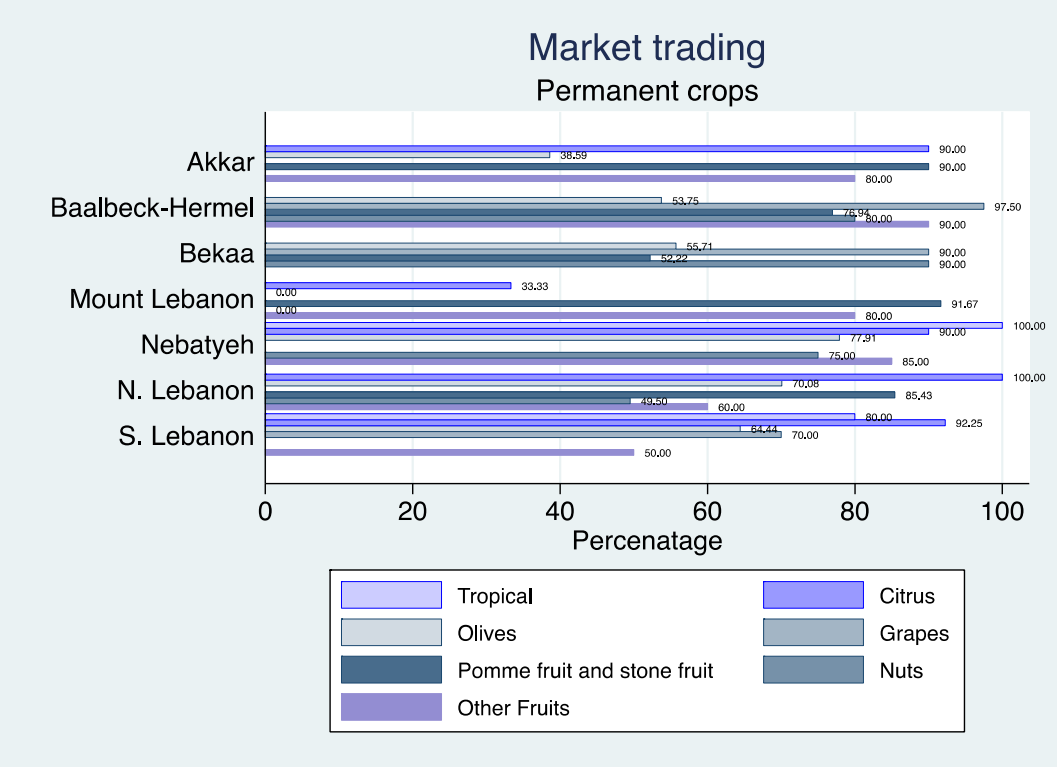


FIGURE 14: PERCENTAGE OF SEASONAL AND PERMANENT CROPS TRADED BY CROP AND GOVERNORATE

3.2.6 Livestock activities

Around 112 female holders (27% of total sample) declared to run livestock raising activities; 33 of those female holders are at the head of an holding focusing exclusively on livestock raising.
In all the governorates cattle rising is mentioned as the most important livestock activity, except in Mount Lebanon in which 33% of the sample deal with traditional poultry rising, Figure 17 . In some governorates, as South Lebanon, there are other livestock rising activities considered as much important as cattle raising, for example traditional poultry raising in South Lebanon, or sheep raising in Bekaa.

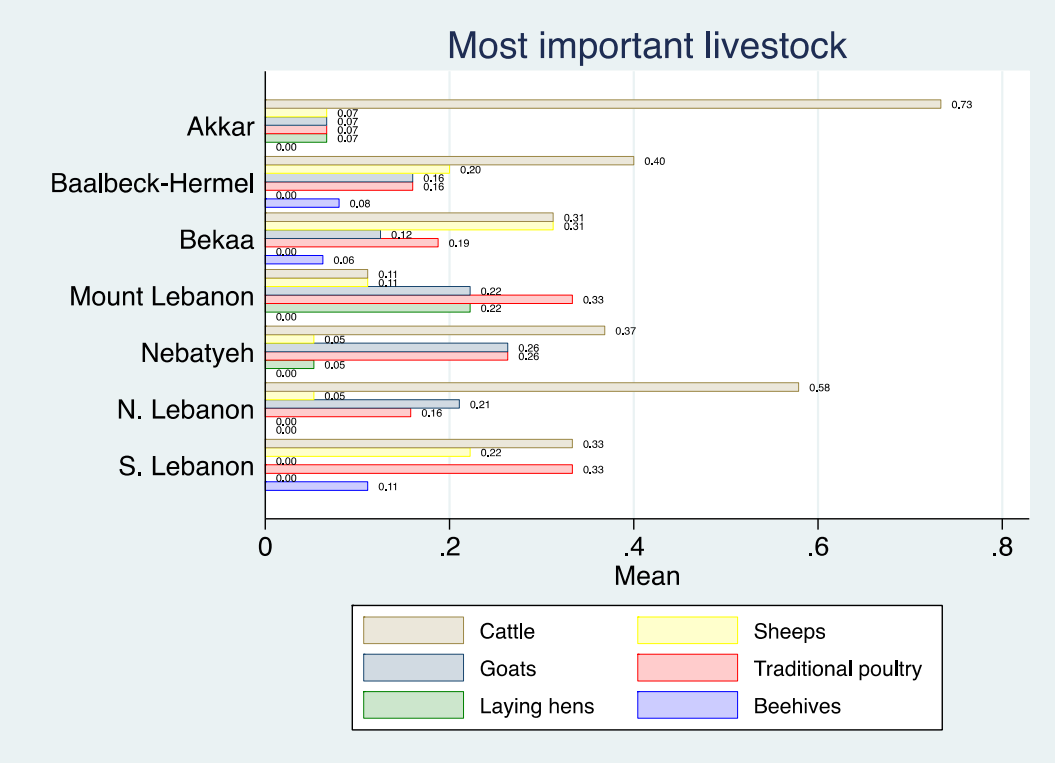


FIGURE 15:MOST IMPORTANT LIVESTOCK ACTIVITIES

In September 2020, the number of cattle owned was around 4.5 on average in the full sample. Bekaa, Nebatyeh and South Lebanon show the highest numbers with 6.80, 6.29 and 5.67 cattle owned on average, Figure 18 . Governorates with highest number of traditional poultries are Bekaa and North Lebanon with an average of 66 and 37 traditional poultries owned. Bekaa and Mount Lebanon register the highest average number of sheep with an average of 200 and 193 sheep owned, respectively.

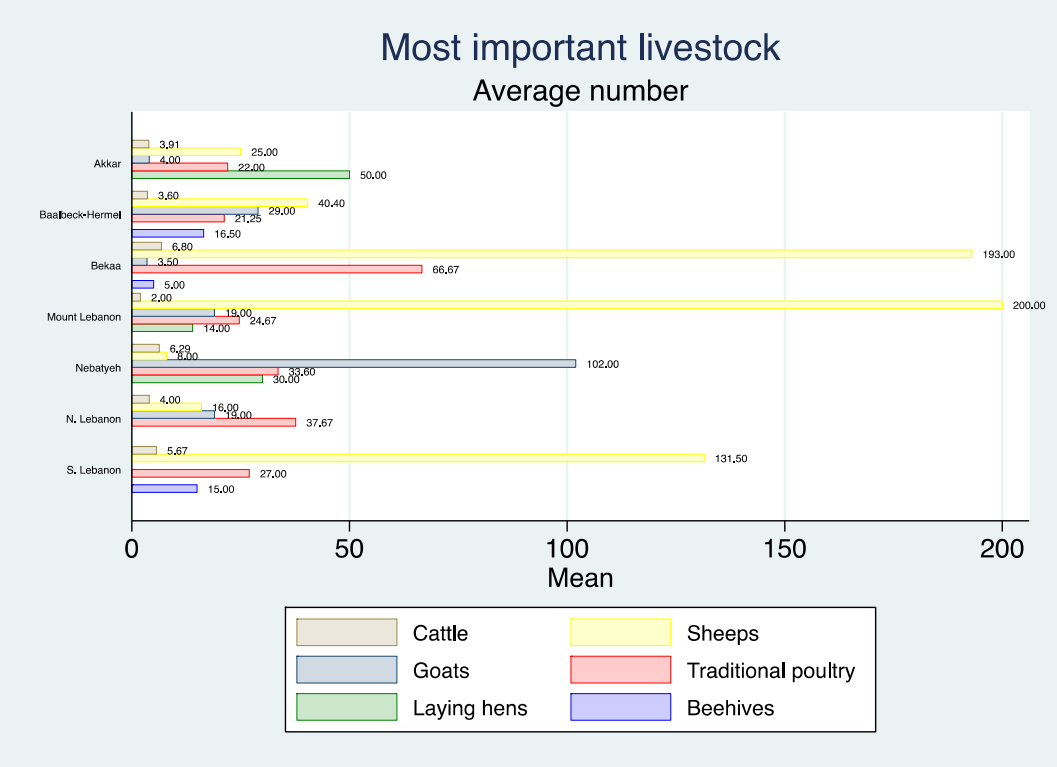


FIGURE 16: MOST IMPORTANT LIVESTOCK TYPE

Livestock by product

Milk from cattle and eggs are mentioned as the most important livestock by product by 43% (48 observation) and 23% of the sample (24 observations), respectively.

In particular, milk from cattle is considered the principal livestock by product by the majority of female holders in Akkar (73%) and North Lebanon (58%), and by a good part of the sample in Baalbeck-Hermel (39%), Nebatieh (37%) and South Lebanon (33%), Figure 18. Eggs production is considered the main livestock by product by 50% of the sample in Mount Lebanon , by 33% in South Lebanon and 31% in Nebatyeh, Figure 18.

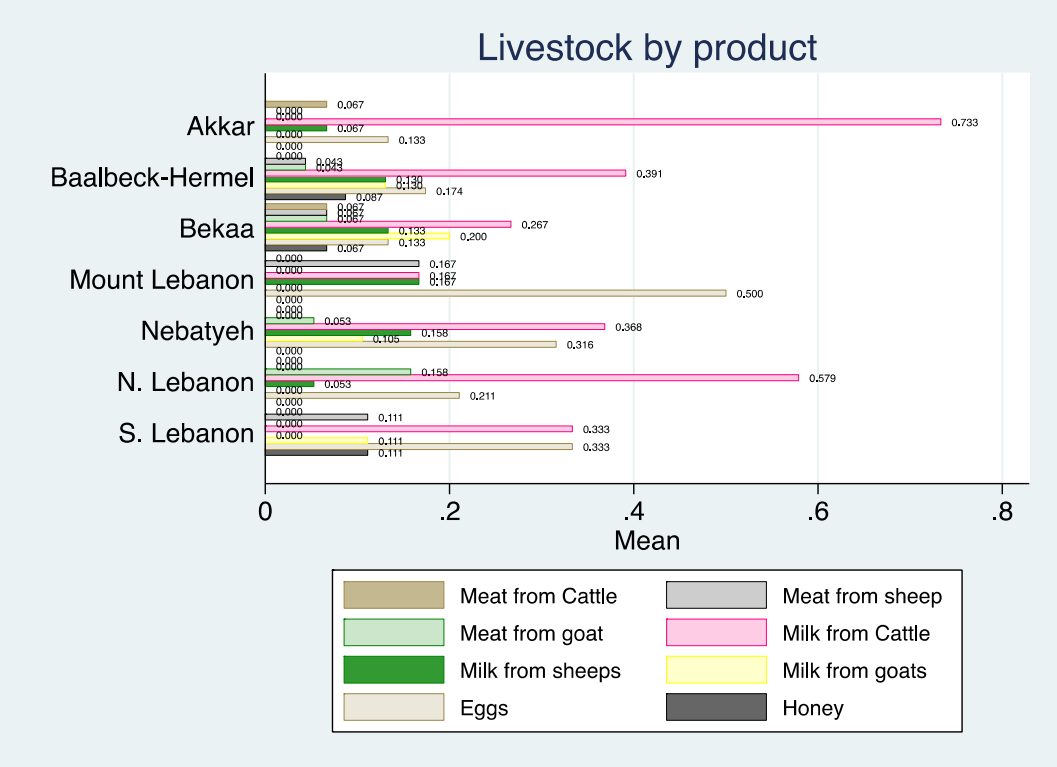


FIGURE 17: MOST IMPORTANT LIVESTOCK BY PRODUCT

The average liters of milk produced per cattle are around 2258 liters,Table 20. Baalbeck-Hermel is the governorate that produced more liters per animal (2506 liters per animal), however there are not significant difference between governorates, except for South Lebanon in which the number of liters is lower in a significant way with respect to all the other governorates with 1341 liters per animal. In all governorate more than half of the liters produced is commercialized.

	Milk from Cattle					
Governorate	**Total animals**	**Total liters produced**	**Avg. liters produced (Total liters/N)**	**Average liters per animal**	**% Sold or traded**	**Observations (N)**
Akkar	41	92200	9220	2248	78.5%	10
Baalbeck-Hermel	21	52640	5848	2506	90.5%	9
Bekaa	32	78000	19500	2437	87.5%	4

Mount Lebanon	0	0	0	0	0%	0
Nebatyeh	44	104000	14857	2363	92%	7
N. Lebanon	44	99720	9065	2266	83%	11
S.Lebanon	17	22800	7600	1341	91%	3
Total	**199**	**449360**	**10212**	**2258**	**86%**	**44**

TABLE 20: CATTLE AVERAGE MILK PRODUCTION BY GOVERNORATE

Mount Lebanon and Nebatyeh are the governorates that produced more eggs per animal, Table 21. Information about eggs suffered of a lot of variability between observations and there have been six some observations dropped due to extreme values of production. That's why we did not report the statistics for Bekaa.

	Eggs					
Governorate	**Total animals**	**Total eggs produced**	**Average eggs produced (Total eggs/N)**	**Average eggs per animal**	**% Sold or traded**	**Observations (N)**
Akkar	72	7920	3960	110	NA	2
Baalbeck-Hermel	85	4810	1202	57	NA	4
Mount Lebanon	52	9000	3000	173	NA	3
Nebatyeh	103	9940	10056	96	NA	4
N. Lebanon	105	10800	2700	102	NA	2
S.Lebanon	81	6000	2000	74	NA	3
Total	**723**	**102.670**	**4277**	**142**	**NA**	**24**

TABLE 21: EGGS AVERAGE PRODUCTION BY GOVERNORATE

3.2.7 Farm labor

We investigate farm labor considering short term, long term and family workers performing agricultural and livestock activities. Since only 5% of female holders reported the presence of long term workers, we limit data analysis to short term and family work.

Short term work

We are in presence of short term work if the worker was involved in farming activities for less than six months. In governorates as Baalbeck –Hermel, Mount Lebanon and N.Lebanon, more than the majority of female holders interviewed used short term workers, Table 22.

	Short term workers							
Governorate	**Use**	**Avg. number workers**	**% male workers**	**% female workers**	**Avg. number working days**		**Daily payment LBP**	
					Male	**Female**	**Male**	**Female**
Akkar	36%	6.3	47%	53%	17.4	12.55	23600	20050
Baalbeck-Hermel	66%	10.5	56%	44%	61.6	63.8	38763	25310
Bekaa	36%	10	54%	46%	53.0	62.2	25583	17001
Mount Lebanon	60%	4.2	97%	3%	20.3	20	62000	27500
Nebatyeh	48%	4	67%	33%	14.1	17.6	33000	25173
N.Lebanon	60%	4.6	90%	10%	25.0	40.5	30922	26111
S.Lebanon	51%	5.7	59%	41%	44.6	33.0	30000	25055
Total sample	**51%**	**6.3**	**68%**	**32%**	**33**	**37**	**34958**	**23589**

TABLE 22:SHORT TERM WORKERS

Around six short term workers have been employed in the farm, on average. The majority of these workers are male (68%), except in Akkar in which the majority of short term workers is represented by female (53%), Table 22. The most intensive use of short term workers is registered in Baalbek –Hermale and Akkar with an average about 61 and 53 days of work for male, and 63 and 62 days for female, respectively. Although we are in presence of female holders, the daily payment (i.e. payment for a day of work) is lower for female than for male workers. The average payment amount reported for a male worker is 18 euro (34958LBP) and 13 euro for female workers(26538 LBP), showing a significant difference at 0.001 level, Table 22.

Disaggregating the daily wage information at governorate level, we register the higher discrepancies in terms of daily wage in Mount Lebanon, Baalbeck-Hermel and North Lebanon, Figure 20.

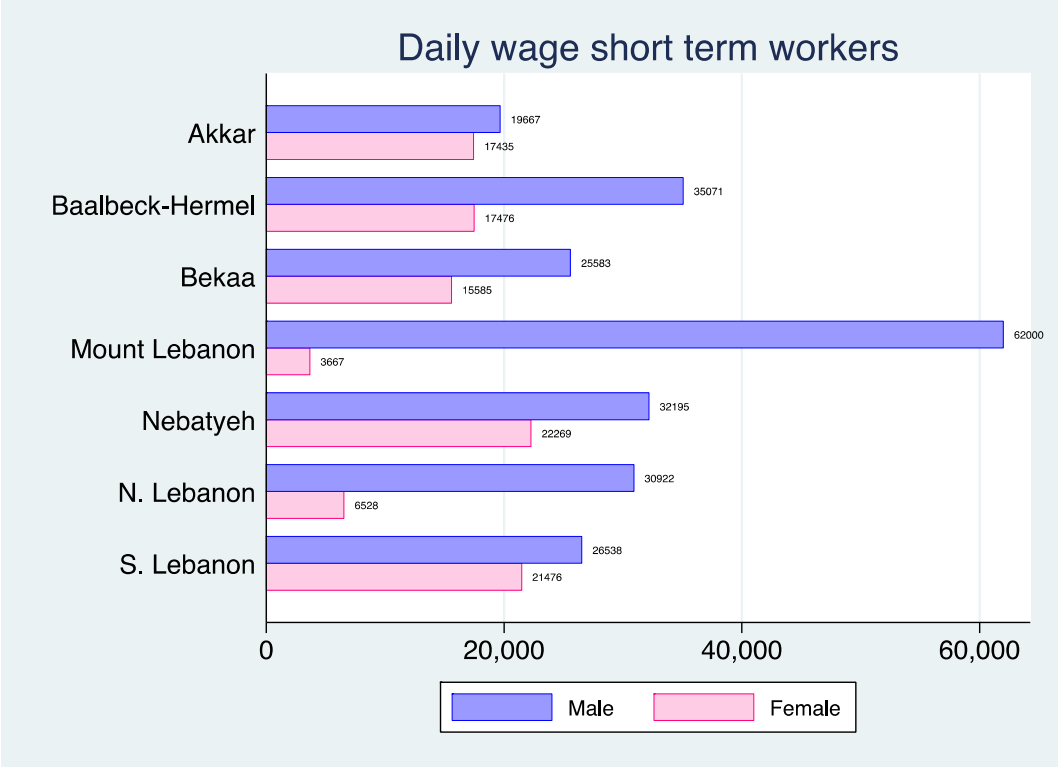


FIGURE 18: DAILY WAGE FOR SHORT TERM WORKERS: MALE AND FEMALE

Family work

About 53% of the sample declared to have used unpaid family work, Table 23. In all governorates around half or slightly more than half of the sample have been advantaged by the help of the family, except South Lebanon in which only 35% of the sample have used unpaid work from family members. On average, two family members have been involved in farming activities and male have been involved for more number of days than female with a significant difference at 0.001 level.

	Family work					
	Use	**Avg. family workers**	**%male workers**	**%female workers**	**Avg number working days**	
					Male	**Female**
Akkar	56%	2.5	61%	39%	55.8	82.4

Baalbeck-Hermel	59%	1.8	46%	54%	142.2	126.1
Bekaa	57%	2.5	65%	35%	76.3	53.6
Mount Lebanon	54%	1.7	39%	61%	148.2	61.7
Nebatyeh	55%	1.7	60%	40%	64.9	46.2
N.Lebanon	49%	1.7	89%	11%	79.1	119.6
S.Lebanon	35%	1.4	95%	5%	41.0	38.9
Total sample	**53%**	**1.9**	**61%**	**39%**	**83**	**75**

TABLE 23:FAMILY WORK

3.2.8 Food insecurity

The survey contains basic survey questions on household food consumption that do not provide a detailed description of 'food security'. To have a detailed understanding of food security, a more intensive set of questions would need to have been included in the survey. However, due to the wide scope of the research and length of the survey, we chose to take a different approach able to give some insights on the state of food security in the research area.
Accordingly to FAO (2019) "The State of Food Security and Nutrition in the World", we consider food secure people with adequate access to food both in quality and quantity; moderate food insecure people facing some uncertainties about food; and strongly food insecure people running out of food and experiencing a day or days without eating. We measure adequate food provision, asking respondents whether they faced food shortage in the past 12 months "During the last year, did any member of the household eat fewer meals, or smaller portions than usual because there was not enough food?".

On average, around 91% of the sample declared that the household have been never food insecure, Figure 21. There is a small percentage, around 1%, that have been moderately food insecure (eating less than twice a month in a year), while around 8% seem to be more strongly food insecure (eating less for one or few weeks in the year). North and South Lebanon show the highest percentage of strongly food insecure households. In case of food insecurity, 97% of the female holders declared that they reduce food to themselves.
Accordingly to MoA, the number of food insecure in the sample is largely comparable with the number of food insecure at the national level which was also estimated at around 10 percent before the deterioration of the situation in the last few months of 2021.

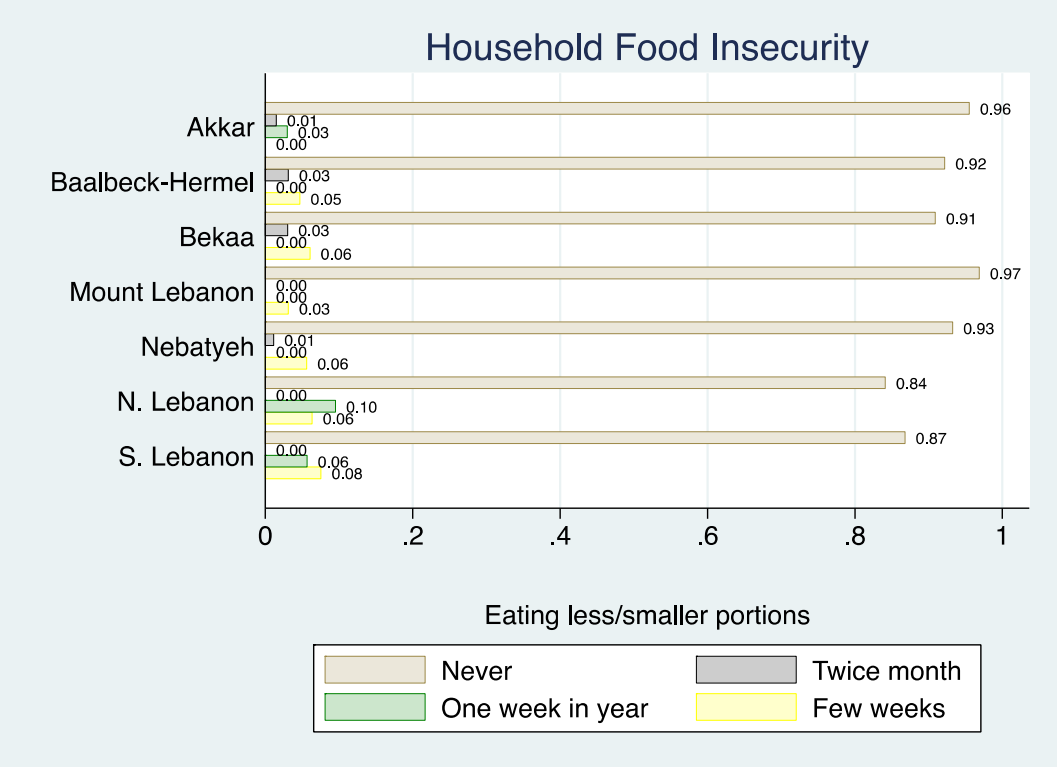


FIGURE 19: FOOD INSECURE HOUSEHOLDS BY GOVERNORATE

3.2.9 Access to information

Access to information seems to be an issue for more than half of the sample (58%),Figure 22. The main information topics concern agricultural (18%), health (20%) and weather information (19%). Agricultural information is well accessed in Akkar (31%) and Mount Lebanon (41%), The access to market information is low in all governorates with only 6% of female holders benefitting from market information. Governorates as Baalbek-Hermel, North Lebanon and Bekaa seem to suffer more than others in accessing all kind of information, Figure 22.

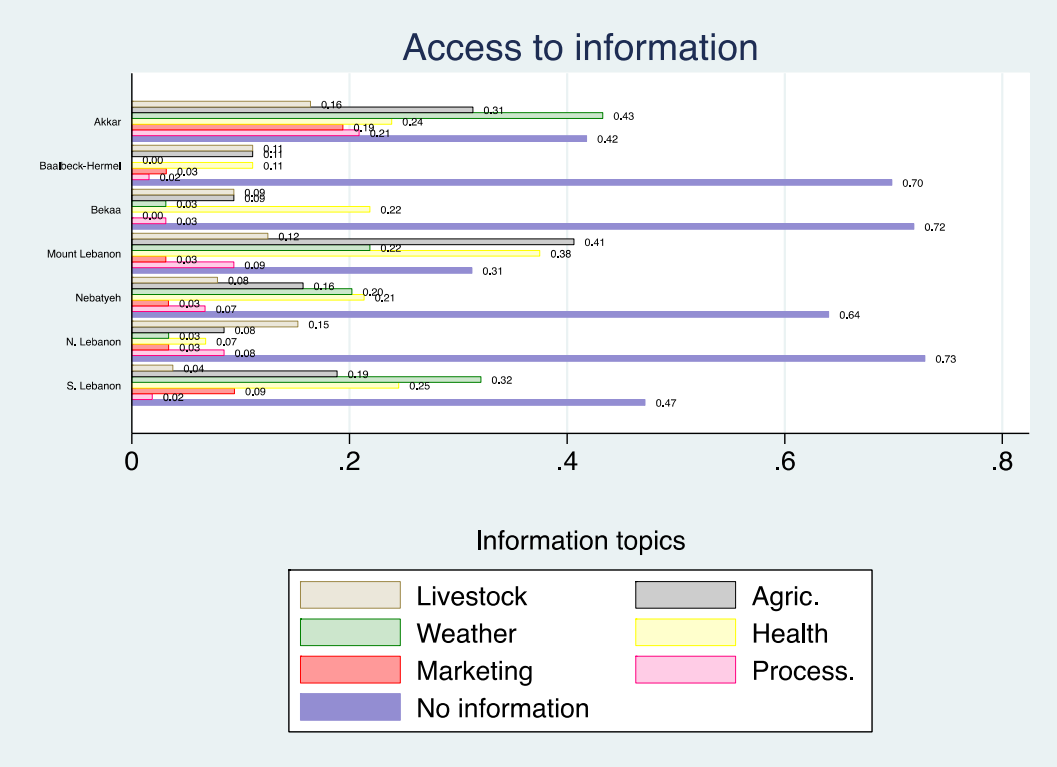


FIGURE 20: ACCESS TO INFORMATION BY GOVERNORATE

We analyze the sources of information for the main information topics (agriculture, health and weather), Table 24. Interestingly friends are the main source of information for health and agriculture, family for weather information, while the government takes an important a role in health information together with friends.

	Agriculture	**Health**	**Weather**
Government	21%	**46%**	33%
Company	15%	11%	14%
NGO	13%	30%	9%
Farmer promoter	12	1	1
Cooperative	8%	0%	1%
Family	38%	34%	**63%**
Friends	**49%**	**47%**	**62%**

TABLE 24: SOURCES OF INFORMATION FOR MAIN INFORMATION TOPICS

3.2.10 PRO-WEAI INDEX

In this report, we adapted the project-level WEAI (or pro-WEAI) to the Lebanese context in order to identify key areas of women's disempowerment, design appropriate strategies to address identified deficiencies, and monitor project outcomes related to women's empowerment. The classic 12 PRO-WEAI indicators are presented in Table 25.

Indicator [A]	Definition of adequacy	Difference compared to original WEAI
Intrinsic Agency		
Autonomy in income	More motivated by own values than by coercion or fear of others' disapproval: *Relative Autonomy Index* [B] score>=1 RAI score is calculated by summing responses to the three vignettes about a person's motivation for how they use income generated from agricultural and non-agricultural activities (yes = 1; no = 0), using the following weighting scheme: 0 for vignette 1 (no alternative), −2 for vignette 2 (external motivation), −1 for vignette 3 (introjected motivation), and +3 for vignette 4 (autonomous motivation)	Based on "Autonomy in production" indicator in the WEAI but now focuses exclusively on the use of income generated from agricultural and non-agricultural activities and uses a new vignette-based survey instrument.
Self-efficacy	"Agree" or greater on average with self-efficacy questions: *New General Self-Efficacy Scale* [C] score>=32	Not included in the WEAI
Attitudes about intimate partner violence against women	Believes husband is NOT justified in hitting or beating his wife in all 5 scenarios: [D] 1) She goes out without telling him 2) She neglects the children 3) She argues with him 4) She refuses to have sex with him 5) She burns the food	Not included in the WEAI
Respect among household members	Meets ALL of the following conditions related to their spouse, the other respondent, or another household member: 1) Respondent respects relation (MOST of the time) AND 2) Relation respects respondent (MOST of the time) AND 3) Respondent trusts relation (MOST of the time) AND 4) Respondent is comfortable disagreeing with relation (MOST of the time)	Not included in the WEAI
Instrumental Agency		
Input in productive decisions	Meets at least ONE of the following conditions for ALL of the agricultural activities they participate in 1) Makes related decision solely, 2) Makes the decision jointly and has at least some input into the decisions 3) Feels could make decision if wanted to (to at least a MEDIUM extent)	Included in the WEAI, but now uses a stricter adequacy cut-off
Ownership of land and other assets	Owns, either solely or jointly, at least ONE of the following: 1) At least THREE small assets (poultry, nonmechanized equipment, or small consumer durables) 2) At least TWO large assets 3) Land	Included in the WEAI, but now uses a stricter adequacy cut-off
Access to and decisions on financial services	Meets at least ONE of the following conditions: 1) Belongs to a household that used a source of credit in the past year AND participated in at least ONE sole or joint decision about it 2) Belongs to a household that did not use credit in the past year but could have if wanted to from at least ONE source 3) Has access, solely or jointly, to a financial account	Based on "Access to and decisions on credit" indicator in the WEAI, but now includes access to financial accounts
Control over use of income	Has input in decisions related to how to use BOTH income and output from ALL of the agricultural activities they participate in AND has input in decisions related to income from ALL non-agricultural activities they participate in, unless no decision was made	Included in the WEAI, but now uses a stricter adequacy cut-off
Work balance	Works less than 10.5 h per day: Workload = time spent in primary activity + (1/2) time spent in childcare as a secondary activity	Similar to 'Workload" indicator in the WEAI but restricts the measurement of secondary activities to a single activity: childcare.
Visiting important locations	Meets at least ONE of the following conditions: 1) Visits at least TWO locations at least ONCE PER WEEK of [city, market, family/relative], or 2) Visits least ONE location at least ONCE PER MONTH of [health facility, public meeting]	Not included in the WEAI
Collective Agency		
Group membership	Active member of at least ONE group	Same as in the WEAI
Membership in influential groups	Active member of at least ONE group that can influence the community to at least a MEDIUM extent	Not included in the WEAI

Source: H. Malapit et al. / World Development 122 (2019) 675–692 [10]

TABLE 25: PRO-WEAI INDICATORS

We used a reduced version of the classic 12 pro-WEAI adopting only 8 of them. The decisions to limit the analysis to a reduced set of indicators was due to some sensitive indicators that were not compatible within the context, as attitudes about violence, and the presence of budget constraints link to the nature of pilot survey. The indicators removed belong to the sphere of the intrinsic agency and they are: respect among household members; attitudes about violence; self-efficacy; autonomy in income. The other two spheres of empowerment, instrumental agency (power to), and collective agency (power with) are covered by the survey.

We did not compute a Gender Parity Index (GPI) that compares the empowerment scores of men and women in the same household, since we only interviewed female holders. The lack of GPI allows to only compute the Disempowerment Score that is a part of the PRO-WEAI index.[11] In the following we explore all the indicators adopted for the construction of the Disempowerment Score.

Intra-household decision making

The survey allows to capture three main spheres of intra-household decision making as in PRO-WEAI (2018): income, household expenses and economic/productive decisions.[12] We consider individuals having power to participate in the final decisions if they participate in most or all the decisions about that activity. We then compute the % of activities in which individuals are involved and they have decision making power about. We investigate the decisions making power in the three spheres: income, household expenses and economic/productive decisions.

a) Input in productive decisions

Differently from PRO-WEAI, in order to build the indicator "Input in economic/productive decisions" we do not investigate whether the individual made the decision jointly or solely, and if he/she feels could make decision if wanted to (to at least a medium extent). But we only consider whether he/she made the decision and in how many activities. If follows that the "input in economic/productive decisions" indicator is equal to 1 when the individual participated in

[10] Development of the project-level Women's Empowerment in Agriculture Index (pro-WEAI)

[11] Pro-WEAI, similar to the original WEAI, is calculated as the weighted mean of two sub-indices:The Three Domains of Empowerment Index (3DE) (90% weight) ; Gender Parity Index (10% weight)

[12] Differently form the PRO-WEAI (2018) we do not distinguish between productive and economic decisions since our sample is quite diversified and it does not only focus on farming (fish, livestock and agriculture) activities. Further, we keep the distinction between having decision making power and consultation power and analyze whether there is a difference between the two spheres of power, Table 1.

more than half of the decisions about the activities in which he/she took part. On average we find a high percentage of activities (71%) in which female holders participate and take decisions. Nebatyeh is the governorate with the highest percentage, 94% (highest in a significant way with respect to all the other governorates), while North Lebanon shows the lowest percentage, 66% (lowest in a significant way with respect to all the other governorates), Figure 23.

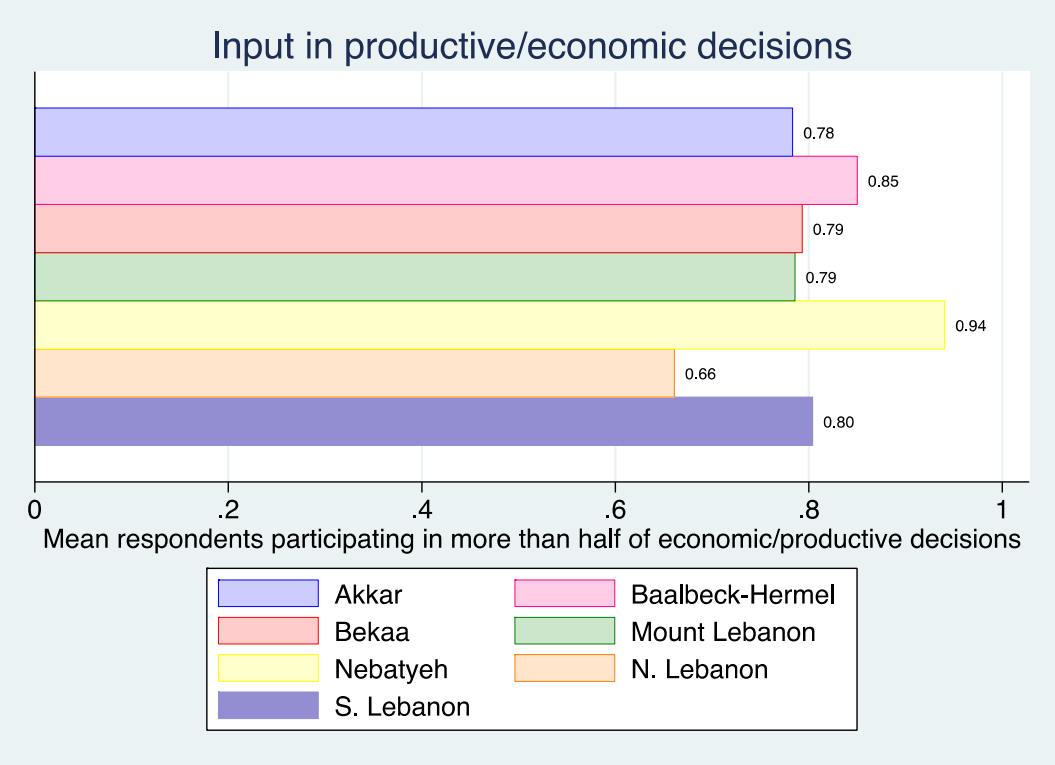


FIGURE 21:INPUT IN PRODUCTIVE/ECONOMIC DECISIONS

b) Control over use of income and household expenses

Considering the decisions about income use and household expenses, we build the same indicators as for input in economic/productive decisions. We observe a significant difference between Baalbeck and Mount Lebanon with respect to all the other governorates , with Baalbeck –Hermel having the highest women control over expenses, and Mount Lebanon showing the lowest input power in expenses decisions,Figure 24.

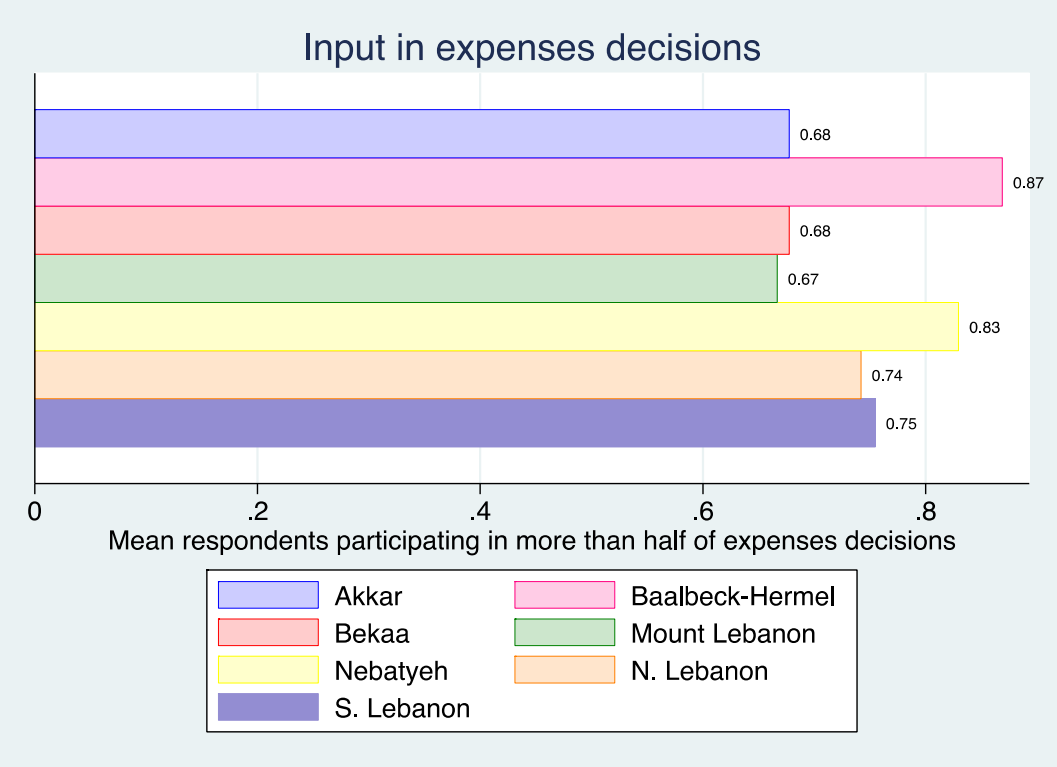


FIGURE 22: INPUT IN EXPENSES DECISIONS

Concerning the control over the use of income South Lebanon shows the highest percentages and Bekaa the lowest, Figure 25 . The differences are statistically significant.

In conclusion, we observe that some governorates are performing better than others in terms of intra-household decision making, with Netabtyeh, Baalbeck and South Lebanon distinguishing themselves in terms of better control over production decisions, expenses and income respectively.

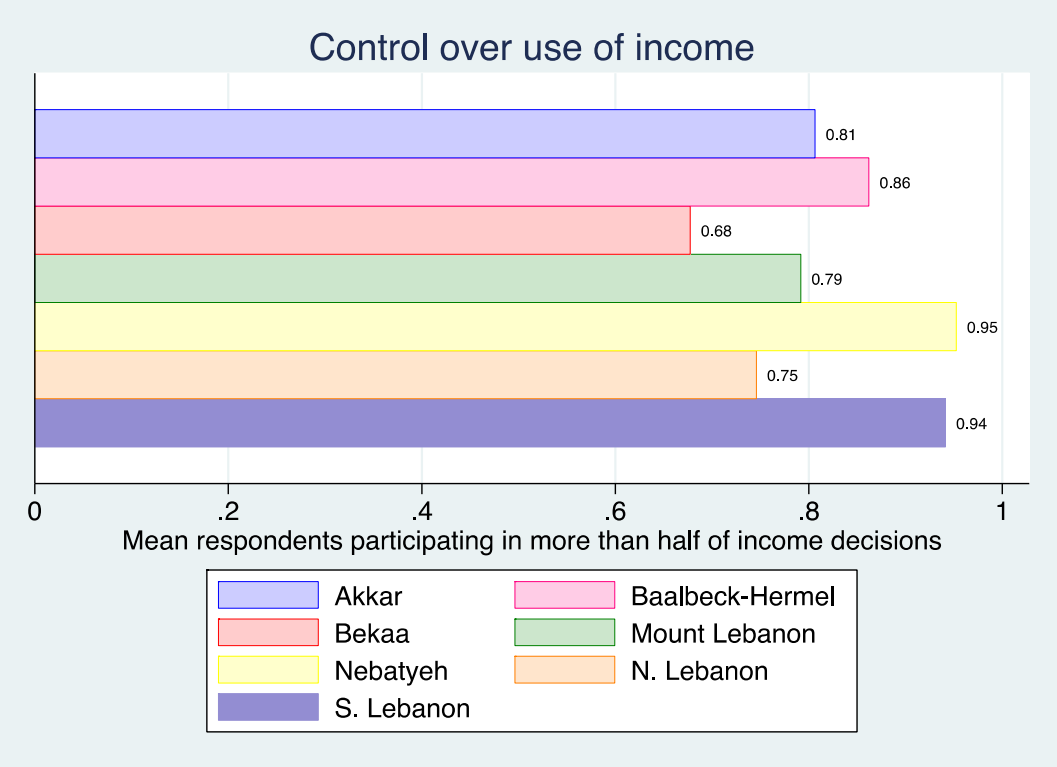
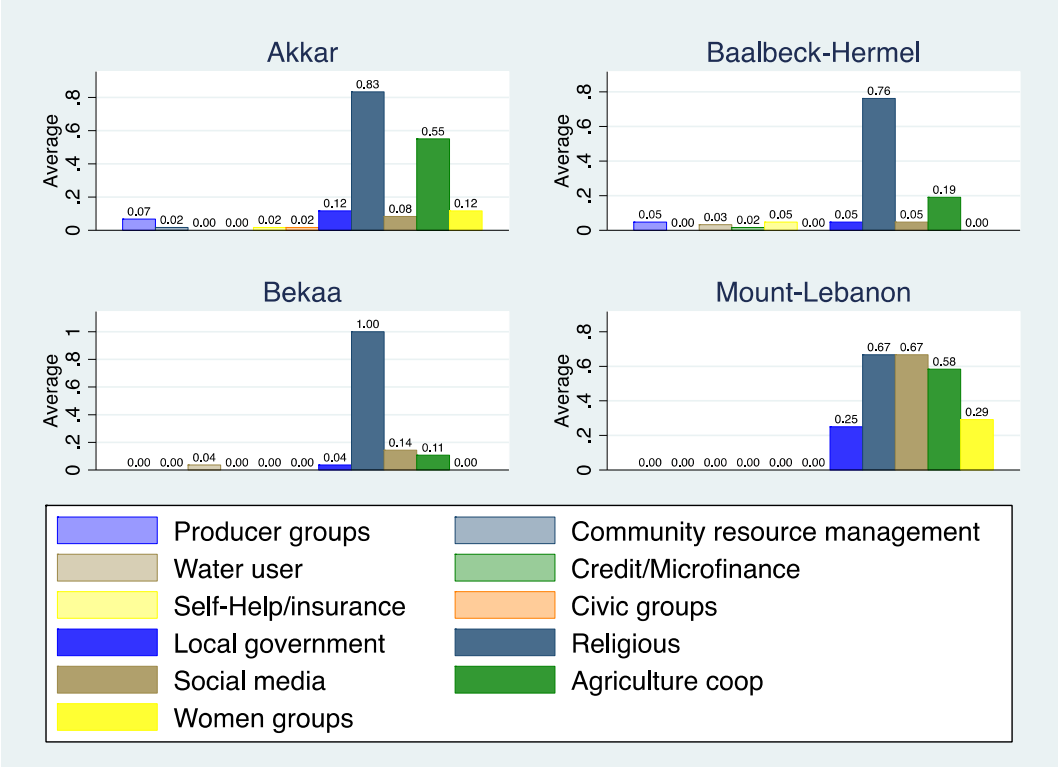


FIGURE 23:CONTROL OVER THE USE OF INCOME

Group membership

Religious, social media and agricultural groups are the most mentioned groups in all governorates. Moreover, Nebatyeh registers the presence of micro-finance groups, mentioned by 20% of people interviewed, while 29% of female holders interviewed in Mount Lebanon mentioned other women groups.



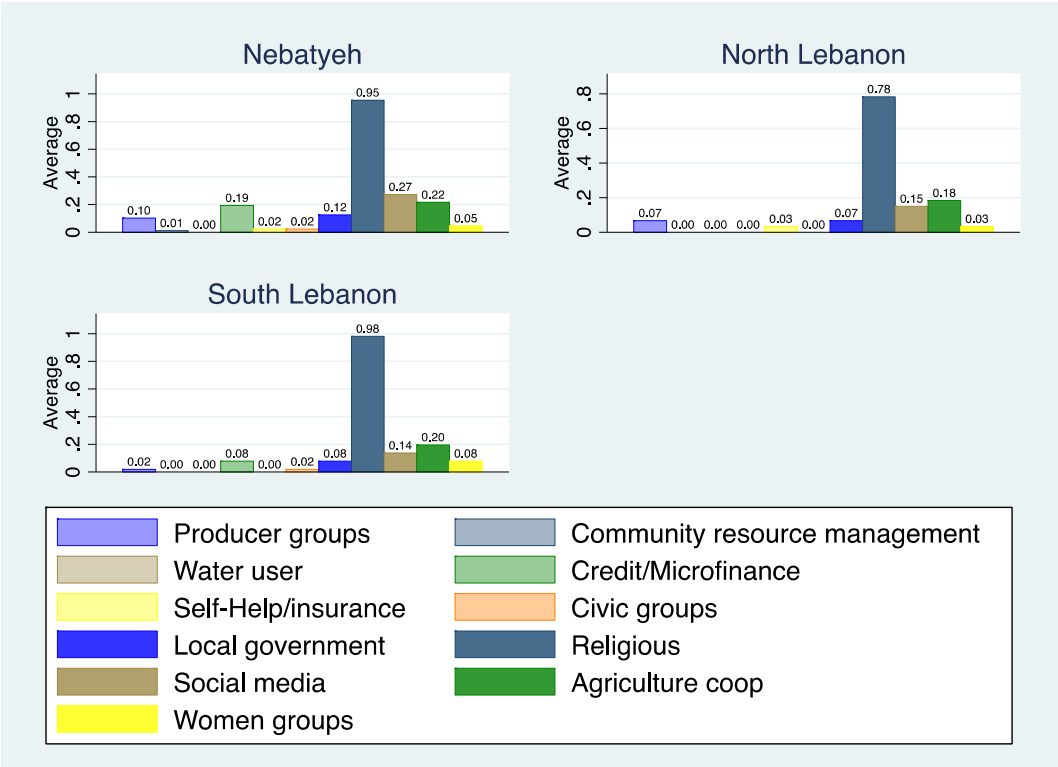


FIGURE 24:GROUPS IN THE COMMUNITY

Between the different groups we investigated whether female holders are active members. Differently from the PRO-WEAI we did not ask whether the individual is an active group member, but we asked about the frequency of meeting attendance to determine whether she is an active member. We consider a female holder as an active member if she always attends meetings. If she is an active member of at least one group, we consider her as an active group member. Disaggregating the information between the different governorates it emerges a low active group participation in all governorates, Figure 27. Moreover, in all governorates, the groups in which female holders participate do not results influential for life in the community, Figure 28.

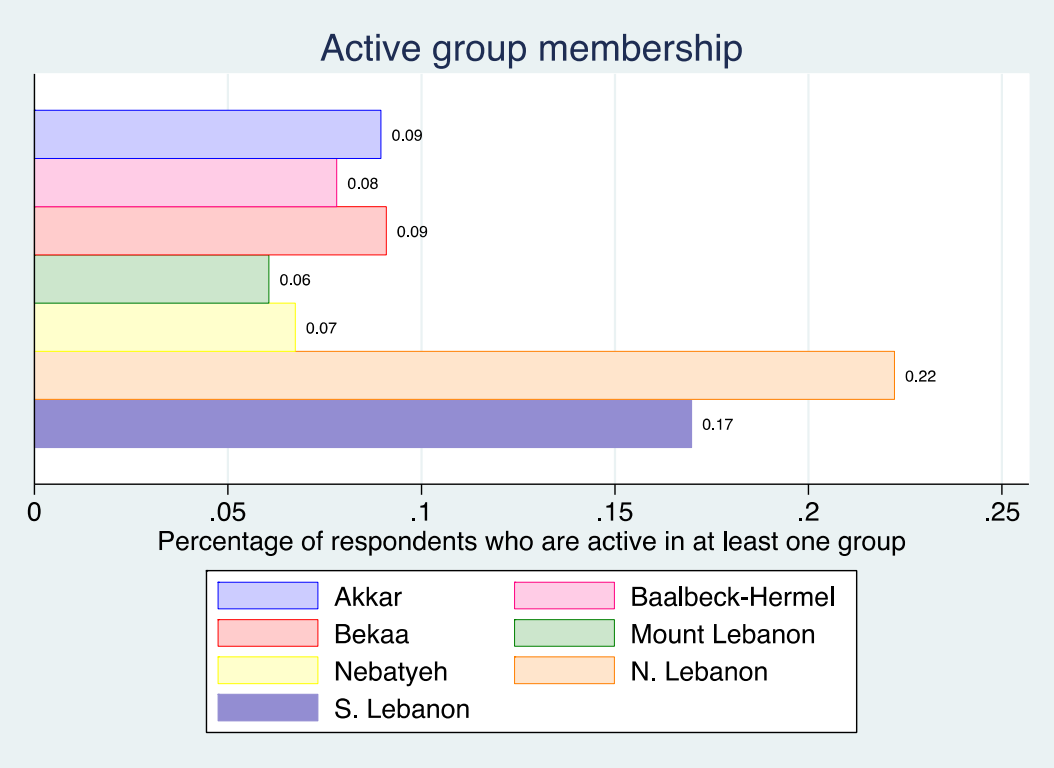


FIGURE 25: ACTIVE GROUP MEMBERSHIP

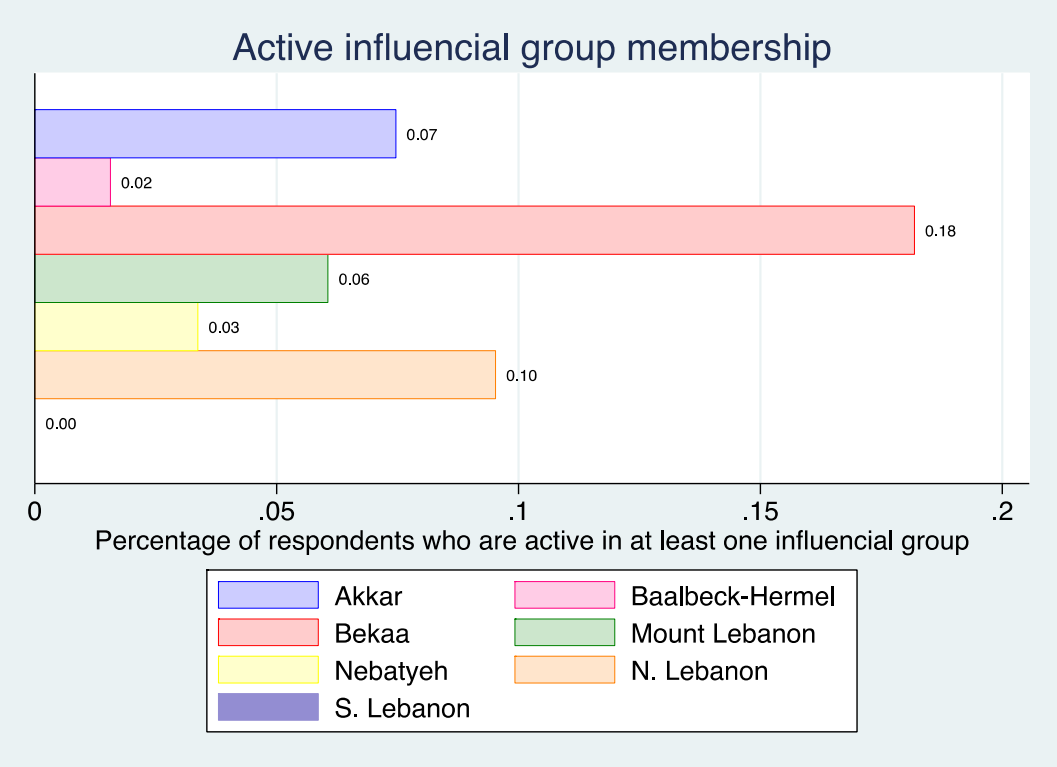


FIGURE 26:ACTIVE GROUP MEMBERSHIP IN GROUPS INFLUENCIAL IN COMMUNITY LIFE

Access to productive capital (assets)

In line with PRO-WEAI (2018) we investigate large and small assets' ownership. We did not consider individual land ownership since MoA staff suggested to measure agricultural land ownership at household level and not at individual level.We include house, large consumer durables (Fridge, TV, etc.) and means of personal and work transport in the category of large assets, while we consider farm and non farm equipment, small durables (radio, cookware), means of communication as small assets. In line with PRO-WEAI we build the indicator of asset ownership equal to 1 if the individual owns at least one large asset or at least two small assets. This is the same to say: empowered if owns AT LEAST one asset and that asset is not a small asset. The analysis shows a high percentage of asset ownership, on average around 71% with significant difference between governorates. In particular, there is a clear inequality in North Lebanon with only 56% of female holders having the ownership of one large asset or two small ones.

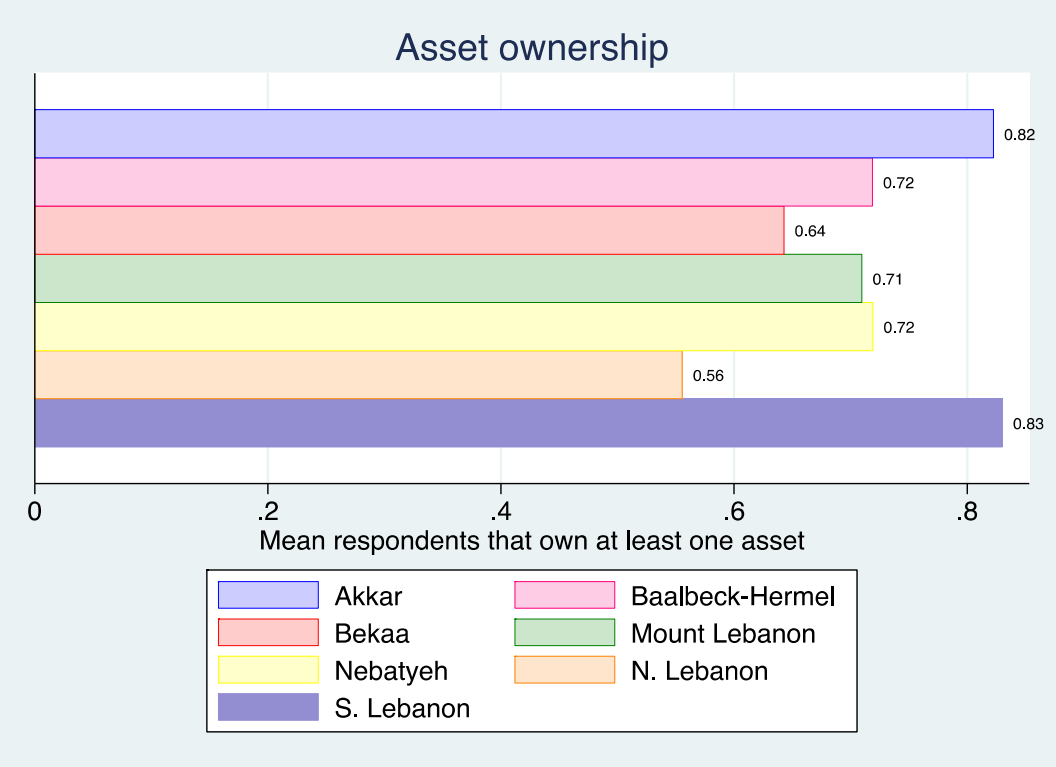


FIGURE 27:ASSET OWNERSHIP

Access to credit

Access to credit allows farmers invest in their farms. However, we know from previous studies that credit is not always used to make on-farm investments. For example, credit can be used by farmers to support their households during the off-season when there is less money available or used to pay for education, health expenditures and family emergencies. Farmers often have difficulties accessing a loan from a bank because they are perceived to be unreliable borrowers.

In our study, in line with PRO-WEAI (2018) we first consider whether the household could borrow if wanted to from at least one credit source. Interestingly we observe big differences between governorates with Nebatyeh , South Lebanon and North Lebanon showing less than half of the respondents having access to a credit source if needed, Figure 30.

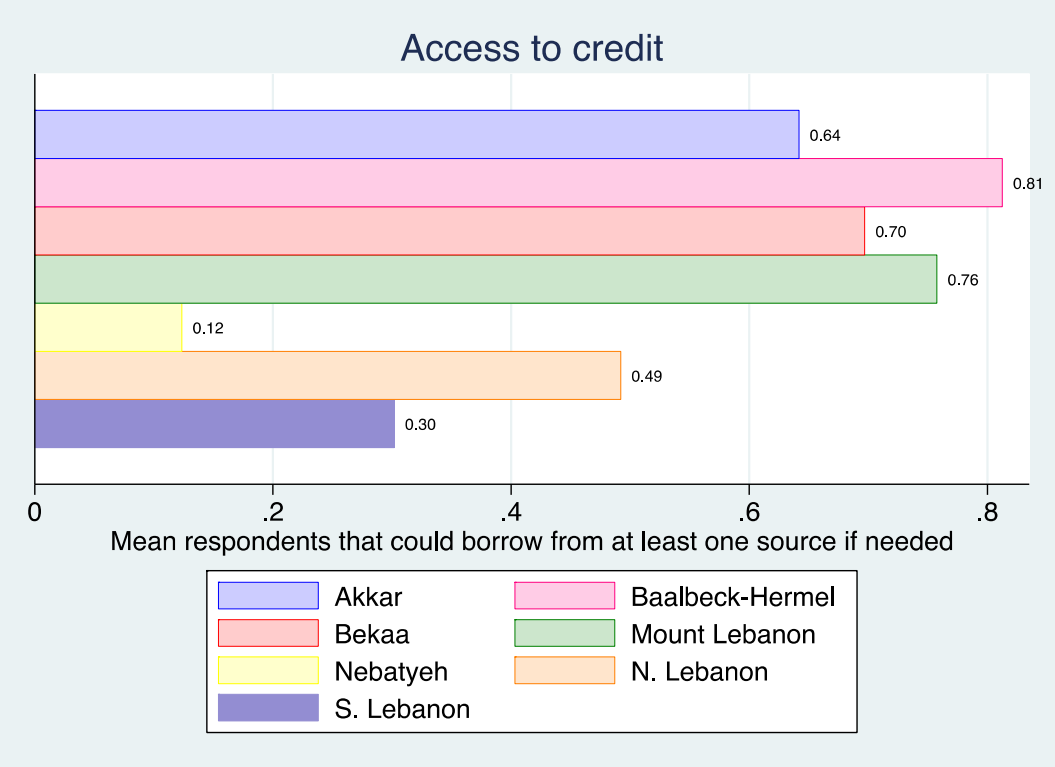


FIGURE 28: ACCESS TO CREDIT IF NEEDED

The most mentioned credit sources are formal lenders (24%) and friends or relatives (27%), but 48% of respondents replied that they do not know. It seems that they either did not want to answer to the question or they are not informed about credit lenders.

The second aspect investigated is whether the female holder (i.e. single individual) used a source of credit in the past year. In general, we found that less than than one quarter of respondents said they had done so, Figure 31. About 31% of them declared that they are afraid that they cannot pay back the money, while 41% said that it is for other reasons, without specifying.

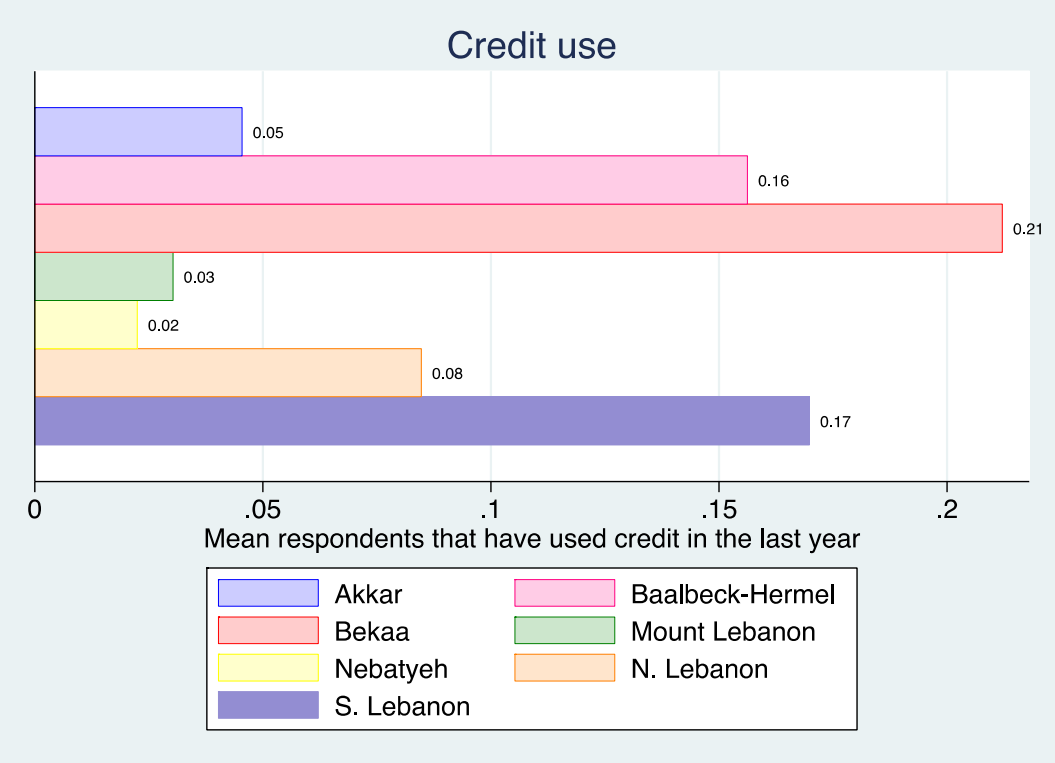


FIGURE 29: CREDIT USE IN THE LAST YEAR

We then combine this information with the information about decision making power on credit decisions ("Who makes decision to borrow most of the time from the different sources") finding a significant difference between governorates with Baalbeck-Hermel showing a significant higher involvement of female holders in credit decision making, Figure 32.

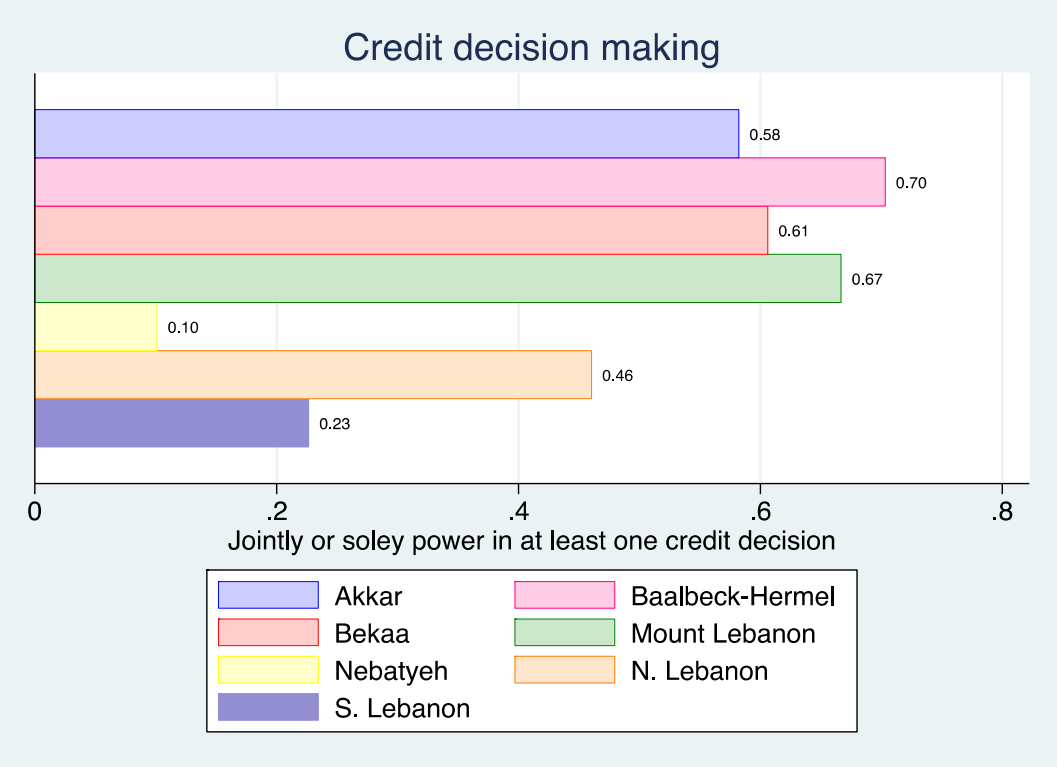


FIGURE 30: CREDIT DECISION MAKING

We then investigated whether female holders have access to a financial account. We found a low percentage of female holders having a bank account. Mount Lebanon detect the highest percentage of bank account holders with 52% of female holders having a bank account, Figure 33.

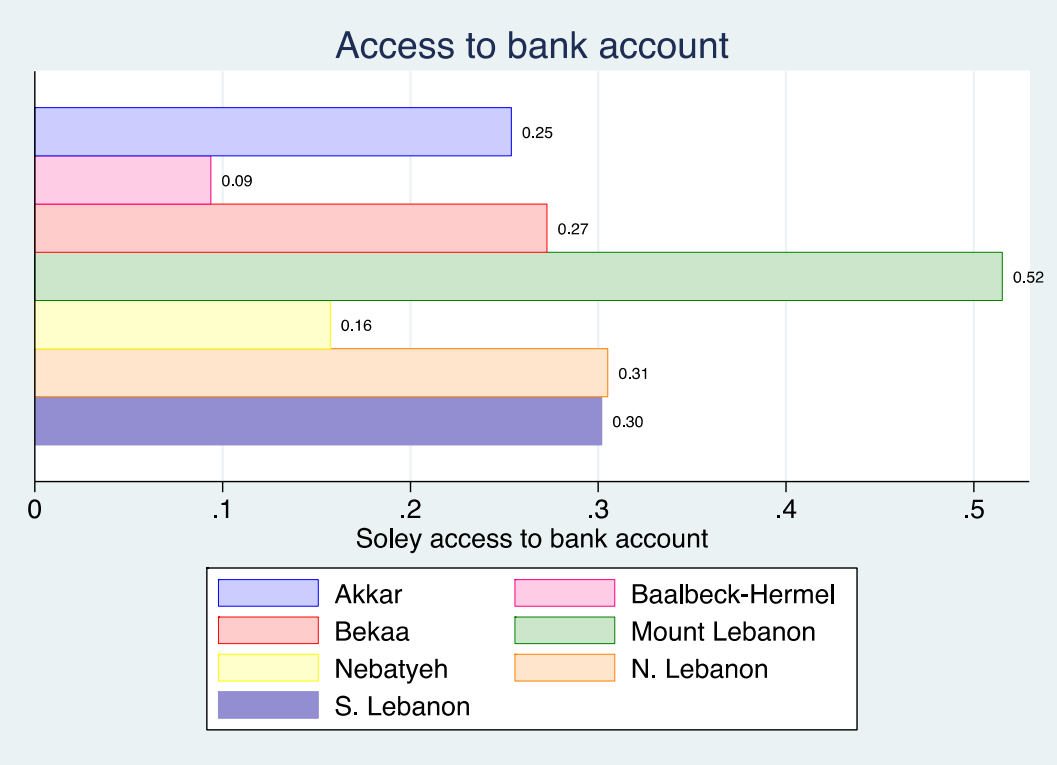


FIGURE 31: INDIVIDUAL ACCESS TO A BANK ACCOUNT

Finally following the PRO-WEAI, we build the indicator "Access and decision on credit" . This indicator is equal to one if individual meets at least ONE of the following conditions:

- She used a source of credit in the past year AND participated in at least ONE sole or joint decision about it
- Belongs to a household that did not use credit in the past year but could have if wanted to from at least ONE source
- Has access to a financial account

The indicator shows a low capacity of access to credit, with less than 50% of the sample having access to credit. We notice a significant difference between governorates with Nebatyeh and Baalbeck-Hermel registering the lowest percentages.

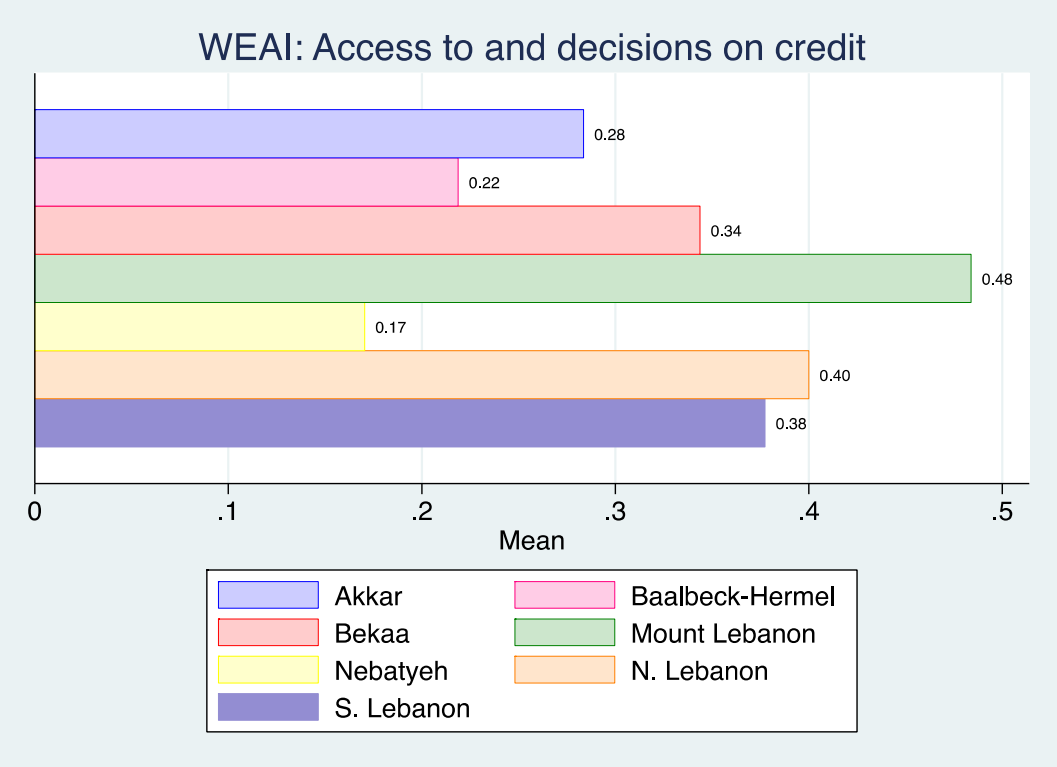


FIGURE 32: PRO-WEAI ACCESS TO CREDIT INDICATOR

Time allocation

On average, female holders dedicate three hours per day on working activities, Figure 35. The low amount of working hours is not surprising, if we consider that we are in front of very small holders supported by family work, with an average of two household members involved in the holding work. We also asked whether women took care of children while performing working activities, but this information has been considered as sensitive information and almost all women did not provide an answer.

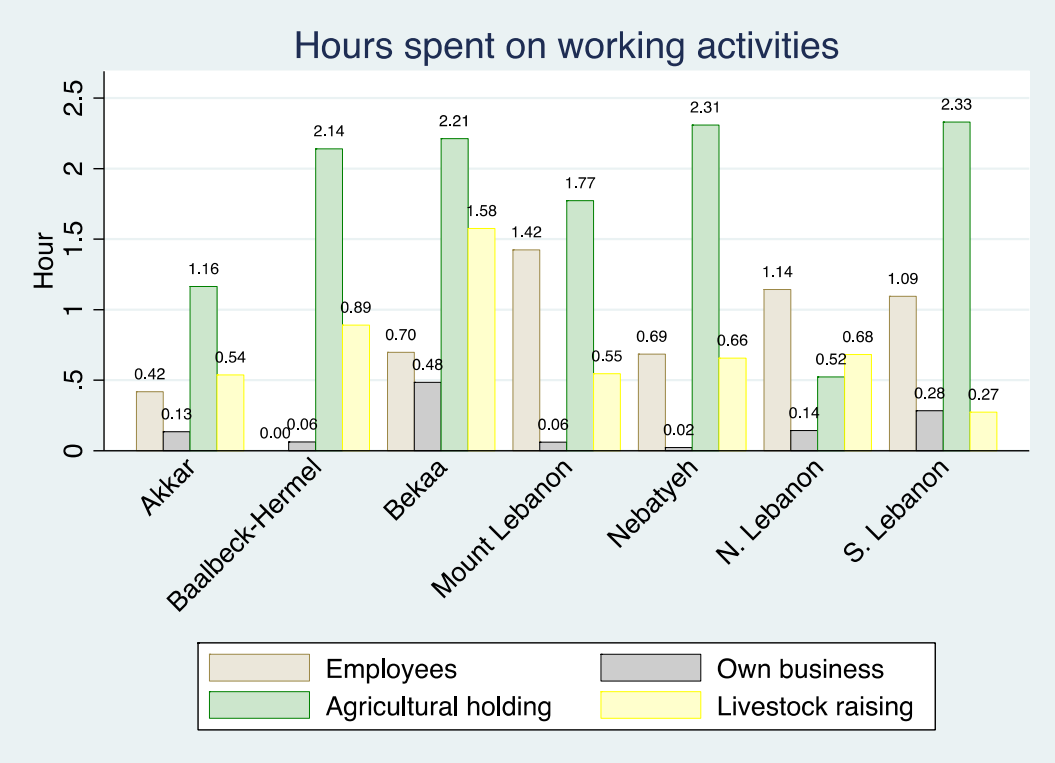


FIGURE 33: DISTRIBUTION OF WORKING ACTIVITIES BY GOVERNORATE

In line with PRO-WEAI (2018), we build the indicator of "Work balance" considering that there is balance in case the individual works less than 10.5 hours per day. The work balance is very high with 99% of the sample working less than 10.5 hours per day.

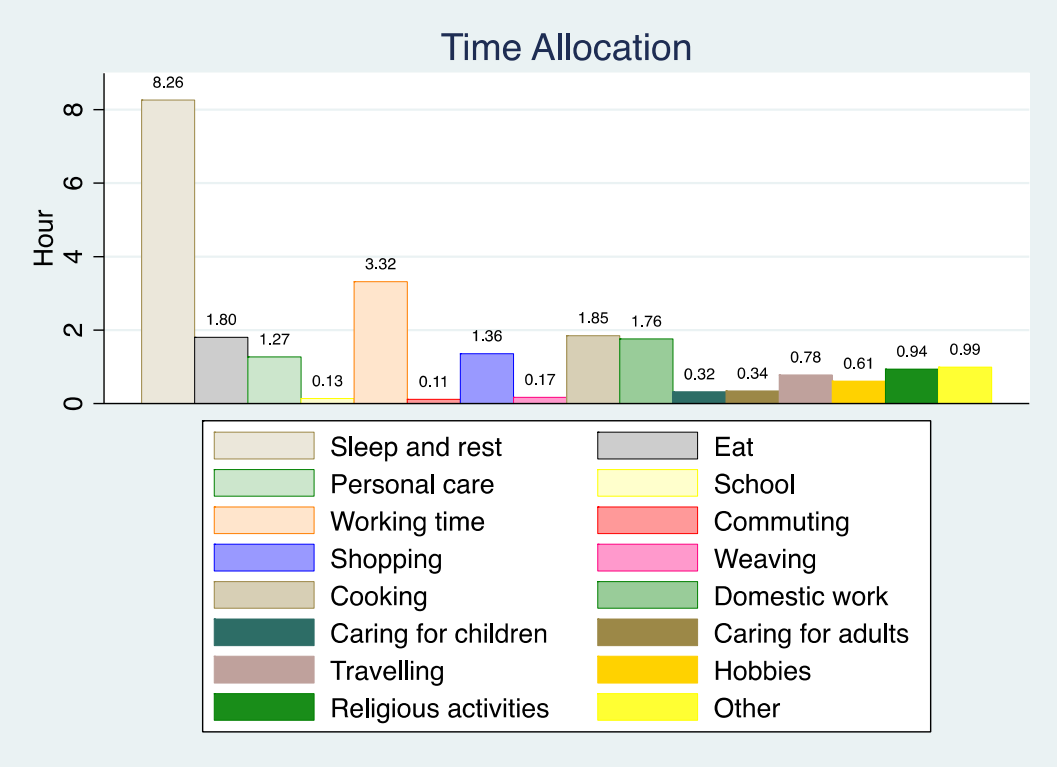


FIGURE 34: DISTRIBUTION OF HOURS TO THE DIFFERENT ACTIVITIES DURING THE DAY

The hours that were not spent in working activities were used mainly for sleeping (8 hours on average), eating (2 hours), cooking (1.8 hours) and domestic work (1.7 hours). These female holders spend the same time in working activities as in cooking and domestic work,Figure 36 .

Physical Mobility

In line with PRO-WEAI 2018, we ask about the degree of freedom in visiting some important places as market or trading place, friends and family (inside and outside the community), hospital or other places to seek for health advice, community meetings and NGO's or program's trainings. Differently from PRO-WEAI (2018), we build the indicator "Visiting important locations" without asking about frequency in going to those places, but we cross check the information about freedom to go with the decision whether to go to those places in case somebody in the family opposes about it. We consider that individuals have freedom in visiting important locations if they can freely or highly freely go to more than half of the places listed, as in the PRO-WEAI, and they decide to go to more than half of the locations also in case there is somebody against this decision. In general, we find a low degree of freedom in all governorates, except than in North Lebanon in which the majority of female (59%) show a good degree of freedom in mobility, Figure 37.

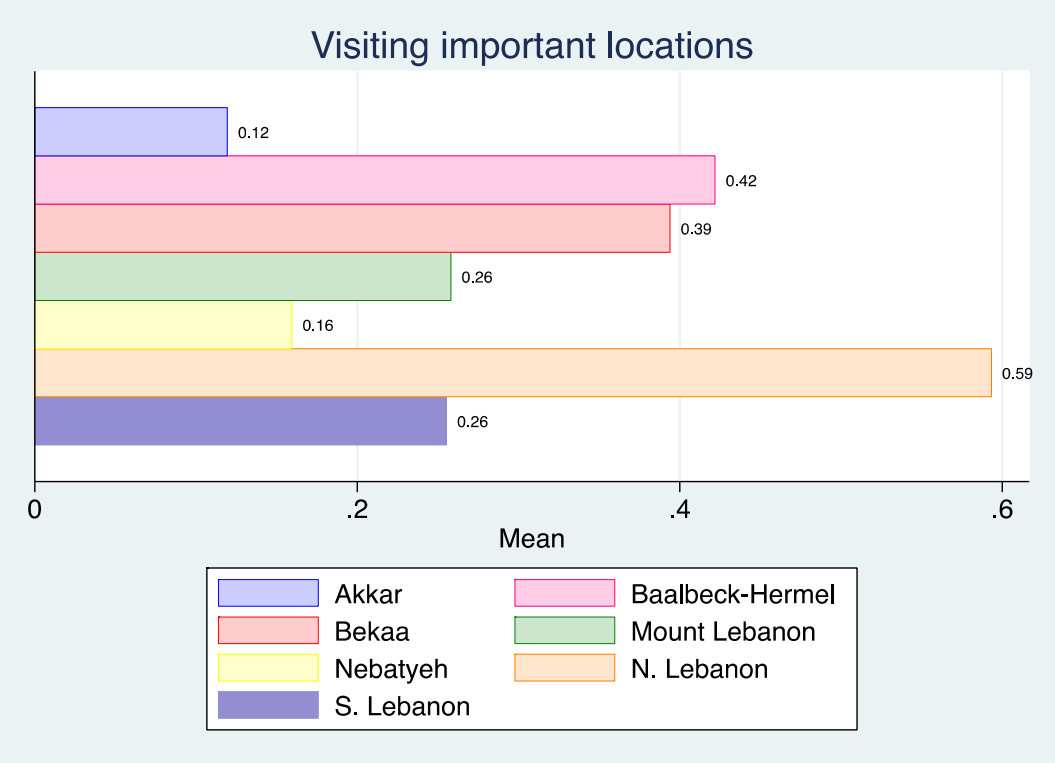


FIGURE 35: PHYSICAL MOBILITY

Although we register a low level of freedom in mobility, female holders who are or were married declared to have been more free after the wedding than before it.

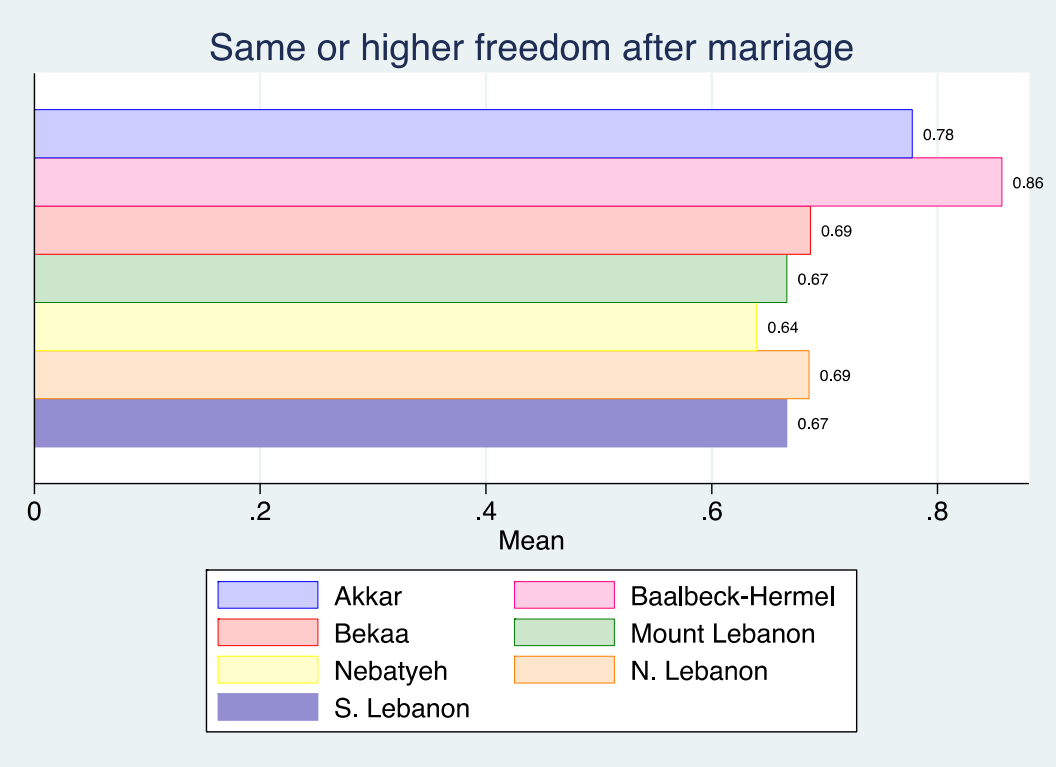


FIGURE 36: LEVEL OF FREEDOM AFTER MARRIAGE

3.2.11 Computation of PRO-WEAI INDEX

The methodology of the original WEAI (Alkire et al., 2013) is used to compute the pro-WEAI. In general, Pro-WEAI is calculated as the weighted mean of two sub-indices: the Three Domains of Empowerment Index (3DE), with a weight of 90 percent, and the Gender Parity Index (GPI), with a weight of 10 percent. The 3DE measures women's empowerment across three domains: intrinsic agency power within), instrumental agency (power to), and collective agency (power with). The GPI compares the empowerment scores of the eligible individual and her spouse, or the male respondent, in each household.

Since we only interviewed female holders we only computed the 3DE measure of women's empowerment.

Based on the 3DE methodology (Alkire & Foster, 2011), we first classified respondents as either adequate (=1) or inadequate (=0) in a given indicator by comparing their responses to a given threshold. We then computed the respondent's empowerment score that is calculated by summing the inadequacy status of all indicators, each multiplied by their corresponding weight equal to 1/8. We then identified the disempowered comparing a person's inadequacy score with the disempowerment cut-off. The disempowerment cut-off is the share of (weighted) inadequacies an individual must have to be considered disempowered. In pro-WEAI, the cut-off is set at 0.25, and thus a person is identified as disempowered if they are inadequate in at least 6 of the 8 indicators. In other words, if her/his score is 75% or higher, or if she/he is adequate in 6 out of 8 indicators, then she/he is classified as empowered. Conversely, if her/his score is below

75%, then she/he is classified as dis-empowered. Finally, we compute the disempowerment headcount ratio or the percentage of women who are disempowered and the intensity of disempowerment.

Table 25 represents the PRO-WEAI information for the sample for which complete data on all 8 indicators are available. About 14% of women in this sample are empowered according to the PRO-WEAI. Of those women who are disempowered, the mean adequacy score is 0.49 that means that these women achieve adequacy in an average of 49% of the indicators.

Indicator	**Woman**
Number of observations	402
3DE Score	0.54
Disempowerment Score (1-3DE)	0.46
% achieving empowerment	14%
% not achieving empowerment	86%
Mean adequacy score for not yet empowered	0.49
Mean disempowered score for not yet empowered (1-adequacy)	0.51

TABLE 26: PRO-WEAI RESULTS

Figure 39 depicts the absolute contribution of each indicator to disempowerment.[13] The overall depth of each bar shows the total disempowerment score (1- 3DE), and the different colored bars within show the absolute contribution of each indicator to disempowerment. The largest contributors to disempowerment for women are group membership, membership in influential groups and access to credit. Work balance does not contribute to the disempowerment since we register work balance in almost all the sample. The analysis shows that intra-household decision making in terms of control over the use of income, input in economic and expenses decisions is well developed in the research area.

The overall analysis of the PRO-WEAI shows a medium level of empowerment (54%). The main issue for women is that they have very limited control over financial resources (credit), group

[13] It is calculated as the censored headcount ratio for a given indicator divided by the total empowerment score, multiplied by the indicator's weight times 100.

membership and leadership capacities. In contrast, the control over the use of income and time use domains are not such important drivers of disempowerment; rural women in Lebanon have acceptable workloads and leisure time.

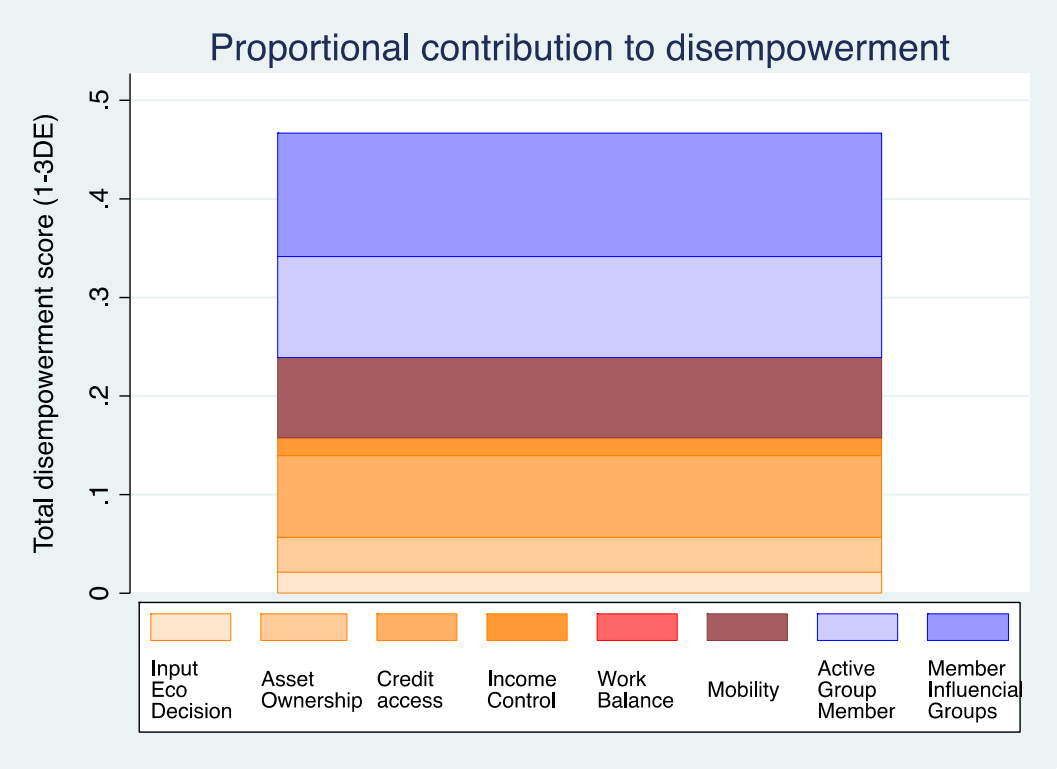


FIGURE 37: PROPORTIONAL CONTRIBUTION OF EACH INDICATOR TO DISEMPOWERMENT

If we decompose the information at the level of governorate we do not find any difference in the variables contributing the most to the total disempowerment score, Figure 40.

FIGURE 38: PRO-WEAI BY GOVERNORATE

3.2.12 Concluding remarks

This pilot study has has demonstrated that there is a high potentiality in using sex- disaggregated statistics, pro-WEAI and its component indicators. Although the instrument has been developed and piloted with a sample in which only female holders have been interviewed, it can be extended and used in all its components in other projects targeted to the whole household, in which man and women are interviewed.

Finally, we emphasize that sex-disaggregated statistics and pro-WEAI are being developed with the aim to assist MoA staff in making the APS survey more gender sensitive. The tool developed in this study will help MoA in measuring empowerment in agricultural development projects and keep track of changes over time.

The key findings and conclusions provide rich insights into the capacities and processes that are critical to integrating gender equality and women's empowerment into projects that support small-scale producers and communities that depend on rural livelihoods for economic opportunity and well-being. The most critical recommendation emerging from PRO-WEAI analysis consist in:

- Developing the capacity of organizations for rural women, farmers, producers and other groups to be inclusive (in terms of gender, age and ethnicity), including by creating fair and transparent criteria for women's participation in leadership positions in these organizations.
- Enhancing women's physical mobility. Because of lack mobility and resources, women have more limited opportunities than their men counterparts to secure employment outside of agriculture, to increase nonfarm income, and to access education, training, and transportation services that will facilitate their livelihood (both domestic and income earning).
- Adopting measures to promote access to financial services:
    - increase rural women's access to financial services, including savings, credit, insurance and domestic payment services, and to economic, financial and business literacy skills, and provide support to the transition from informal to formal financial services;
    - support community-managed financial services, and establish mechanisms for monitoring commercially motivated operations in the financial sector.

4. Bibliography

Alkire, S. (2005) Subjective quantitative studies of human agency. Social Indicators Research, 74(1), 217–260. https://doi.org/10.1007/s11205-005-6525-0.

Alkire, S. (2018) Multidimensional poverty measures as relevant policy tools (OPHI Working Paper 118). University of Oxford.

Alkire, S., & Foster, J. (2011) Counting and multidimensional poverty measurement. Journal of Public Economics, 95(7–8), 476–487.

Alkire, S., Foster, J., Seth, S., Santos, M. E., Roche, J. M., & Ballón, P. (2015) Multidimensional poverty measurement and analysis. Oxford: Oxford University Press. doi: 10.1093/acprof:oso/9780199689491.001.0001.

Alkire, S., Meinzen-Dick, R., Peterman, A., Quisumbing, A., Seymour, G., & Vaz, A. (2013) The women's empowerment in agriculture index. World Development, 52, 71–91.

Agri Pro Focus Learning Network (2014) Gender in value chains. Practical toolkit to integrate a gender perspective in agricultural value chain development

Asian Development Bank and Australian Aid (2013) Tool kit on gender equality results and indicators

CARE (2015) Rapid gender analysis toolkit

CAS (2012) Population and Housing in Lebanon

CAS (2011) The Labor Market In Lebanon - Issue 01

CAS (2009) Multiple Indicators Cluster Survey (MICS 3). Online version: http://www.cas.gov.lb/index.php/all-publications-en

CAS (2007) Living Conditions of households

CHIEAM (2015) Assessing and Advancing Food Security in Lebanon: Innovative Initiatives at the American University of Beirut

CHIEAM, ENPARD and EU (2019) Rapport de synthèse sur l'agriculture en Tunisie

FAO (2019) Livestock patterns

FAO (2019b) Main results and metadata by country (2006-2015). World Programme for the census of Agriculture 2010. FAO Statistical Development Series N.17. Rome.

FAO (2018) Developing gender-sensitive value chains – Guidelines for practitioners. Rome

FAO (2016a) Lebanon country programming framework 2016-2019

FAO (2016b) Agri-Gender statistics toolkit

FAO (2016c) Developing gender-sensitive value chains – A guiding framework. Rome

FAO (2015a) De la o Campos, Ana Paula; Warring, Nynne; Brunelli, Chiara; Doss, Cheryl; and Kieran, Caitlin (2015) Gender and land statistics recent developments in FAO's gender and land rights database. Rome, Italy: Food and Agricultural Organization of the United Nations (FAO).

FAO (2015b) Food Security and livelihoods assessment of Lebanese host communities

FAO AQUASTAT (2016) Questionnaire water and gender

FAO AQUSTAT (2014) The role of women in agricultural water management - Results of a pilot project to develop gender-sensitive indicators.

FAO, EU, MoA (2015c) Agriculture in Lebanon in 2015

FAO-CEDAW (2013) A tool for gender sensitive agriculture and rural development policy and programme formulation

FAO (2012a) Country Study on Status of Land Tenure, Planning and Management in Oriental Near East Countries

FAO (2012b) Guidelines for Linking Population and Housing Censuses with Agricultural Censuses with selected country practices

FAO (2011) Guidelines for the preparation of livestock sector reviews. Animal Production and Health Guidelines

FAO (2010) World Programme for the Census of Agriculture 2010. Concepts and definitions of agricultural census items

FAO (1996) Guidelines for the improvement of statistics on women. Online version http://www.fao.org/3/w0022e/w0022e00.htm

FAO, CHIEAM, MoA (2012) Résultats Globaux du module de base du recensement de l'agriculture 2010

IFPRI (2018) Introducing Pro-WEAI. Online version http://weai.ifpri.info/2018/04/27/introducing-pro-weai-a-tool-for-measuring-womens-empowerment-in-agricultural-development-projects/

Hazel Malapit, Agnes Quisumbing, Ruth Meinzen-Dick, Greg Seymour, Elena M. Martinez, Jessica Heckert, Deborah Rubin, Ana Vaz, Kathryn M. Yount, and the Gender Agriculture Assets Project Phase 2 (GAAP2) Study Team, (2019) Development of the project-level Women's Empowerment in Agriculture Index (pro-WEAI), World Development

IFPRI (2016) Module G: Women Empowerment in Agricultural Index

ILO (2018) Women's and Youth Empowerment in Rural Tunisia An assessment using the Women's Empowerment in Agriculture Index (WEAI)

Institute of Development Studies (2007) Gender Indicators

INS (2019) and MDICI-Institut National de la Statistique (INS) and Ministère du Développement de l'Investissement et de la Coopération Internationale (MDICI) (2019) Enquête par grappes à indicateurs multiples (MICS) 2018

INS (2015) INS (2015) Enquête Nationale sur le Budget, la Consommation et le Niveau de vie des ménages, 2015 : Volume A

INS (2014) A travers le Recensement Général de la Population et de l'Habitat 2014

OECD (2017) Women's economic empowerment in selected MENA countries: The impact of legal frameworks in Algeria, Egypt, Jourdan, Libya Morocco, Tunisia, Competitiveness and private sector development, OECD publishing, Paris. DOI:https://doi.org/10.1787/9789264279322-en

Ministry of Agriculture and Land Reclamation (2010) Agricultural Census 2009-2010 Egypt

Mercy Corps (2018) Measuring gender dynamics in resilience

ODI (2014) Building Momentum Women's Empowerment in Tunisia

OXFAM (2018) Women Empowerment in Tunisia

OXFAM GB (2017) A "how to" guide to measuring women empowerment

OXFAM (2016) Poverty, inequality and social protection in Lebanon

UNECE and World Bank (2010) Developing Gender Statistics: A practical tool

UNICEF (2011) EGYPT MENA Gender Equality Profile Status of Girls and Women in the Middle East and North Africa

United Nation ESCWA (2016) A Review of the Status of Women and Gender Equality in the Arab Region (Beijing +20)

United Nation (2019) The United Nation Minimum set of gender indicators

United Nation (2016) Strategic Review of Food and Nutrition Security in Lebanon

United Nation (2015) Monitoring gender equality and the empowerment of women and girls in the 2030 Agenda for Sustainable Development: Opportunities and challenges.

United Nation Women (2018) Understanding Masculinities: International men and gender equality survey (IMAGES) Egypt. Key Findings 2016-2017

UNFPA (2015) The Egypt economic cost of gender-based violence survey (ECGBVS) 2015

USAID (2010) Guide to Gender Integration and Analysis

World Bank (2013) The little Data Book on Gender

Word Bank, FAO and IFAD (2009) Gender in Agriculture Sourcebook

Zezza, A., Pica-Ciamarra, U., Mugera, H. K., Mwisomba, T., & Okello, P (2016) Measuring the Role of Livestock in the Household Economy: A Guidebook for Designing Household Survey Questionnaires. Washington DC: World Bank.